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STAR

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Langley Research Center

Scientific and Technical Information Program Office

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- NASA-owned patents and patent applications
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- Domestic and foreign dissertations and theses.

Also included are two indexes, Subject Term and Personal Author. The Subject Term Index is generated from the *NASA Thesaurus* terms associated and listed with each document.

STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

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Subject Divisions

Document citations are grouped first by the following divisions. Select a division title to view the category-level Table of Contents.

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F. Life Sciences
G. Mathematical and Computer Sciences
H. Physics
I. Social Sciences
J. Space Sciences
K. General

Indexes

Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also select either of the two indexes provided for searching on *NASA Thesaurus* subject terms and personal author names.

Subject Term Index

Personal Author Index

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Subject Categories of the Division A. Aeronautics

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

01 Aeronautics (General) 1

02 Aerodynamics 2

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery. For related information, see also *34 Fluid Mechanics and Heat Transfer.*

03 Air Transportation and Safety 3

Includes passenger and cargo air transport operations; and aircraft accidents. For related information, see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

04 Aircraft Communications and Navigation 5

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information, see also *17 Space Communications, Spacecraft Communications, Command and Tracking* and *32 Communications Radar.*

05 Aircraft Design, Testing and Performance 5

Includes aircraft simulation technology. For related information, see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*. For land transportation vehicles, see *85 Urban Technology and Transportation*.

06 Aircraft Instrumentation 7

Includes cockpit and cabin display devices; and flight instruments. For related information, see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

07 Aircraft Propulsion and Power 8

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft. For related information, see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

08 Aircraft Stability and Control 9

Includes aircraft handling qualities; piloting; flight controls; and autopilots. For related information, see also *05 Aircraft Design, Testing and Performance*.

09 Research and Support Facilities (Air) 10

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands. For related information, see also *14 Ground Support Systems and Facilities (Space).*

Subject Categories of the Division B. Astronautics

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

12 Astronautics (General) 11

For extraterrestrial exploration, see *91 Lunar and Planetary Exploration*.

13 Astrodynamics N.A.

Includes powered and free-flight trajectories; and orbital and launching dynamics.

14 Ground Support Systems and Facilities (Space) N.A.

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators. *For related information, see also 09 Research and Support Facilities (Air)*.

15 Launch Vehicles and Space Vehicles 13

Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles. For related information, see also *20 Spacecraft Propulsion and Power.*

16 Space Transportation N.A.

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information, see also *03 Air Transportation and Safety* and *18 Spacecraft Design, Testing and Performance*. For space suits, see *54 Man/System Technology and Life Support*.

17 Space Communications, Spacecraft Communications, Command and Tracking 13

Includes telemetry; space communication networks; astronavigation and guidance; and radio blackout. For related information, see also *04 Aircraft Communications and Navigation* and *32 Communications and Radar.*

18 Spacecraft Design, Testing and Performance 13

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls. For life support systems, see *54 Man/System Technology and Life Support*. For related information, see also *05 Aircraft Design, Testing and Performance, 39 Structural Mechanics, and 16 Space Transportation*.

19 Spacecraft Instrumentation N.A.

For related information, see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

20 Spacecraft Propulsion and Power 15

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information, see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 44 Energy Production and Conversion*, and *15 Launch Vehicles and Space Vehicles*.

Subject Categories of the Division C. Chemistry and Materials

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

23 Chemistry and Materials (General) 16

24 Composite Materials 17

Includes physical, chemical, and mechanical properties of laminates and other composite materials. For ceramic materials see *27 Nonmetallic Materials*.

25 Inorganic and Physical Chemistry 22

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also *77 Thermodynamics and Statistical Physics*.

26 Metallic Materials 30

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 Nonmetallic Materials 37

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials.*

28 Propellants and Fuels 53

Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

29 Materials Processing 57

Includes space-based development of products and processes for commercial application. For biological materials see *55 Space Biology.*

Subject Categories of the Division D. Engineering

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

31 Engineering (General) 58

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

32 Communications and Radar 60

Includes radar; land and global communications; communications theory; and optical communications. For related information see also *04 Aircraft Communications and Navigation* and *17 Space Communications, Spacecraft Communications, Command and Tracking*. For search and rescue see 03 Air Transportation and Safety, and *16 Space Transportation*.

33 Electronics and Electrical Engineering 65

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry. For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

34 Fluid Mechanics and Heat Transfer 82

Includes boundary layers; hydrodynamics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

35 Instrumentation and Photography 88

Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation*.

36 Lasers and Masers 91

Includes parametric amplifiers. For related information see also *76 Solid-State Physics*.

37 Mechanical Engineering 95

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

38 Quality Assurance and Reliability 101

Includes product sampling procedures and techniques; and quality control.

39 Structural Mechanics 102

Includes structural element design and weight analysis; fatigue; and thermal stress. For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

Subject Categories of the Division E. Geosciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

42 Geosciences (General) N.A.

43 Earth Resources and Remote Sensing 103

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see *35 Instrumentation and Photography.*

44 Energy Production and Conversion 105

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower. For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *28 Propellants and Fuels*.

45 Environment Pollution 113

Includes atmospheric, noise, thermal, and water pollution.

46 Geophysics 123

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For space radiation see *93 Space Radiation*.

47 Meteorology and Climatology 131

Includes weather forecasting and modification.

48 Oceanography 135

Includes biological, dynamic, and physical oceanography; and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

Subject Categories of the Division F. Life Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

51 Life Sciences (General) 136

52 Aerospace Medicine 137

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

53 Behavioral Sciences 141

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 Man/System Technology and Life Support 141

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also *16 Space Transportation.*

55 Space Biology N.A.

Includes exobiology; planetary biology; and extraterrestrial life.

Subject Categories of the Division G. Mathematical and Computer Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

59 Mathematical and Computer Sciences (General) 144

60 Computer Operations and Hardware N.A.

Includes hardware for computer graphics, firmware, and data processing. For components see *33 Electronics and Electrical Engineering*.

61 Computer Programming and Software 145

Includes computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM.

62 Computer Systems 151

Includes computer networks and special application computer systems.

63 Cybernetics 153

Includes feedback and control theory, artificial intelligence, robotics and expert systems. For related information see also *54 Man/System Technology and Life Support.*

64 Numerical Analysis 156

Includes iteration, difference equations, and numerical approximation.

65 Statistics and Probability 157

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 Systems Analysis 159

Includes mathematical modeling; network analysis; and operations research.

67 Theoretical Mathematics 160

Includes topology and number theory.

Subject Categories of the Division H. Physics

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

70 Physics (General) 160

For precision time and time interval (PTTI) see *35 Instrumentation and Photography;* for geophysics, astrophysics or solar physics see *46 Geophysics*, *90 Astrophysics*, or *92 Solar Physics*.

71 Acoustics 161

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution.*

72 Atomic and Molecular Physics 167

Includes atomic structure, electron properties, and molecular spectra.

73 Nuclear and High-Energy Physics 177

Includes elementary and nuclear particles; and reactor theory. For space radiation see *93 Space Radiation.*

74 Optics 179

Includes light phenomena and optical devices. For lasers see *36 Lasers and Masers*.

75 Plasma Physics 185

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics*.

76 Solid-State Physics 189

Includes superconductivity. For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

77 Thermodynamics and Statistical Physics 193

Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics. For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

Subject Categories of the Division I. Social Sciences

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80 Social Sciences (General) N.A.

Includes educational matters.

81 Administration and Management 194

Includes management planning and research.

82 Documentation and Information Science 195

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see *61 Computer Programming and Software*.

83 Economics and Cost Analysis 201

Includes cost effectiveness studies.

84 Law, Political Science and Space Policy N.A.

Includes NASA appropriation hearings; aviation law; space law and policy; international law; international cooperation; and patent policy.

85 Urban Technology and Transportation N.A.

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation. For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion.*

Subject Categories of the Division J. Space Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

88 Space Sciences (General) N.A.

89 Astronomy 201

Includes radio, gamma-ray, and infrared astronomy; and astrometry.

90 Astrophysics 203

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust. For related information see also *75 Plasma Physics*.

91 Lunar and Planetary Exploration 205

Includes planetology; and manned and unmanned flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

92 Solar Physics 205

Includes solar activity, solar flares, solar radiation and sunspots. For related information see also *93 Space Radiation.*

93 Space Radiation 207

Includes cosmic radiation; and inner and outer earth's radiation belts. For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics.*

Subject Categories of the Division K. General

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99 General 209

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs.

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E13	210.50	421.00
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Typical Report Citation and Abstract

❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10’ to 50’, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65’ swept forebody serrations tended to roll together, while vortices from 40’ swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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VOLUME 36, SEPTEMBER 28, 1998

01
AERONAUTICS (GENERAL)

19980210878 General Accounting Office, National Security and International Affairs Div., Washington, DC USA
Report to Congressional Committees. B-2 Bomber: Additional Costs to Correct Deficiencies and Make Improvements
Jun. 1998; 26p; In English
Report No.(s): GAO/NSIAD-98-152; B-278432; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The conference report on the National Defense Authorization Act for Fiscal Year 1994 requires us to report to the congressional defense committees at regular intervals on the total acquisition costs of the B-2A bomber through the completion of the production program. The last production aircraft was delivered in November 1997, and all aircraft are scheduled to be updated to the latest defined (block 30) configuration by July 2000. This report discusses deficiencies that must be corrected to achieve Air Force objectives for the B-2A, additional costs to correct the deficiencies, and the B-2A modification schedule.
Derived from text
Congressional Reports; Bomber Aircraft; Costs

19980211051 Naval Postgraduate School, Monterey, CA USA
A Comparative Analysis of the Efficiency and Effectiveness of the F-14 Tomcat Overhaul Process
Pruett, Arthur P., Naval Postgraduate School, USA; Zarkowski, Michael W., Naval Postgraduate School, USA; Jun. 1998; 116p; In English
Report No.(s): AD-A348135; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The objective of this thesis is to examine the process and managerial policies used for the F-14 Standard Depot Level Maintenance (SDLM) and compare it to the processes and managerial policies for overhaul of the F/A-18 and for the United Airlines 737. Efficiencies discovered in the F/A-18 and 737 overhaul processes that can be applied to reduce F-14 SDLM Turn Around Time (TAT) are identified. The F-14 community faces the possibility of having insufficient numbers of aircraft to satisfy fleet requirements due to excessive SDLM TAT. A 50% reduction in TAT would yield an increase of 10 to 11 aircraft available for use per year. A TAT reduction of 10% is required by the fourth quarter of Fiscal Year 1998 in order to alleviate the premature retirement of approximately 10% of the inventory (21 F-14 aircraft). This research identifies areas for potential F14 SDLM TAT improvement pertaining to planning, pre-induction requirements, and the component management policies at NADEP Jacksonville, Florida.
DTIC
Maintenance; F-14 Aircraft; Efficiency; Commercial Aircraft; Policies; Civil Aviation; Airline Operations

19980211460 Logistics Management Inst., McLean, VA USA
A Method for Making Cross-Comparable Estimates of the Benefits of Decision Support Technologies for Air Traffic Management *Final Report*
Lee, David, Logistics Management Inst., USA; Long, Dou, Logistics Management Inst., USA; Etheridge, Mel, Logistics Management Inst., USA; Plugge, Joana, Logistics Management Inst., USA; Johnson, Jesse, Logistics Management Inst., USA; Kostiuk, Peter, Logistics Management Inst., USA; Jul. 1998; 101p; In English
Contract(s)/Grant(s): NAS2-14361; RTOP 538-16-11-01
Report No.(s): NASA/CR-1998-208455; NS710S1; NAS 1.26:208455; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

We present a general method for making cross comparable estimates of the benefits of NASA-developed decision support technologies for air traffic management, and we apply a specific implementation of the method to estimate benefits of three decision support tools (DSTs) under development in NASA's advanced Air Transportation Technologies Program: Active Final Approach Spacing Tool (A-FAST), Expedite Departure Path (EDP), and Conflict Probe and Trial Planning Tool (CPTP). The report also reviews data about the present operation of the national airspace system (NAS) to identify opportunities for DST's to reduce delays and inefficiencies.
Author
Air Traffic Control; Air Transportation; Decision Support Systems; National Airspace System; Flight Management Systems; Aircraft Approach Spacing

02
AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery. For related information see also 34 Fluid Mechanics and Heat Transfer.

19980210969 NASA Ames Research Center, Moffett Field, CA USA
Turbulence Measurements on a Flap-Edge Model ***Final Report***
Moriarty, Patrick, Stanford Univ., USA; Bradshaw, Peter, Stanford Univ., USA; Cantwell, Brian, Stanford Univ., USA; Ross, James, NASA Ames Research Center, USA; Sep. 30, 1996; 30p; In English
Contract(s)/Grant(s): NCC2-5140
Report No.(s): NASA/CR-1996-208291; NAS 1.26:208291; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The properties of hot-wire anemometry were studied using facilities at NASA Ames. Hot-film probes were used because of their durability, but cross-films were limited by non-linear end effects. Hot-film probes were used to measure velocities in the farfield wake of a cylinder with an airfoil in the near-field wake. The airfoil reduced the drag coefficient of the system by 10%. A single wire was used to measure velocity profiles over the top of a NACA 63(sub 2)-215 Mod. B wing with a Fowler flap and leading edge slat. Results showed the slat wake remains in the wake over the entire wing. Velocity increased through the slat gap with increased deflection. Slat serrations decreased the chance of separation. Measurements were taken at the flap edge with a single wire. Trends in the data indicate velocity and turbulence levels increase at the flap edge. The porous Revell flap modifies the mean flow near the flap edge. Correlations were made between the hot-wire signal and the unsteady pressure transducers on the wing.
Author
Velocity Measurement; Turbulence; Aerodynamic Coefficients; Flow Measurement; Pressure Sensors; Wire

19980211353 Illinois Univ. at Urbana-Champaign, Urbana, IL USA
Effects of Ice Accretion on Aircraft Aerodynamics ***Final Report***
Bragg, Michael B., Illinois Univ. at Urbana-Champaign, USA; Feb. 24, 1998; 4p; In English
Contract(s)/Grant(s): NAG3-1681
Report No.(s): NASA/CR-1998-208313; NAS 1.26:208313; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The primary objective of this research was to support the development of a new ice accretion model by improving our physical understanding of the ice accretion process through experimental measurements. The focus was on the effect of the initial ice roughness (smooth/rough boundary) on the accretion process. This includes understanding the boundary-layer development over the roughness and especially its effect on the heat transfer which is fundamental to the ice accretion process. The research focused on acquiring the experimental data needed to formulate a new ice accretion physical model. Research was conducted to analyze boundary-layer data taken on a NACA 0012 airfoil with roughness to simulate the smooth/rough boundary. The effect of isolated roughness on boundary-layer transition was studied experimentally to determine if the classical critical roughness Reynolds number criteria could be applied to transition in the airfoil leading-edge area. The effect of simulated smooth/rough boundary roughness on convective heat transfer was studied to complete the study. During the course of this research the effect of free-stream wind tunnel turbulence on the boundary layer was measured. Since this quantity was not well known, research to accurately measure the wind tunnel turbulence in an icing cloud was undertaken. Preliminary results were attained and the final data were acquired, reduced and presented under a subsequent grant.
Author
Aerodynamic Characteristics; Aircraft Icing; Experimentation; Models; Boundary Layers; Convective Heat Transfer; Ice Formation

19980213250 Sverdrup Technology, Inc., Arnold AFS, TN USA

Assessment of Store Control Surface Effectiveness in a Non-Uniform Aircraft Flow Field

Nichols, R. H., Sverdrup Technology, Inc., USA; Evans, S. B., Sverdrup Technology, Inc., USA; Jun. 25, 1997; 14p; In English; 15th; Applied Aerodynamics, 23-25 Jun. 1997, Atlanta, GA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AD-A346160; AIAA Paper 97-2200; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Comparisons of the control effectiveness for two stores in free stream and in the flow field of a parent aircraft have been performed using computational fluid dynamics (CFD). The computations were performed to assess the changes in control surface effectiveness of the store due to the highly nonlinear flow field of the parent aircraft at transonic speeds. The Navier-Stokes equations were solved using an algebraic turbulence model for an extended range air-to-ground missile (AGM-130A) mounted on the wing pylon of an F-15E aircraft and for an air-to-air missile mounted on the forward station of the inboard pylon of an F-15E aircraft. Free-stream calculations showed good agreement with wind tunnel control surface effectiveness results for both stores. Calculations of control surface effectiveness in the aircraft flow field indicate significant changes occur for the AGM-130A missile while the air-to-air missile showed very little effect. This is attributed to the fact that a large region of separated flow occurs on the lee side of the deflected flap of the AGM-130A while the flow over the air-to-air missile deflected elevator is attached. DTIC

Computational Fluid Dynamics; Navier-Stokes Equation; Separated Flow; Turbulence Models; External Store Separation; F-15 Aircraft; Transonic Flow; Flaps (Control Surfaces); Free Flow

19980213308 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Wind Tunnel Testing for Drag Reduction of an Aircraft Laser Turret

Synder, Christopher H., Air Force Inst. of Tech., USA; Jun. 1998; 111p; In English

Report No.(s): AD-A346110; AFIT/GAE/ENY/98J-02; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This study investigated the use of aft-mounted fairings and splitter plates to reduce the drag of a half-scale aircraft laser turret. Forces, moments, and pressure distributions were measured in the AFIT 1.5-m (5-ft) wind tunnel at Reynolds numbers between 3 x 10 to the 5th power and 9 x 10 to the 5th power based on the turret diameter. Oil traces indicated the nature of the flow near the surface of the unmodified turret and the surrounding area. Tufts placed on the turret, fairings, and splitter plates showed changes in separation regions when configurations were changed. The flow around the turret was characterized by dominant vortices shedding from the top of the turret and a large trailing wake of vorticity. Splitter plates were ineffective in reducing drag as a result of the strong flow over the top of the turret. A small fairing reduced baseline drag by 49% but was unable to produce attached flow near the turret. A large fairing eliminated nearly all separation regions and reduced baseline drag by 55%. DTIC

Wind Tunnel Tests; Drag Reduction; Lasers; Fairings; Afterbodies

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents. For related information see also 16 Space Transportation and 85 Urban Technology and Transportation.

19980211010 General Accounting Office, Washington, DC USA

Airline Competition: Cargo Airline Has Enhanced Competition in Hawaii but Faces an Uncertain Future

Jun. 18, 1998; 25p; In English

Report No.(s): AD-A348183; GAO/RCED-98-156; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Because Hawaii comprises eight major islands remote from the U.S. mainland, many cargo customers must rely on air service as the only way to transport their goods in a timely fashion. Historically, two airlines have provided service to meet this need. Under an exemption from provisions of the Airport Noise and Capacity Act, these two airlines are permitted to operate an interisland ”turnaround” service (i.e., flights within Hawaii) with relatively noisy ’Stage 2’ aircraft, which are being phased out on the mainland. Specifically, airlines that were providing turnaround service with Stage 2 aircraft when the act was passed in November 1990 are allowed to continue to do so. In May 1995, the Federal Aviation Administration (FAA) determined that American International Cargo (AIC) also qualified on the basis of its November 1990 operations, in which it provided what FAA deemed turnaround service in Hawaii - and ”onward” service to the U.S. mainland - with a McDonnell-Douglas DC-5 Stage 2 aircraft. In November 1995, this airline began to conduct scheduled interisland cargo service consistent with FAA’s decision. Shortly thereafter, in a reinterpretation of its 1995 decision, FAA concluded that AIC did not qualify to continue providing such service. FAA’s revised inter-

pretation required AIC either to begin operating quieter, Stage 3, aircraft on interisland routes or to exit these markets entirely. Converting an aircraft for Stage 3 operations typically costs an airline $1.5 million per engine. Legislation enacted in Oct 1996 allowed AIC to continue serving Hawaii's interisland markets with one Stage 2 aircraft through September 30,1998. to help prepare the Congress to reexamine the issue as the deadline approaches, you asked us to determine on what basis FAA revised its interpretation of turnaround service.
DTIC
Hawaii; Airline Operations; Noise Pollution; Aircraft Noise; Commercial Aircraft

19980211011 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia
The Air Operations Simulation Centre Audio System
Worl, Reg, Defence Science and Technology Organisation, Australia; Apr. 1998; 44p; In English
Report No.(s): AD-A348181; DSTO-GD-0172; DODA-AR-010-512; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Air Operations Division at the Aeronautical and Maritime Research Laboratory has established the Air Operations Simulation Centre for conduct of manned aircraft flight simulations. An audio system has been developed to deliver sound effects during simulations and to provide audio communications between manned stations. This report describes the hardware and software components of the audio system.
DTIC
Aircraft; Flight Simulation

19980214896 General Accounting Office, Washington, DC USA
Testimony Before the Subcommittee on Aviation, Committee on Commerce, Science and Transportation, US Senate. Aviation Competition: Proposed Domestic Airline Alliances Raise Serious Issues
Jun. 04, 1998; 22p; In English
Report No.(s): AD-A349433; GAO/T-RCED-98-215; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Six major domestic airlines have proposed alliances in 1998. These alliances are significant in scope but vary in extent, and their details are still emerging. In sum, the three alliances would control about 70 percent of domestic traffic, as measured by the number of passengers that board a plane-enplanements. Table 1 summarizes the size and characteristics of the proposed alliances. A key characteristic of two of the alliances is extensive code-sharing. According to officials at DOJ and DOT, code-sharing agreements are forms of corporate integration that fall between outright mergers, which involve equity ownership, and traditional arm's length agreements between airlines about such things as how they will handle tickets and baggage.
DTIC
Competition; Congressional Reports; Commercial Aircraft; Civil Aviation

19980214901 Air Force Academy, CO USA
USAFA Discovery, *Jul - Sep. 1998*
Jan. 1998; 8p; In English
Report No.(s): AD-A349467; USAFA-98-03; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

USAFA Discovery is published quarterly by the faculty of the U.S. Air Force Academy (USAFA). It contains reports on USAFA cadet and faculty research, a complete list of current USAFA research points of contact, and a summary of recent awards and publications. Partial contents include: A Bird Avoidance Model for the US Air Force; Aeronautical Research Center Leading Effort to Improve Operational Capability of AC-130U Gunship; and overviews of The Institute for National Security Studies and The Institute for Information Technology Applications.
DTIC
Research Facilities; Technology Utilization; Security; Armed Forces; Bird-Aircraft Collisions

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 17 Space Communications, Spacecraft Communications, Command and Tracking and 32 Communications and Radar.

19980211057 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
New Algorithms for Moving-Bank Multiple Model Adaptive Estimation
Vasquez, Juan R., Air Force Inst. of Tech., USA; May 26, 1998; 325p; In English
Report No.(s): AD-A347840; AFIT/DS/ENG/98-10; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

The focus of this research is to provide methods for generating precise parameter estimates in the face of potentially significant parameter variations such as system component failures. The standard Multiple Model Adaptive Estimation (MMAE) algorithm uses a bank of Kalman filters, each based on a different model of the system. A new moving-bank MMAE algorithm is developed based on exploitation of the density data available from the MMAE. The methods used to exploit this information include various measures of the density data and a decision-making logic used to move, expand, and contract the MMAE bank of filters. Parameter discretization within the MMAE refers to selection of the parameter values assumed by the elemental Kalman filters. A new parameter discretization method is developed based on the probabilities associated with the generalized Chi-Squared random variables formed by residual information from the elemental Kalman filters within the MMAE. Modifications to an existing discretization method are also presented, permitting application of this method in real time and to nonlinear system models or linear/linearized models that are unstable or a stable. These new algorithms are validated through computer simulation of an aircraft navigation system subjected to interference/jamming while attempting a successful precision landing of the aircraft.
DTIC
Algorithms; Systems Analysis; Procedures; Estimates; Computerized Simulation; Random Variables; Probability Theory

19980213306 Radex, Inc., Bedford, MA USA
GPS Scintillation Analysis
Caton, Ronald G., Radex, Inc., USA; Kendra, Michael J., Radex, Inc., USA; McNell, William J., Radex, Inc., USA; Jan. 15, 1998; 34p; In English
Contract(s)/Grant(s): F19629-95-C-0106; AF Proj. 7659
Report No.(s): AD-A346074; RXR-980101; AFRL-VS-HA-TR-98-0013; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Scintillation data recorded by Global Positioning System (GPS) receivers in various locations are examined. This report details our investigation into the validation of the GPS S4 and 60-second phase sigma values for their inclusion into the Air Force Research Laboratory Scintillation Network Decision Aid (SCINDA) as an aid in issuing scintillation warnings and predictions. GOES8 L-band data is compared with GPS S4 and phase sigma levels during moderate scintillation. The construction of and need for site specific masks to reduce the possibility of issuing false scintillation warnings due to persistent anomalous spikes seen in the GPS data, likely due to interference, is also discussed.
DTIC
Global Positioning System; Scintillation

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology. For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles see 85 Urban Technology and Transportation.

19980210899 Naval Research Lab., Washington, DC USA
The Path to Affordable Long Term Failure Warning: The XRF-Wear Monitor
Whitlock, Robert R., Naval Research Lab., USA; Humprey, Gary R., Joint Oil Analysis Program, USA; Churchill, Darrell B., GasTOPS Ltd., Canada; Jan. 1998; 10p; In English; Prepared in collaboration with Joint Oil Analysis Program Technical Support Center, Pensacola, FL and GasTOPS Ltd., Onatario, Canada.
Report No.(s): AD-A348000; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Long term early warning of wear related failure has recently been demonstrated for operational turbine engines. Particles recovered from Navy F/A-18 engine oil filters were analyzed for chemical elemental content using X-ray fluorescence analysis

(XRF). (1) The data were compared with known engine metallurgy to determine the source of particles generated by wear, corrosion, and contamination. The identified sources agreed with engine history as recorded in the maintenance database. Normally operating engines showed low levels of wear particulates, as expected. The XRF filter debris analysis method (XRF-FDA) successfully identified every oil wetted wear-related failure as having elevated quantities of metals. Warning times in excess of 100 operating hours; and (2) were achieved through the ability of XRF to measure elements other than iron. Some engines undergoing high time replacements showed high levels of metals as expected; the method enables the low wear engines to be identified. These striking results have implications for planning of operations and maintenance. This paper presents the XRF-Wear concept for autonomous on-line monitoring of aviation engines and other high value machinery. An economically advantageous approach to assembling the wear-profile database of previously unmonitored equipment is offered in the context of a fully automated, field deployable, on-site expert system.
DTIC
Corrosion; Turbine Engines; Early Warning Systems; Contamination; Turbines; Aircraft Engines; Failure

19980211055 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia
An Investigation of F/A-18 AMAD Gearbox Driveshaft Vibration
Rebbechi, Brian, Defence Science and Technology Organisation, Australia; Burchill, Madeleine, Defence Science and Technology Organisation, Australia; Coco, Gareth, Defence Science and Technology Organisation, Australia; Nov. 1997; 101p; In English
Report No.(s): AD-A348040; DSTO-TN-0121; DODA-AR-010-389; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The RAAF has experienced several failures of the input bearing of the F/A-18 AMAD (Aircraft Mounted Accessory Drive) gearbox. Two of these failures have resulted in in-flight fires. Measurements of input housing vibration showed very high vibration levels on some aircraft, apparently due to unbalance in the driveshaft assembly. Subsequent measurement of drive-shaft motion confirmed synchronous forward whirl of the driveshaft. The driveshaft system appears to operate below its first critical speed, but there are indications that the first critical speed may not be far above running speed. There is no evidence of significant driveshaft system resonances during the operating speed range of idle to full military power. The unbalance appears to result primarily from clearances in the AMAD gearbox input shaft assembly. These clearances will bring about an initial unbalance of the assembly much greater than specified component tolerances. Partial alleviation of the high vibration has been brought about by rotation of the 19E215-1 driveshaft relative to the input power take-off shaft assembly.
DTIC
Vibration; Failure; Aircraft; Transmissions (Machine Elements)

19980211413 DME Corp., Fort Lauderdale, FL USA
Automated Machinery Health Monitoring Using Stress Wave Analysis and Artificial Intelligence
Board, David B., DME Corp., USA; Jan. 1998; 10p; In English
Report No.(s): AD-A347198; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper describes the current state of development of a prototype mechanical diagnostic system for the U.S. Army, for application to helicopter drive train components. The system will detect structure borne, high frequency acoustic data, and process it with feature extraction and polynomial network artificial intelligence software. Data for network training and evaluation has been acquired from both healthy and discrepant components, operated over a full range of loads, in a test cell. Stress Wave Analysis is a high frequency acoustic sensing and signal conditioning technology, which provides an analog signal that is a time history of friction and shock events in a machine. This Stress Wave Pulse Train (SWPT) is independent of background levels of vibration and audible noise. The SWPT is digitized and used to compute a set features that characterize the friction signature. Fault Detection Networks of polynomial equations are used to automatically classify SWPT features as being representative of either healthy or discrepant mechanical components. The application of these techniques for automatic classification of friction signatures advances current technology to achieve real time diagnostic capability at all flight power levels.
DTIC
Health; Data Recorders; Prototypes; Diagnosis; Acoustic Properties; Evaluation; Data Acquisition

19980214900 Dayton Univ. Research Inst., OH USA
The Effects of the Cold Working Process and Interference Fit Bushings on the Fatigue Life of Polycarbonate Specimens with Holes ***Interim Report, Nov. 1994 - Apr. 1997***
Huelsman, Marc A., Dayton Univ. Research Inst., USA; Bowman, Daniel R., Dayton Univ. Research Inst., USA; Apr. 1997; 36p; In English

Contract(s)/Grant(s): F33615-92-C-340O; AF Proj. 2402
Report No.(s): AD-A349453; UDR-TR-97-71; WL-TR-97-3110; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Aircraft transparencies must provide performance and durability at an acceptable cost to be considered for production. The most important performance factor is flight safety. In order to achieve flight safety from a structural standpoint, the transparency system must withstand loads associated with flight and with bird impact. Conventional transparencies are fastened to an aircraft using bolts, and the ability to withstand flight loads or bird impact is strongly dependent upon the condition of the bolt holes in the transparency. Fatigue loading results from flight, and transparencies are subject to cracking due to the stress concentration associated with the bolts holes. Bolt hole cracks have been found by inspecting service-aged F-111, F-16, and B-1 transparencies. Transparency bolt hole cracking results in a reduced life of the transparency as well as reduced birdstrike capability. Because of the problems associated with bolt hole cracking: improvements in the fatigue life of the transparency will reduce the number of transparencies that are removed for this cause. Also, since many aircraft transparencies are now refurbished one or more times, reducing or eliminating bolt hole cracking will increase the refurbishable life of aircraft transparencies. In addition, birdstrike protection will not be reduced. This program was conducted to investigate and refine cold working techniques and to investigate interference fit bushings. Results of this program show better than two orders of magnitude improved fatigue life with interference fit bushings over the baseline.
DTIC
Polycarbonates; Bolts; Bushings; Cold Working; Fatigue Life; Aircraft Maintenance

06
AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments. For related information see also 19 Spacecraft Instrumentation and 35 Instrumentation and Photography.

19980211410 Naval Research Lab., Marine Geosciences Div., Stennis Space Center, MS USA
AV-8B Map System 2: Moving Map Composer Software Users Manual ***Final Report***
Lohrenz, Maura C., Naval Research Lab., USA; Gendron, Marlin L., Naval Research Lab., USA; Mehaffey, J. Michelle, Naval Research Lab., USA; Wischow, Perry B., Naval Research Lab., USA; Trenchard, Michael E., Naval Research Lab., USA; May 27, 1998; 73p; In English
Report No.(s): AD-A347231; NRL/FR/7441--97-9677; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report documents the Moving Map Composer (MMC) software system developed by scientists in NRL Code 7441. The MMC software is resident on the AV-8B Map 2 Station, which NRL designed and configured in support of AV-8B mission planners and pilots in the field. These MMC driven Map 2 Stations enable AV-8B users to perform the following functions: (1) Design and build Aircraft Optical Disk (AOD) images from user specified Compressed Aeronautical Chart (CAC) and scanned chart data; (2) Include emergency check lists and reconnaissance photographs in an AOD image; (3) Write completed AOD images to militarized Write Once Read Many AODs; (4) Evaluate failed AODs and recover from failed AOD image builds; (5) Design and build Mission Planning System Compact Disk Images (MPS CDIs) from user specified CAC, scanned chart, and DTED data; (6) Write MPS CDIs to Recordable Compact Disk (CD-R) for mission planning purposes; and (7) Scan and compress paper charts into a CAC compatible format (when CAC or Arc Digitized Raster Graphics (ADRG) are not available) and include them in an AOD image or MPS-CDI. These Map 2 Stations will completely replace all map data functions and all optical disk image functions that are currently handled by the AV-8B Map, Operator, and Maintenance Stations (MOMS).
DTIC
Maps; Computer Programs; Computer Aided Design; Evaluation; User Manuals (Computer Programs); Digital Data; Navigation Aids; Computer Graphics; Charts

07
AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft. For related information see also 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.

19980211303 NASA Lewis Research Center, Cleveland, OH USA
Wave Augmented Diffusers for Centrifugal Compressors
Paxson, Daniel E., NASA Lewis Research Center, USA; Skoch, Gary J., Army Research Lab., USA; Jul. 1998; 10p; In English; 34th; Propulsion, 12-15 Jul. 1998, Cleveland, OH, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 523-26-33
Report No.(s): NASA/TM-1998-208480; E-11253; NAS 1.15:208480; AIAA Paper 98-3401; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A conceptual device is introduced which would utilize unsteady wave motion to slow and turn flows in the diffuser section of a centrifugal compressor. The envisioned device would substantially reduce the size of conventional centrifugal diffusers by eliminating the relatively large ninety degree bend needed to turn the flow from the radial/tangential to the axial direction. The bend would be replaced by a wall and the flow would instead exit through a series of rotating ports located on a disk, adjacent to the diffuser hub, and fixed to the impeller shaft. The ports would generate both expansion and compression waves which would rapidly transition from the hub/shroud (axial) direction to the radial/tangential direction. The waves would in turn induce radial/tangential and axial flow. This paper presents a detailed description of the device. Simplified cycle analysis and performance results are presented which were obtained using a time accurate, quasi-one-dimensional CFD code with models for turning, port flow conditions, and losses due to wall shear stress. The results indicate that a periodic wave system can be established which yields diffuser performance comparable to a conventional diffuser. Discussion concerning feasibility, accuracy, and integration follow.
Author
Centrifugal Compressors; Centrifugal Force; Compression Waves; Elastic Waves; Computational Fluid Dynamics

19980211424 Air Force Research Lab., Wright-Patterson AFB, OH USA
The Future Direction and Development of Engine Health Monitoring (EHM) Within the USA Air Force
Green, Andrew J., Air Force Research Lab., USA; Apr. 24, 1998; 7p; In English; Paper from the 1998 Technology Showcase Joap International Condition Monitoring Conference.
Report No.(s): AD-A347976; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The USAF has set itself goals for capability, performance and reliability standards that it must achieve if it is to maintain air superiority. The advent of novel design methodologies and materials has put the spotlight on engine diagnostics and prognostics as an essential element to achieve those goals. The development and implementation of the COEHM Methodology will help meet the set Autonomics goals and the needs of the third millennium. The development of a totally sensed engine (real or virtual) that provides exact and accurate data will help a COEHM system perform the AI function that is required to derive fast and accurate answers; this will enable the maintainers to quickly regenerate an aircraft for it next mission. The COEHM is more than just an approach but an asserted effort to produce a range of compatible EM systems for 2001 and beyond.
DTIC
Gas Turbines; Engines; Health; Autonomy

19980211443 NASA Lewis Research Center, Cleveland, OH USA
Model Engine Performance Measurement From Force Balance Instrumentation
Jeracki, Robert J., NASA Lewis Research Center, USA; Jul. 1998; 30p; In English; 34th; Propulsion, 12-15 Jul. 1998, Cleveland, OH, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 538-03-11
Report No.(s): NASA/TM-1998-208486; E-11263; NAS 1.15:208486; AIAA Paper 98-3112; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A large scale model representative of a low-noise, high bypass ratio turbofan engine was tested for acoustics and performance in the NASA Lewis 9- by 15-Foot Low-Speed Wind Tunnel. This test was part of NASA's continuing Advanced Subsonic Technology Noise Reduction Program. The low tip speed fan, nacelle, and an un-powered core passage (with core inlet guide vanes) were simulated. The fan blades and hub are mounted on a rotating thrust and torque balance. The nacelle, bypass duct stators, and core passage are attached to a six component force balance. The two balance forces, when corrected for internal pressure

tares, measure the total thrust-minus-drag of the engine simulator. Corrected for scaling and other effects, it is basically the same force that the engine supports would feel, operating at similar conditions. A control volume is shown and discussed, identifying the various force components of the engine simulator thrust and definitions of net thrust. Several wind tunnel runs with nearly the same hardware installed are compared, to identify the repeatability of the measured thrust-minus-drag. Other wind tunnel runs, with hardware changes that affected fan performance, are compared to the baseline configuration, and the thrust and torque effects are shown. Finally, a thrust comparison between the force balance and nozzle gross thrust methods is shown, and both yield very similar results.
Author
Ducted Fans; Thrust; Aerodynamic Drag; Wind Tunnels; Fan Blades; Turbofan Engines

19980211493 NASA Lewis Research Center, Cleveland, OH USA
High Stability Engine Control (HISTEC) Flight Test Results
Southwick, Robert D., Pratt and Whitney Aircraft, USA; Gallops, George W., Pratt and Whitney Aircraft, USA; Kerr, Laura J., Pratt and Whitney Aircraft, USA; Kielb, Robert P., Pratt and Whitney Aircraft, USA; Welsh, Mark G., Pratt and Whitney Aircraft, USA; DeLaat, John C., NASA Lewis Research Center, USA; Orme, John S., NASA Dryden Flight Research Center, USA; Jul. 1998; 12p; In English; 34th; Propulsion, 12-15 Jul. 1998, Cleveland, OH, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 523-53-13
Report No.(s): NASA/TM-1998-208481; E-11255; NAS 1.15:208481; AIAA Paper 98-3757; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The High Stability Engine Control (HISTEC) Program, managed and funded by the NASA Lewis Research Center, is a cooperative effort between NASA and Pratt & Whitney (P&W). The program objective is to develop and flight demonstrate an advanced high stability integrated engine control system that uses real-time, measurement-based estimation of inlet pressure distortion to enhance engine stability. Flight testing was performed using the NASA Advanced Controls Technologies for Integrated Vehicles (ACTIVE) F-15 aircraft at the NASA Dryden Flight Research Center. The flight test configuration, details of the research objectives, and the flight test matrix to achieve those objectives are presented. Flight test results are discussed that show the design approach can accurately estimate distortion and perform real-time control actions for engine accommodation.
Author
Engine Control; F-15 Aircraft; Flight Tests; Aircraft Engines; Flow Distortion; Thrust Control

08
AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots. For related information see also 05 Aircraft Design, Testing and Performance.

19980211108 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
High Amplitude Tracking Control
McNamee, Joseph W., Air Force Inst. of Tech., USA; Jun. 1998; 206p; In English
Report No.(s): AD-A347638; AFIT/DS/ENG/98-09; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The problem of tracking control in the face of high amplitude dynamic reference signals, hard state and control constraints, and open-loop unstable plants is investigated. Saturation effects mitigation is a current research topic, and a large body of literature exists which addresses this problem. However, with a few notable exceptions, little work has been accomplished which is applicable to the problem of high amplitude dynamic reference signal tracking in the face of hard state and control constraints, and open-loop unstable plants. Moreover, methods that do address the stated problem generally limit the exogenous reference signal to statically admissible values to obtain a BIBO stable closed-loop system. In these investigations a nonlinear reference signal governor generates a modified reference signal based on the exogenous reference signal and the state of the controlled process. This research departs from previous work in that a dual-loop reference signal governor methodology is developed that prevents constraint violation but does not restrict the modified reference signal to statically admissible values. Thus tracking performance is improved. An arbitrarily close approximation of the controlled process maximal statically admissible set is characterized. On-line computational burden is generally less than that imposed by current reference signal governor methods, and the resulting closed-loop system is BIBO stable.
DTIC
Speed Regulators; Feedback Control; Amplitudes; Control Systems Design; Tracking (Position)

19980211327 NASA Langley Research Center, Hampton, VA USA

Parameter Estimation of Actuators for Benchmark Active Control Technology (BACT) Wind Tunnel Model with Analysis of Wear and Aerodynamic Loading Effects

Waszak, Martin R., NASA Langley Research Center, USA; Fung, Jimmy, NASA Langley Research Center, USA; Jul. 1998; 32p; In English; Atmospheric Flight Mechanics Conference, 29-31 Jul. 1996, San Diego, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 505-64-52-01

Report No.(s): NASA/TM-1998-208452; NAS 1.15:208452; L-17540; AIAA Paper 96-3362; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes the development of transfer function models for the trailing-edge and upper and lower spoiler actuators of the Benchmark Active Control Technology (BACT) wind tunnel model for application to control system analysis and design. A simple nonlinear least-squares parameter estimation approach is applied to determine transfer function parameters from frequency response data. Unconstrained quasi-Newton minimization of weighted frequency response error was employed to estimate the transfer function parameters. An analysis of the behavior of the actuators over time to assess the effects of wear and aerodynamic load by using the transfer function models is also presented. The frequency responses indicate consistent actuator behavior throughout the wind tunnel test and only slight degradation in effectiveness due to aerodynamic hinge loading. The resulting actuator models have been used in design, analysis, and simulation of controllers for the BACT to successfully suppress flutter over a wide range of conditions.

Author

Actuators; Control Systems Design; Transfer Functions; Active Control; Aerodynamic Loads

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands. For related information see also 14 Ground Support Systems and Facilities (Space).

19980211052 Army Cold Regions Research and Engineering Lab., Hanover, NH USA

Construction, Maintenance, and Operation of a Glacial Runway, McMurdo Station, Antarctica

Blaisdell, George L., Army Cold Regions Research and Engineering Lab., USA; Lang, Renee M., Army Cold Regions Research and Engineering Lab., USA; Crist, Gerald, Army Cold Regions Research and Engineering Lab., USA; Kurtti, Keith, Army Cold Regions Research and Engineering Lab., USA; Harbin, R. J., Army Cold Regions Research and Engineering Lab., USA; Mar. 1998; 138p; In English

Report No.(s): AD-A348091; CRREL-98-1; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

On 7 February 1994, a C-141 departed Christchurch, New Zealand, and landed on the 3050 m (10,000 ft) Pegasus glacial ice runway, located on the Ross Ice Shelf 13 km (8 miles) south of McMurdo, Antarctica. This event marked the final test for a five-year development program to demonstrate the feasibility of a semipermanent glacial ice runway capable of supporting heavy wheeled aircraft at a site easily accessible to McMurdo. In the later phases of developing the glacial ice runway, numerous working flights of LC-130s operating on wheels (rather than skis) moved cargo more efficiently to the South Pole, and the LC-130 and a C-130 carried larger passenger loads to Christchurch. The primary benefit of the Pegasus runway to the US Antarctic Program is its ability to support heavy wheeled aircraft for most of the period of mid-January through November. In the past, only ski-equipped aircraft could land in the McMurdo area during this time period. The Pegasus runway allows increased payloads for the LC-130 (an additional 3600 kg or 8000 lb takeoff weight when using wheels) and provides access for virtually any conventional aircraft. The technology for siting, constructing, maintaining, and operating such a runway is now well understood and is described in detail in this comprehensive report.

DTIC

Runways; Glaciers; C-141 Aircraft; Construction; McMurdo Sound

19980211422 Naval Facilities Engineering Service Center, Port Hueneme, CA USA

Thermochemical Concrete Pavement Scaling Mechanism: Navy F/A-18 Jet Aircraft Parking Apron Problem *Final Report, 1994-1998*

Novinson, Thomas, Naval Facilities Engineering Service Center, USA; Jun. 1998; 33p; In English

Report No.(s): AD-A347038; NFESC-TM-2281-SHR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Experiments were conducted to determine the mechanism of concrete ”scaling” or deterioration on airfield parking aprons used by F/A-18 Navy jets. Some of the ”scaling” was caused by heat from the auxiliary power unit (APU) and some was caused by phosphoric acid attack on the heated concrete. The phosphoric acid originated from hydrolysis of organic phosphates in used engine oil. The mechanism was confirmed by demonstrating that the concrete scale debris was high in phosphate content.
DTIC
Thermal Degradation; Chemical Attack; Pavements; Experimentation; Deterioration; Concretes; Landing Sites

19980211576 NYMA, Inc., Brook Park, OH USA
Subsonic Flow Quality Surveys of the NASA Lewis Research Center 10- by 10-Foot Supersonic Wind Tunnel ***Final Report***
Arrington, E. Allen, NYMA, Inc., USA; Gonsalez, Jose C., NYMA, Inc., USA; Jun. 1998; 34p; In English
Contract(s)/Grant(s): NAS3-27186; RTOP 505-62-82
Report No.(s): NASA/CR-1997-206326; NAS 1.26:206326; E-11017; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During April 1996, qualification tests for the subsonic operation of the 10- by 10-Foot Supersonic Wind Tunnel (10 x 10 SWT) were conducted. These tests proved that the facility could be safely operated over the subsonic Mach number range of 0 to 0.36 either by using the air circulation fans of the facility air dryer or by operating the primary drive compressor with one, two, three or all four of the electric drive motors. During the qualification tests, an existing flow field survey rake was used to collect total and static pressure data in the test section. This rake was used for all the surveys made at the operating conditions tested during the qualification tests. The data showed that the spanwise Mach number distribution at the test section centerline was acceptable and that the goal of 0.005 variation in Mach number was met for most of the subsonic operating conditions.
Author
Test Chambers; Supersonic Wind Tunnels; Surveys; Performance Tests

12
ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see 91 Lunar and Planetary Exploration.

19980210922 Arnold Engineering Development Center, Arnold AFS, TN USA
MSX Satellite Flight Measurements of Contaminant Deposition on a CQCM and on TQCMs
Wood, B. E., Sverdrup Technology, Inc., USA; Bertrand, W. T., Sverdrup Technology, Inc., USA; Hall, D. F., Aerospace Corp., USA; Lesho, J. C., Johns Hopkins Univ., USA; Uy, O. M., Johns Hopkins Univ., USA; Dyer, J. S., Utah State Univ., USA; Jan. 1997; 12p; In English; 35th; Aerospace Sciences, 6-10 Jan. 1997, Reno, NV, USA
Report No.(s): AD-A345787; AIAA 97-0841; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Midcourse Space Experiment (MSX) is a Ballistic Missile Defense Organization (BMDO) demonstration and validation satellite program that has both defense and civilian applications. MSX was launched April 24, 1996, and has UV, visible, and infrared instruments including the SPIRIT 3 (Space Infrared Imaging Telescope) cryogenic telescope. It also has several contamination measuring instruments for measuring pressure, gas species, water and particulate concentrations and condemnable gas species. A cryogenic quartz crystal microbalance (CQCM) and four temperature-controlled microbalances (TQCMs) are part of this suite of contamination measuring instruments on board the satellite. This paper describes some of the flight QCM data obtained and analyzed to date. The CQCM is located internal to the SPIRIT 3 cryogenic telescope and is mounted adjacent to the primary mirror. Monitoring of contaminant mass deposition on the primary mirror is being provided by the CQCM, which is cooled to the same temperature as the mirror - approx. 20 K. The four TQCMs are mounted on the outside of the spacecraft and monitor contaminant deposition on the external surfaces. The TQCMs operate at approx. -50 C and are positioned strategically to monitor the silicone and organic contaminant flux arriving at specific locations, such as near to the UV instruments, or coming from specific contaminant sources such as the solar panels. Time histories of contaminant thickness deposition for each of the QCMs are presented. During the first week of flight operation, all QCMs recorded deposition in the 10-20 ng/cm 2-day (1-2 ang./day) range. These TQCM deposition rates have continuously decreased, and after 100 days into the mission the measured rates have fallen to values between 0 and 0.2 ang./day depending on TQCM location.
DTIC
Satellite Observation; Flight Operations; Deposition; Cryogenics; Quartz Crystals; Microbalances; Ballistic Missiles; Missile Defense; Artificial Satellites

19980211345 NASA Ames Research Center, Moffett Field, CA USA

Optimization Study of the Ames 0.5 Two-Stage Light Gas Gun

Bogdanoff, D. W., NASA Ames Research Center, USA; Mar. 1996; 24p; In English

Contract(s)/Grant(s): RTOP 478-85-20

Report No.(s): NASA-TM-1996-110386; NAS 1.15:110386; A-961331; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

There is a need for more faithful simulation of space debris impacts on various space vehicles. Space debris impact velocities can range up to 14 km/sec and conventional two-stage light gas guns with moderately heavy saboted projectiles are limited to launch velocities of 7-8 km/sec. Any increases obtained in the launch velocities will result in more faithful simulations of debris impacts. It would also be valuable to reduce the maximum gun and projectile base pressures and the gun barrel erosion rate. In this paper, the results of a computational fluid dynamics (CFD) study designed to optimize the performance of the NASA Ames 0.5' gun by systematically varying seven gun operating parameters are reported. Particularly beneficial effects were predicted to occur if (1) the piston mass was decreased together with the powder mass and the hydrogen fill pressure and (2) the pump tube length was decreased. The optimum set of changes in gun operating conditions were predicted to produce an increase in muzzle velocity of 0.7-1.0 km/sec, simultaneously with a substantial decrease in gun erosion. Preliminary experimental data have validated the code predictions. Velocities of up to 8.2 km/sec with a 0.475 cm diameter saboted aluminum sphere have been obtained, along with large reductions in gun erosion rates.

Author

Computerized Simulation; Space Debris; Projectiles; Impact Velocity; Micrometeoroids

19980211365 National Space Development Agency, Tokyo, Japan

Proceedings of the Twentieth International Symposium on Space Technology and Science, Volume 1

Oct. 31, 1996; 1488p; In English; 20th, 19-25 May 1996, Gifu, Japan

Report No.(s): CONF-9605284-Vol.1; DE97-770444; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The 20th International Symposium on Space Technology and Science was held in Japan on May 19-25, 1996, and a lot of papers were made public. This proceedings has 252 papers of all the papers read in the symposium including the following: Computational fluid dynamics in the design of M-V rocket motors in the propulsion field; Joint structures of carbon-carbon composites in the field of materials and structures; On-orbit attitude control experiment of ETS-6 in the field of astrodynamics, navigation, guidance and control; Magnetic transport of bubbles in liquid in microgravity; The outline and development status of JEM-EF in the field of on-orbit and ground support systems. The proceedings also includes the papers titled Conceptual study of H-2A rocket in the space transportation field; Microgravity research in the microgravity science field; 'Project Genesys' in the field of satellite communications and broadcasting.

DOE

Astrodynamics; Attitude Control; Carbon-Carbon Composites; Space Transportation; Satellite Communication

19980211590 Rome Air Development Center, Hanscom AFB, MA USA

Electron Density and Temperature During the CHARGE-2B Sounding Rocket Mission

Ernstmeyer, James, Rome Air Development Center, USA; Tanigawa, Timothy J., Rome Air Development Center, USA; Myers, Neil B., Rome Air Development Center, USA; Jul. 1997; 30p; In English

Contract(s)/Grant(s): AF Proj. 2304

Report No.(s): AD-A346495; RL-TR-97-152; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The CHARGE-2B sounding rocket was launched from Poker Flats Research Range, Alaska, in March 1992 to investigate VLF electromagnetic radiation generated by a modulated electron beam in the ionosphere. A Langmuir probe on board the Rome Laboratory Diagnostic Free Flyer (DFF) sub-payload was the only source of local electron density and temperature data for the mission. The probe detected supra-thermal electrons generated by the beam injections. These observations were used to characterize the disturbed plasma region surrounding the beam-vehicle system. Spectral analysis of the probe current data reveals a low level of electron density fluctuation despite clear signatures of electrostatic beam emissions on the DFF wave observations.

DTIC

Electromagnetic Radiation; Sounding Rockets; Electron Energy; Electrostatic Probes; Electron Beams; Earth Ionosphere; Atmospheric Sounding

15
LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles. For related information see also 20 Spacecraft Propulsion and Power.

19980211071 Lawrence Livermore National Lab., Livermore, CA USA
Optimization studies of a three-stage light gas gun
Glenn, L. A., Lawrence Livermore National Lab., USA; Jun. 01, 1997; 8p; In English; Shock Compression of Condensed Matter, 27 Jul. - 1 Aug. 1997, Amherst, MA, USA; Sponsored by American Physical Society, USA
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-127855; CONF-970707; DE98-051995; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A new gasdynamic launcher is described, in which intact projectiles weighing at least 1 gram can be accelerated to mass velocities of 15- 20 km/s. The system employs a conventional 2--stage light gas gun, with the barrel modified and filled with helium to act as a pump tube for a third stage. The key feature of the launcher is that the peak pressure in the third stage can be maintained below 2.5 GPa, thus assuring high efficiency and the integrity of the projectile.
DOE
Light Gas Guns; Helium; Hypervelocity Projectiles

17
SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation and guidance; and radio blackout. For related information see also 04 Aircraft Communications and Navigation and 32 Communications and Radar.

19980211562 University of South Australia, Australian Center for Test and Evaluation, Salisbury, Australia
Computer Aided Synthesis or Measurement Schemes for Telemetry applications ***Final Report, 1 May 1996 - 30 Apr. 1997***
Sydenham, Peter H., University of South Australia, Australia; Evdokiou, Peter, University of South Australia, Australia; Sep. 02, 1997; 142p; In English
Contract(s)/Grant(s): F49620-96-1-0186
Report No.(s): AD-A347298; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This report describes the design, implementation, testing and operation of a subminiature telemetry (SMT) configuration tool. The configuration tool is comprised of software and hardware components. The software, written in Microsoft Visual Basic Version 4.0, offers a graphical user interface for specifying SMT configurations. It also includes a function for automating the tedious task of setting up a telemetry frame structure. The program features automatic report generation, programming of the SMT devices and setting up a test environment to configure and verify correct operation of the SMT devices in a laboratory before going out in the field. The hardware includes a programming interface between a PC and an SMT device and a programmable test signal generator to test and verify the correct SMT configuration. The SMT configuration tool has reduced a labour skilled intensive process to an automated, efficient and user friendly computer aided approach. The tool has been used in realistic environments to Support test and evaluation missions of high-tech state-of-the-art conventional armament.
DTIC
Computer Programming; Computer Programs; Computers; Telemetry; Computer Aided Design; Subminiaturization

18
SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls. For life support systems see 54 Man/System Technology and Life Support. For related information see also 05 Aircraft Design, Testing and Performance, 39 Structural Mechanics, and 16 Space Transportation.

19980211013 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Performance Analysis of the IRIDIUM Low Earth Orbit Satellite System
Fossa, Carl E., Jr., Air Force Inst. of Tech., USA; Jun. 01, 1998; 113p; In English
Report No.(s): AD-A348174; AFIT/GE/ENG/98J-01; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This thesis provides a performance evaluation of the IRIDIUM Low Earth Orbit Satellite system. It examine's the system's ability to meet real time communications constraints with a degraded satellite constellation. The analysis is conducted via computer simulation. The simulation is run at low, medium, and high loading levels with both uniform and non-uniform traffic distributions. An algorithmic approach is used to select critical satellites to remove from the constellation. Each combination of loading level and traffic distribution is analyzed with zero, three, five and seven non-operational satellites. The measured outputs are end-to-end packet delay and packet rejection rate. In addition to the delay analysis, a user's ability to access the network with a degraded satellite constellation is evaluated. The average number of visible satellites, cumulative outage time, and maximum continuous outage time are analyzed for both an Equatorial city and a North American city. The results demonstrate that the IRIDIUM network is capable of meeting real-time communication requirements with several non-operational satellites. Both the high loading level and the non-uniform traffic distribution have a significant effect on the network's performance. The analysis of both network delay performance and network access provides a good measure of the overall network performance with a degraded satellite constellation.
DTIC
Real Time Operation; Artificial Satellites; Satellite Communication; Low Earth Orbits; Satellite Constellations; Communication Networks; Constellations; Iridium

19980211129 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
Neural Networks Based Control of a Satellite Attitude with Varying Dynamics ***Redes Neurais Aplicadas ao Controle de Atitude de Satelites Com Geometria Variavel***
Carrara, Valdemir, Instituto de Pesquisas Espaciais, Brazil; Jun. 1997; 202p; In Portuguese
Report No.(s): INPE-6384-TDI/603; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

The use of neural networks for satellite attitude control is addressed in this work. In order to validate this application, a spacecraft with a variable dynamic behavior due to articulated appendages fixed to the body was chosen. The differential equations therefore show the nonlinear dynamic effects to be identified by neural nets. In this work some of the main expressions that allow system modeling through neural nets as well as two different training procedures - back-propagation and least squares - are presented. A general method for obtaining the inertia tensor and center of mass of an articulated space device, is also explained, as well as the dynamic and cinematic differential equations. These formulations were used in attitude simulation for neural network system identification and control training. The solar array deployment of the NECB's remote sensing satellite was used as an example of attitude control by means of neural nets. Three solar arrays are articulated in the satellite body and are deployed after orbit injection by a trigger device. Initially, a direct model of the satellite by means of a neural net was obtained. Afterwards, several arrangements and training procedures were tested in order to achieve the inverse model of the dynamics. The best results were obtained with the inverse training through feedback error. In order to validate the control procedure, a parameter variation method (inertia tensor and mass) together with sensor noise were employed after accomplishing the training phase, so as to verify control robustness against to parameter variation. The results show that the neural net is tolerant to sensor noise and has a relatively large capacity to compensate the parameter uncertainty.
Author
Neural Nets; Satellite Attitude Control; Satellite Observation; Dynamic Characteristics

19980214926 General Accounting Office, Washington, DC USA
International Space Station: U.S. Life-Cycle Funding Requirements
May 1998; 46p; In English
Report No.(s): AD-A347352; GAO/NSIAD-98-147; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

As requested, we reviewed issues associated with the National Aeronautics and Space Administration's (NASA) International Space Station program. As agreed with your office, this report (1) provides an estimate of the station's development, assembly, and operations costs and compares this estimate with the estimate in our June 1995 report; (2) identifies program uncertainties that may affect those costs; (3) discusses potential debris tracking costs; (4) discusses the status of program reserves; and (5) describes recent actions to measure prime contractor performance based on rebaselined information. NASA and its international partners--Japan, Canada, the European Space Agency, and Russia-are building the space station as a permanently orbiting laboratory to conduct materials and life sciences research, earth observation and commercial utilization, and related uses under nearly weightless conditions. Each partner is providing station hardware and crew members and is expected to share operating costs and use of the station. The NASA space station program manager is responsible for the cost, schedule, and technical performance of the total program. The Boeing Corporation, the prime contractor, is responsible for development, integration, and on-orbit perfor-

mance of the station. by the end of 1997, the USA and its partners had produced well over 358,000 pounds of space flight hardware, of which the prime contractor was responsible for about 260,000 pounds.
DTIC
International Space Station; Costs; NASA Space Programs

20
SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also 07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 44 Energy Production and Conversion, and 15 Launch Vehicles and Space Vehicles.

19980210866 Hernandez Engineering, Inc., Huntsville, AL USA
Space Shuttle Main Engine Quantitative Risk Assessment: Illustrating Modeling of a Complex System with a New QRA Software Package
Smart, Christian, Hernandez Engineering, Inc., USA; 1998; 6p; In English; PSAM IV, 13-18 sEP. 1998, New York, NY, USA
Report No.(s): NASA/TM-1998-208244; NAS 1.15:208244; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

During 1997, a team from Hernandez Engineering, MSFC, Rocketdyne, Thiokol, Pratt & Whitney, and USBI completed the first phase of a two year Quantitative Risk Assessment (QRA) of the Space Shuttle. The models for the Shuttle systems were entered and analyzed by a new QRA software package. This system, termed the Quantitative Risk Assessment System(QRAS), was designed by NASA and programmed by the University of Maryland. The software is a groundbreaking PC-based risk assessment package that allows the user to model complex systems in a hierarchical fashion. Features of the software include the ability to easily select quantifications of failure modes, draw Event Sequence Diagrams(ESDs) interactively, perform uncertainty and sensitivity analysis, and document the modeling. This paper illustrates both the approach used in modeling and the particular features of the software package. The software is general and can be used in a QRA of any complex engineered system. The author is the project lead for the modeling of the Space Shuttle Main Engines (SSMEs), and this paper focuses on the modeling completed for the SSMEs during 1997. In particular, the groundrules for the study, the databases used, the way in which ESDs were used to model catastrophic failure of the SSMES, the methods used to quantify the failure rates, and how QRAS was used in the modeling effort are discussed. Groundrules were necessary to limit the scope of such a complex study, especially with regard to a liquid rocket engine such as the SSME, which can be shut down after ignition either on the pad or in flight. The SSME was divided into its constituent components and subsystems. These were ranked on the basis of the possibility of being upgraded and risk of catastrophic failure. Once this was done the Shuttle program Hazard Analysis and Failure Modes and Effects Analysis (FMEA) were used to create a list of potential failure modes to be modeled. The groundrules and other criteria were used to screen out the many failure modes that did not contribute significantly to the catastrophic risk. The Hazard Analysis and FMEA for the SSME were also used to build ESDs that show the chain of events leading from the failure mode occurence to one of the following end states: catastrophic failure, engine shutdown, or siccessful operation(successful with respect to the failure mode under consideration). Derived from text
Space Shuttle Main Engine; Applications Programs (Computers); Assessments; Failure Analysis

19980211409 Rensselaer Polytechnic Inst., Dept. of Chemical Engineering, Troy, NY USA
Wide Temperature Range Kinetics of Plume Reactions ***Final Report, Mar. 1995 - Mar 1998***
Fontijn, Arthur, Rensselaer Polytechnic Inst., USA; Jun. 1998; 25p; In English
Contract(s)/Grant(s): F49620-95-1-0258; AF Proj. 2308
Report No.(s): AD-A347236; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The kinetics of reactions leading to the CO Fourth Positive vacuum ultraviolet emission is studied for incorporation in plume radiation models. A fast-flow reactor and a high-temperature pseudo-static, photochemistry reactor have been used. Experiments with the former on the O + C2H2 reaction have shown that the intensity of the CO Triplet bands decreases with increasing pressure. This is in accord with the proposed mechanism for CO formation, by collision-induced curve crossing from CO triplet states. Experiments in the pseudo-static reactor have confirmed the increase of the CO chemiluminescence intensity with pressure, as indicated by this mechanism, but show a decrease in the intensity of the emission when the C2 + O2 reaction is investigated instead. This indicates a direct CO formation in the latter reaction, which leads to more intense vuv emission and may be a more important reaction for rocket exhausts. As the first step toward obtaining the absolute light intensities and chemiluminescence efficiencies for the C2 + O2 reaction, its vuv emission is used to obtain its overall rate coefficients, k(300-976 K) = 1.8 x 10(exp -11) (-451

K/T) cu cm/(molecule.sec). These values are in excellent agreement with earlier experiments, where the C2 consumption rate coefficients were measured instead.
DTIC
Chemiluminescence; Temperature Gradients; Plumes; Photochemical Reactions; Exhaust Gases

23
CHEMISTRY AND MATERIALS (GENERAL)

19980210941 Department of Energy, Office of Energy Research, Washington, DC USA
Materials sciences programs fiscal year 1996
Jun. 1997; 185p; In English
Report No.(s): DOE/ER-0703; DE97-007709; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The purpose of this report is to provide a convenient compilation and index of the DOE Materials Sciences Division programs. This compilation is primarily intended for use by administrators, managers, and scientists to help coordinate research. The report is divided into eight sections. Section A contains all Laboratory projects, Section B has all contract research projects, Section C has projects funded under the Small Business Innovation Research Program, Section D describes the Center of Excellence for the Synthesis and Processing of Advanced Materials and E has information on major user facilities. F describes other user facilities, G as a summary of funding levels and H has indices characterizing research projects.
DOE
Research Management; Research Projects; Efficiency

19980211511 Istituto Superiore di Sanita, Rome, Italy
Determination of polycyclic aromatic hydrocarbons (PAHs): Gas chromatographic method ***Determinazione degli idrocarburi policiclici aromatici (IPA): Metodo gascaromatografico***
Menichini, E., Istituto Superiore di Sanita, Italy; Viviano, G., Istituto Superiore di Sanita, Italy; Dec. 1997; ISSN 1123-3117; 19p; In Italian
Report No.(s): ISS-97-35; DE98-759688; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The method enables the determination of 4- to 6- ring PAHs and particularly of carcinogenic PAHs regulated in Italy. This revision is based on the results of a national collaborative study. Sample extract, obtained by a method described in a previous report (Rapporto ISTISAN: 90/33) is cleaned up by thin layer chromatography and analysed by gas chromatography; identification is confirmed by mass spectrometry. An intralaboratory quality control program is described.
DOE
Gas Chromatography; Mass Spectroscopy; Polycyclic Aromatic Hydrocarbons; Quality Control; Thin Layer Chromatography

19980211617 Rensselaer Polytechnic Inst., Dept. of Chemical Engineering, Troy, NY USA
Wide Temperature Range Kinetics of Plume Reactions ***Final Report, Mar. 1995 - Mar 1998***
Fontijn, Arthur, Rensselaer Polytechnic Inst., USA; Jun. 1998; 25p; In English
Contract(s)/Grant(s): F49620-95-1-0258; AF Proj. 2308
Report No.(s): AD-A346516; AFRL-SR-BL-TR-98-0498; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The kinetics of reactions leading to the CO Fourth Positive vacuum ultraviolet emission is studied for incorporation in plume radiation models. A fast-flow reactor and a high temperature, pseudo-static, photochemistry reactor have been used. Experiments with the former on the O + C2H2 reaction have shown that the intensity of the CO Triplet bands decreases with increasing pressure. This is in accord with the proposed mechanism for CO formation, by collision-induced curve crossing from CO triplet states. Experiments in the pseudo-static reactor have confirmed the increase of the CO chemiluminescence intensity with pressure, as indicated by this mechanism, but show a decrease in the intensity of the emission when the C2 + O2 reaction is investigated instead. This indicates a direct CO formation in the latter reaction, which leads to more intense vuv emission and may be a more important reaction for rocket exhausts. As the first step toward obtaining the absolute light intensities and chemiluminescence efficiencies for the C2 + 02 reaction, its vuv emission is used to obtain its overall rate coefficients, k(300-976 K) =

1.8X10EXP(-11)(exp-451K/T) cu cm/(molecule.s). These values are in excellent agreement with earlier experiments, where the C2 consumption rate coefficients were measured instead.
DTIC
Chemiluminescence; Reaction Kinetics; Fast Nuclear Reactors; Photochemical Reactions; Plumes; Ultraviolet Emission

19980211699 General Electric Co., Research and Development, Schenectady, NY USA
Non-Toxic, Self Cleaning Silicone Foul Release Coatings ***Progress Report, Apr - Jun. 1998***
Cella, James, General Electric Co., USA; Jun. 1998; 24p; In English
Contract(s)/Grant(s): N00014-96-C-0145
Report No.(s): AD-A349039; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Additional screening panels have been deployed at FIT. Concepts currently under evaluation include: The effect of oil incorporation into non-silicone coatings with poor foul release characteristics; The effect of loading level of the oil on foul release properties; The effect of molecular weight and water solubility of the oil on foul release properties. About 58 panels are deployed at MMRTS and include two panels each of the downselected compositions. Data collection continues on the first and second downselect panels at FIT, Bridger Scientific, University of Hawaii and SUNY Buffalo.
DTIC
Paints; Cleaning; Coatings; Silicones; Toxicity

19980211727 Department of the Navy, Washington, DC USA
Fluorescent Detection of Hydrazine, Monomethylhydrazine, and 1,1-Dimethylhydrazine by Derivatization with Aromatic Dicarboxaldehydes
Rose-Pehrsson, Susan, Inventor, Department of the Navy, USA; Collins, Gregory E., Inventor, Department of the Navy, USA; Feb. 17, 1998; 27p; In English; Supersedes US-Patent-Appl-SN-326518
Patent Info.: Filed 20 Oct. 1994; US-Patent-Appl-SN-326518; US-Patent-5,719,061
Report No.(s): AD-D018926; No Copyright; Avail: US Patent and Trademark Office, Microfiche
A method and apparatus for the detection of hydrazine, monomethylhydrazine. 1,1-dimethylhydrazine in air (or other gas medium) or in an aqueous solution. The detection is accomplished by introducing a stream of air, or other gas medium, or aqueous solution suspected of containing hydrazine, monomethylhydrazine, 1,1-dimethylhydrazine or mixtures thereof into a pH controlled reagent solution containing an aromatic dicarboxaldehyde to react with the hydrazine, monomethylhydrazine, 1,1-dimethylhydrazine or mixtures thereof, respectively, and by exposing the reacted reagent solution to an excitation wavelength range and monitoring an emission from the exposed reagent solution at an emission wavelength range to detect the presence of a hydrazine derivative, monomethylhydrazine derivative, 1,1-dimethylhydrazine derivative, or mixtures thereof (i.e., a derivative formed by the reaction between hydrazine, monomethylhydrazine, 1,1-dimethylhydrazine and the aromatic dicarboxaldehyde) indicating the presence of hydrazine, monomethylhydrazine, 1,1-dimethylhydrazine or mixtures thereof within the stream of air or other gas medium or aqueous solution.
DTIC
Detection; Fluorescence; Dimethylhydrazines; Aqueous Solutions; Methylhydrazine

24
COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials. For ceramic materials see 27 Nonmetallic Materials.

19980210876 NASA Langley Research Center, Hampton, VA USA
Damage Characteristics and Residual Strength of Composite Sandwich Panels Impacted With and Without a Compression Loading
McGowan, David M., NASA Langley Research Center, USA; Ambur, Damodar R., NASA Langley Research Center, USA; 1998; 14p; In English; 39th; Structures, Structural Dynamics and Materials, 20-23 Apr. 1998, Long Beach, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): NASA/TM-1998-208122; NAS 1.15:208122; AIAA Paper 98-1783; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The results of an experimental study of the impact damage characteristics and residual strength of composite sandwich panels impacted with and without a compression loading are presented. Results of impact damage screening tests conducted to identify

the impact-energy levels at which damage initiates and at which barely visible impact damage occurs in the impacted facesheet are discussed. Parametric effects studied in these tests include the impactor diameter, dropped-weight versus airgun-launched impactors, and the effect of the location of the impact site with respect to the panel boundaries. Residual strength results of panels tested in compression after impact are presented and compared with results of panels that are subjected to a compressive preload prior to being impacted.
Author
Residual Strength; Composite Structures; Experimentation; Sandwich Structures; Impact Damage

19980210888 Los Alamos National Lab., NM USA
Influence of reinforcement morphology on the mechanical properties of short-fiber composites
Zhu, Y. T., Los Alamos National Lab., USA; Valdez, J. A., Los Alamos National Lab., USA; Shi, N., Los Alamos National Lab., USA; Lovato, M.L., Los Alamos National Lab., USA; Stout, M. G., Los Alamos National Lab., USA; Zhou, S., Los Alamos National Lab., USA; Blumenthal, W. R., Los Alamos National Lab., USA; Lowe, T. C., Los Alamos National Lab., USA; [1997]; 9p; In English, 15 - 19 Feb. 1998, San Antonio, TX, USA; Sponsored by Minerals, Metals and Materials Society, USA
Contract(s)/Grant(s): W-7405-ENG-36
Report No.(s): LA-UR-97-3963; CONF-980202; DE98-001609; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

A major problem of short-fiber composites is that the interfaces between the fiber and matrix become a limiting factor in improving mechanical properties such as strength. For a short fiber, a strong interface is desired to effectively transfer load from matrix to fiber, thus reducing the ineffective fiber length. However, a strong interface will make it difficult to relieve fiber stress concentration in front of an approaching crack. Stress concentrations result in fiber breakage. The authors report in this paper an innovative approach to overcome this problem: reinforcement morphology design. Short-fibers with enlarged ends are processed and used to reinforce a polyester matrix. The initial results show that the bone-shaped short-fibers produce a composite with significantly higher strength than can be attained with conventional short, straight fibers.
DOE
Morphology; Mechanical Properties; Fibers; Fiber Composites; Matrices (Mathematics)

19980210919 Virginia Univ., School of Engineering and Applied Science, Charlottesville, VA USA
High Temperature Composites: Properties, Processing and Performance ***Final Report, 16 May 1993 - 15 May 1998***
Herakovich, Carl T., Virginia Univ., USA; Aboudi, Jacob, Virginia Univ., USA; Elzey, Dana M., Virginia Univ., USA; Krauss, Roland H., Virginia Univ., USA; Pindera, Marek-Jerzy, Virginia Univ., USA; May 21, 1998; 219p; In English
Contract(s)/Grant(s): F49620-93-1-0359
Report No.(s): AD-A346438; AFRL-SR-BL-TR-98-0491; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The results of the five year grant (including one year of no-cost extension) are reported. The main accomplishments of the grant activity were fabrication, modeling and testing of a hybrid ceramic fiber and nickel alloy matrix composites suitable for higher temperature applications at lower cost.
DTIC
High Temperature; Metal Matrix Composites; Fabrication; Ceramic Fibers; Nickel Alloys; Cost Reduction

19980211007 Department of the Navy, Washington, DC USA
Fiber-Reinforced Phthalonitrile Composite Cured with Low-Reactivity Aromatic Amine Curing Agent
Sastri, Satya B., Inventor, Department of the Navy, USA; Keller, Teddy M., Inventor, Department of the Navy, USA; Oct. 02, 1997; 24p; In English
Patent Info.: Filed 2 Oct. 1997; US-Patent-Appl-SN-940043
Report No.(s): AD-D018903; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A fiber-reinforced phthalonitrile composite is made by impregnating or coating a fibrous material with a phthalonitrile prepolymer mixture containing a phthalonitrile monomer and an aromatic amine curing agent that is thermally stable and nonvolatile at a temperature up to about 375 deg C, and that contains at least one electron withdrawing substituent effective to reduce the reactivity of the aromatic amine curing agent with the phthalonitrile monomer.
DTIC
Fiber Composites; Fibers; Curing; Reactivity; Amines

19980211359 New Energy and Industrial Technology Development Organization, Tokyo, Japan
Survey of advanced composite material technology ***Senshin fukugo zairyo gijutsu ni kansuru chosa***
Mar. 1997; 115p; In Japanese
Report No.(s): NEDO-IT-9602; DE98-745346; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Results of functions and examples are investigated and described for more than 190 fiber reinforced composite materials. There should be a new viewpoint for even the same material when changing the point to observe it, and new industries will be expected if the viewpoint is adequate. This report has proposed a new concept of 'composite functions.' The development works based on non-strength functions which will differentiate the other materials have been stressed. After describing the brief history of the advanced composite materials and significance of composite functions, the present situations and future possibilities of such functions as heat resistance, electricity-electromagnetism, chemicals-proof, adsorption, vibration-proof and resistance, tribology, erosion, sound, adaptability to living bodies and etc. have been examined based on the practical examples. As the future important subjects, adapting possibility of materials having composite functions to marine structures, and possibility of water cleaning system are described.
DOE
Fiber Composites; Mechanical Properties; Electrical Properties

19980211432 Berkeley Applied Science and Engineering, Inc., San Francisco, CA USA
Structural Integrity of Intelligent Materials and Structures ***Final Report, 30 Sep. 1994 - 30 Dec. 1997***
Panahandeh, M., Berkeley Applied Science and Engineering, Inc., USA; Masud, A., Berkeley Applied Science and Engineering, Inc., USA; Kasper, E., Berkeley Applied Science and Engineering, Inc., USA; Mar. 1998; 186p; In English
Contract(s)/Grant(s): F49620-94-C-0084
Report No.(s): AD-A347686; BASE-TR-93-161; AFRL-SR-BL-TR-98-0504; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

A wide variety of applications for intelligent structure technologies exist in defense, aerospace, auto, civil and biomedical industries. Shape Memory Alloys (SMA) and laminated composite materials have unique properties suitable for these technologies. Extensive utilization of these materials requires accurate theories for the mechanics of these materials be developed. The present research is an effort in this direction. In this work; (1) A thermomechanical constitutive model for phase transformation in SMA was proposed; (2) Numerical schemes for solving the highly nonlinear finite element equations were developed; (3) Geometrically nonlinear elements for SMA were introduced; (4) The mechanics of composite laminates was formulated through a multi-director shell theory and was extended to finite kinematics in a corotational framework; (5) Geometrically nonlinear plates and shell elements with multi-directors through the thickness were developed for composite laminates; and (6) An extensive set of test problems was simulated to show the accuracy of the developed theories.
DTIC
Composite Materials; Composite Structures; Shape Memory Alloys; Laminates; Smart Structures; Structural Failure; Technology Assessment

19980211442 Virginia Univ., Civil Engineering and Applied Mechanics Dept., Charlottesville, VA USA
HOTCFGM-1D: A Coupled Higher-Order Theory for Cylindrical Structural Components with Through-Thickness Functionally Graded Microstructures ***Final Report, FY 1997***
Pindera, Marek-Jerzy, Virginia Univ., USA; Aboudi, Jacob, Tel-Aviv Univ., Ramat-Aviv, Israel; Jun. 1998; 56p; In English
Contract(s)/Grant(s): NAS3-96052; RTOP 523-90-13
Report No.(s): NASA/CR-1998-207927; E-11187; NAS 1.26:207927; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The objective of this three-year project was to develop and deliver to NASA Lewis one-dimensional and two-dimensional higher-order theories, and related computer codes, for the analysis, optimization and design of cylindrical functionally graded materials/structural components for use in advanced aircraft engines (e.g., combustor linings, rotor disks, heat shields, blisk blades). To satisfy this objective, a quasi one-dimensional version of the higher-order theory, HOTCFGM-1D, and four computer codes based on this theory, for the analysis, design and optimization of cylindrical structural components functionally graded in the radial direction were developed. The theory is applicable to thin multi-phased composite shell/cylinders subjected to macroscopically axisymmetric thermomechanical and inertial loading applied uniformly along the axial direction such that the overall deformation is characterized by a constant average axial strain. The reinforcement phases are uniformly distributed in the axial

and circumferential directions, and arbitrarily distributed in the radial direction, thereby allowing functional grading of the internal reinforcement in this direction.
Author
Composite Structures; Cylindrical Bodies; Computer Programs; Structural Design; Shells (Structural Forms); Thin Walled Shells; Axial Strain

19980211569 Aerospace Corp., Technology Operations, El Segundo, CA USA
Failure Modes of a Unidirectional Ultra-High-Modulus Carbon-Fiber/Carbon-Matrix Composite
Zaldivar, R. J., Aerospace Corp., USA; Rellick, G. S., Aerospace Corp., USA; Yang, J-M., California Univ., USA; Jan. 15, 1998; 16p; In English
Contract(s)/Grant(s): F04701-93-C-0094
Report No.(s): AD-A349058; TR-93(3935)-15; SMC-TR-98-13; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The objective of this study was to observe the effects of various microstructural features on the in situ, room-temperature tensile fracture behavior of an ultra-high-modulus, unidirectional carbon/carbon (C/C) composite as a function of processing heat-treatment temperature (HTT) over the range of 1100 deg C to 2750 deg C. An in situ SEM flexural stage was used to observe the interactions between the advancing crack tip and the microstructural features in the frontal process zone. Following the lowest HTT of 1100 deg C, failure is dominated by the well-bounded brittle matrix; a tortuous crack path in the E130 fibers appears to contribute to a relatively high utilization of fiber strength in spite of this brittle-matrix failure. Approximate calculations of the interfacial shear stress that might be generated by matrix shrinkage during pyrolysis of the polymer to carbon were compared to approximations of crack-tip interfacial shear stresses (IFSS) using the Cook-Gordon approach. The results suggest that the strong bonding in the 1100 C HTT composite cannot be accounted for by friction alone, and, therefore, chemical bonding or some type of fiber-matrix mechanical interlocking must be involved. Higher HHTs lead to progressive weakening of the fiber-matrix interface, and, with heat treatment to 2150 C, multiple matrix cracking (MMC) is observed. Using the crack-spacing model of Aveston, Cooper, and Kelly (ACK), an IFSS of 1 MPa is estimated for the MMC case. Attempts to calculate the matrix failure strain using the ACK formulation led to a large overprediction of the failure strain, although a number of the parameters used in the calculation are known only very approximately. Heat treatments to 2400 deg C and 2750 C led to longitudinal intramatrix cohesive failure; at 2750 C, this damage is extensive and results in composites with strength utilizations approaching those of dry fiber bundles.
DTIC
Carbon-Carbon Composites; High Strength; Fractures (Materials); Carbon Fibers

19980211575 NASA Lewis Research Center, Cleveland, OH USA
Investigation of Anomalous Behavior in Metallic-Based Materials Under Compressive Loading
Gil, Christopher M., Pennsylvania State Univ., USA; Lissenden, Cliff J., Pennsylvania State Univ., USA; Lerch, Bradley A., NASA Lewis Research Center, USA; Jul. 1998; 26p; In English
Contract(s)/Grant(s): RTOP 523-21-13
Report No.(s): NASA/TM-1998-206640; NAS 1.15:206640; E-11107; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
An anomalous material response has been observed under the action of applied compressive loads in fibrous SiC/Ti (both Ti-6242 and Ti-15-3 alloys) and the monolithic nickel-base alloy IN-718 in the aged condition. The observed behavior is an increase, rather than a decrease, in the instantaneous Young's modulus with increasing load. This increase is small, but can be significant in yield surface determination tests, where an equivalent offset strain on the order of 10 micron(1 x 10(exp -6) m/m) is being used. Stiffening has been quantified by calculating offset strains from the linear elastic loading line. The offset strains associated with stiffening during compressive loading are positive and of the same order as the target offset strains in yield surface determination tests. At this time we do not have a reasonable explanation for this response nor can we identify a deformation mechanism that might cause it. On the other hand, we are not convinced that it is an artifact of the experimental procedure because a number of issues have been identified and seemingly ruled out. In fact, stiffening appears to be temperature dependent, since it decreases as the temperature increases.
Author
Anomalies; Silicon Compounds; Silicon Carbides; Compression Loads

19980211601 United Technologies Corp., East Hartford, CT USA
The Effect of Processing on the Interface, Microstructure, and Properties of Coated Fiber Reinforced Glass-Ceramic Matrix Composites ***Final Report, 1 May 1995 - 31 Mar. 1998***
Brennan, John J., United Technologies Corp., USA; May 15, 1998; 104p; In English

Contract(s)/Grant(s): F49620-95-C-0021
Report No.(s): AD-A346455; AFRL-SR-BL-TR-98-0482; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The primary objective of this program was to study the processing of coated fiber reinforced glass-ceramic matrix composites that will result in reproducible, reliable fiber coatings and the composites that incorporate them, for use to 1200C in advanced gas turbine engine applications. The primary glass-ceramic system was a barium magnesium aluminosilicate (BMAS), while the fibers were Ceramic Grade Nicalon Si-C-O and Nextel 720 aluminosilicate fibers, as well as new advanced high temperature SiC based fibers. The primary fiber coating system was layered BN(+C) for the Nicalon fiber composites, and BN, monazite (LaPO4), and fugitive carbon for the Nextel 720 fiber composites. The layered 3M BN(+C) coatings on Nicalon fibers produced very strong and ”tough” BMAS glass-ceramic matrix composites, due to the limited matrix element diffusion through the coating and matrix crack deviation within the layered coating structure. These composites exhibited excellent tensile fatigue and stress-rupture properties, although oxidation of the layered BN coatings at intermediate temperatures (700-900C) under conditions of high fatigue stress (138 MPa) may potentially limit the stress at which these composites can be utilized for structural applications. Alternate BN and Si-doped BN coatings from other vendors did not perform as well, with excessive BN crystallization occurring during composite fabrication. Nextel 720 aluminosilicate fibers with either BN, fugitive carbon, or C/Al2O3/C coatings did not result in strong or ”tough’ BMAS matrix composites for a variety of reasons, but primarily because of coating debonding leading to fiber/matrix interactions. Monazite (LaPO4) coated Nextel 720 fibers reacted excessively with the BMAS matrix during composite fabrication. The crystalline SiC fibers from the U. of Fla., especially with the in-situ BN coatings, appear to offer future promise for high temperature CMC reinforcement.
DTIC
Ceramic Matrix Composites; Fiber Composites; Glass Fibers; Gas Turbines; Mechanical Properties; Doped Crystals; Structural Design

19980211605 Royal Melbourne Inst. of Tech., Sir Lawrence Wackett Centre for Aerospace Design Technology, Australia
Non-Linear Rate-dependant Behaviour of Aerospace Graphite--Epoxy Laminates
Ohler, B., Technische Hochschule, Germany; Alesi, H., Royal Melbourne Inst. of Tech., Australia; Jones, R., Defence Science and Technology Organisation, Australia; Feb. 1993; 118p; In English
Report No.(s): RMIT-TR-93/01; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche; US Sales Only; US Sales Only

This report is related to one aspect of structural weight savings. In the early days of aviation, wood and linen were the main material for the construction of aeroplanes. Later, with progress in technology, aluminium was introduced. Today, it seems that aircraft design using aluminium has reached its limits concerning weight-saving possibilities. This is not so for composite materials which have been used in aerospace engineering over the past 15 to 20 years. At first, only for the construction of small aircraft, preferably gliders, and secondary structural parts such as cargo and undercarriage doors and, later, even for primary structural parts like the fin of the AIRBUS 320. The aim for the future is to extend the use of composite materials to other primary structural parts of an airplane such as wing and fuselage. In the future, it could be possible to build an airliner entirely of composites. There are already some examples of smaller planes (BEECH STARSHIP, DORNIER SEASTAR) where the feasibility of this concept is validated. This work is connected with postbuckling of stiffened composite panels. Aluminium panels are allowed to buckle because the behaviour of the material is known and wide experience exists in using metal for buckling and postbuckling load cases. Composite materials are so far not allowed to buckle because it was assumed that they fail when buckling. If it can be proven that composites do not fail due to a buckling load, it will be of interest to predict their postbuckling behaviour. The aim of this project is to determine a shear stress-shear strain relation for a particular aerospace graphite-epoxy laminate and numerically simulating using the finite element software packages.
Derived from text
Graphite-Epoxy Composites; Weight Reduction; Aircraft Design; Aluminum; Applications Programs (Computers); Composite Structures; Finite Element Method; Stress-Strain Relationships; Structural Weight

19980211702 European Materials Research Society, Strasbourg, France
European Materials Research Society Spring Meeting: E-MRS 1998 Scientific/Technical Symposia and Exhibition
Jun. 1998; 164p; In English, 16-19 Jun. 1998, Strasbourg, France
Report No.(s): AD-A348969; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Partial Contents: Defects in Silicon: Hydrogen; Light Emission from Silicon: Progress Towards Si-based Optoelectronics; Growth, Characterization and Applications of Bulk II-VI’s; Thin Films Epitaxial Growth and Nanostructures: Thin Films Material for large Area Electronics; Technique and Challenges for 300mm Silicon: Processing, Characterization, Modelling and Equipments; Surface Processing: Laser, Lamp, Plasma; Materials Aspects in Microsystem Technologies; Rapid Thermal Processing; Ion Implantation into Semiconductors, Oxides and Ceramics; Carbon-based Materials for Microelectronics; Nitrides and Related

Wide Band Gap Materials; Molecular Photonics for Optical Telecommunications: Materials, Physics and Device Technology; Material and Processes for Submicron Technologies.
DTIC
Composite Materials; Conferences; Silicon; Defects; Light Emission; Ceramics

19980213254 Florida Univ., Dept. of Materials Science and Engineering, Gainesville, FL USA
Chemically Derived Materials: Structure-Property-Environmental Relations ***Final Report, 1 Jun. 1995 - 28 Feb. 1998***
Hench, L. L., Florida Univ., USA; May 22, 1998; 11p; In English
Contract(s)/Grant(s): F49620-95-1-0382; AF Proj. 2303/BS
Report No.(s): AD-A346204; AFRL-SR-BL-TR-98-0487; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of our research program is to understand and apply the interfacial reactions of chemically derived materials to produce a new generation of advanced optical, sensor and biological materials that are molecularly tailored for specific environmental interactions. Four projects are: (A) The chemistry and application of porous matrices with the objective of using a range of pore sizes and volume fraction of porosity in net-shape optical components to control the chemistry and gradients of inorganic and organic dopants and second phases within the pores. (B) Environmental interaction with molecularly tailored substrates with the goal of developing an optical sensor that can be used for remote monitoring of environmental pollutants such as JP-4 jet fuel. A second goal is to understand the mechanisms of bonding of biological molecules and biomembranes to inorganic substrates for use in monitoring biological agents. (C) Electronic ceramics. structure-property-performance relationships with the objective of tailoring the UV-vis, IR, and microwave characteristics of porous SiO2, SiC, ZnO. (D) Structural ceramics-quantum tribology with the goal of predicting at a quantitative molecular level the effects of environment on the fracture of amorphous silica and polycrystalline Si3N4 including the effect of gases and organic lubricant molecules on fracture.
DTIC
Chemical Properties; Composite Materials; Optical Materials; Amorphous Materials; Ceramics; Polycrystals; Molecular Structure

19980214928 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Centre for Mechanical Engineering, Delft, Netherlands
Shock Reduction by Means of Flexible Plastic Ship Decks, Part 1, The Flexibility of Plastic vs. Steel Decks; Vibration Modes ***Final Report (Schokreductie door middel van flexibele kunststof scheepsdekken. Deelproject 1: De flexibiliteit van kunststof versus stalen***
Oostvogels, J. M., Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Netherlands; Regoord, R., Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Netherlands; Jan. 16, 1998; 70p; In English
Report No.(s): AD-A347330; TNO-93-CMC-R0318; TDCK-98-0093; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The superstructure of future naval ships might be built from glass reinforced polyester. Then the question arises if such flexible ship decks offer much shock reduction, that normal shock mountings in between the deck and equipment are no longer necessary. The present report compares vibration modes of typical decks built from steel and from GRP for various loading conditions. This as a starting point for a shock response analysis.
DTIC
Polyester Resins; Resin Matrix Composites; Ships; Vibration Tests

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INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also 77 Thermodynamics and Statistical Physics.

19980210887 Los Alamos National Lab., NM USA
Catalysts for hydrocarbon oxidation
Ott, K. C., Los Alamos National Lab., USA; Paffett, M. T., Los Alamos National Lab., USA; Earl, W. L., Los Alamos National Lab., USA; [1998]; 7p; In English
Contract(s)/Grant(s): W-7405-ENG-36
Report No.(s): LA-UR-97-3661; DE98-001616; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

This is the final report of a one-year, Laboratory Directed Research and Development (LDRD) project at Los Alamos National Laboratory (LANL). The focus of this project was elucidating structural aspects of a titanosilicate TS-1 that is an oxidation catalyst. The authors have prepared samples of TS-1 and used scanning electron microscopy, high resolution transmission electron microscopy, and ultraviolet-visible spectroscopy to examine the samples of TS-1 for amorphous titanium-containing phases that may confound the analysis of the neutron scattering data. They observed that the volume fraction of titanium-containing impurity phases(s) determined from electron microscopy did not correlate well with that amount determined by ultraviolet-visible diffuse-reflectance spectroscopy. The authors also designed, constructed and tested a flow reactor that can be placed into the neutron flight path at the High Intensity Powder Diffractometer line at the Manual Lujan, Jr. Neutron Scattering Center. This reactor will allow for the observation of crystallographic changes of catalysts and other materials under reaction conditions.
DOE
Catalysts; Hydrocarbons; Oxidation; Titanium; Neutrons; High Resolution; Crystal Structure

19980210903 Naval Academy, Dept. of Physics, Annapolis, MD USA
NMR, DSC and High Pressure Electrical Conductivity Studies on Liquid and Hybrid Electrolytes, *1 Jun. 1997 - 31 May 1998*
Stallworth, P. E., Naval Academy, USA; Fontanella, J. J., Naval Academy, USA; Wintersgill, M. C., Naval Academy, USA; Scheidler, C. D., Naval Academy, USA; Immel, J. J., Naval Academy, USA; Greenbaum, S. G., Hunter Coll., USA; Gozdz, A. S., Bell Communications Research, Inc., USA; Jul. 01, 1998; 31p; In English
Contract(s)/Grant(s): N00014-98-WR-20007; Proj-96PRO-3804
Report No.(s): AD-A348610; TR-18; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Electrical conductivity, DSC and Li-7 NMR studies have been carried out on liquid electrolytes such as EC:PC and EC:DMC containing LiPF6 (and LiCF3SO3 for NMR) and films plasticized using the same liquid electrolytes. The films are based on poly(vinylidene fluoride) copolymerized with hexafluoropropylene and contain fumed silica. All measurements were carried out at atmospheric pressure from room temperature to about 120K and the electrical conductivity studies were performed at room temperature at pressures up to 0.3 GPa. The liquids and hybrid electrolytes are similar in that the electrical conductivity of the EC:PC based materials exhibits VTF behaviour while that for the EC:DMC based materials does not. Further, the glass transition temperatures as determined from NMR, DSC and electrical conductivity measurements are about the same for the liquids and hybrid electrolytes. However, substantial differences are found. The electrical conductivity of the hybrid electrolytes at room temperature is lower than expected and, more importantly, the relative change of conductivity with pressure is larger than for the liquids. In addition, above the glass transition temperature, the NMR T1 values are smaller for the plasticized films than for the liquids While at both low and high temperature the NMR linewidths are larger. Consequently, it is concluded that significant solid matrix-lithium ion interactions take place.
DTIC
Nuclear Magnetic Resonance; Electrical Resistivity; High Pressure; High Temperature; Lithium Isotopes; Metal Ions

19980210917 Los Alamos National Lab., NM USA
Modification of heterogeneous chemistry by complex substrate morphology
Henson, B. F., Los Alamos National Lab., USA; Buelow, S. J., Los Alamos National Lab., USA; Robinson, J. M., Los Alamos National Lab., USA; [1998]; 15p; In English
Contract(s)/Grant(s): W-7405-ENG-36
Report No.(s): LA-UR-97-3382; DE98-001613; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche
This is the final report of a one-year, Laboratory Directed Research and Development (LDRD) project at Los Alamos National Laboratory (LANL). Chemistry in many environmental systems is determined at some stage by heterogeneous reaction with a surface. Typically the surface exists as a dispersion or matrix of particulate matter or pores, and a determination of the heterogeneous chemistry of the system must address the extent to which the complexity of the environmental surface affects the reaction rates. Reactions that are of current interest are the series of chlorine nitrate reactions important in polar ozone depletion. The authors have applied surface spectroscopic techniques developed at LANL to address the chemistry of chlorine nitrate reactions on porous nitric and sulfuric acid ice surfaces as a model study of the measurement of complex, heterogeneous reaction rates. The result of the study is an experimental determination of the surface coverage of one adsorbed reagent and a mechanism of reactivity based on the dependence of this coverage on temperature and vapor pressure. The resulting mechanism allows the first comprehensive modeling of chlorine nitrate reaction probability data from several laboratories.
DOE
Heterogeneity; Morphology; Surface Reactions; Substrates; Atmospheric Chemistry

19980210951 California Univ., Dept. of Materials Science and Engineering, Berkeley, CA USA
Analysis and Optimization of Oxidized Heterolayers ***Annual Report, 1 Apr. 1997 - 31 Mar. 1998***
Weber, Eicke, California Univ., USA; Jun. 30, 1998; 24p; In English
Contract(s)/Grant(s): N00014-97-1-0335
Report No.(s): AD-A348630; TR-442427-23086; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this project is to develop a controlled oxidation process with minimized degradation of the adjacent device structures. A systematic study of the fundamental properties of the wet thermal oxides is being performed, including the dependence on oxide processing parameters, hydrogen and other dopant concentrations, oxidized layer thickness, and Ga concentration. The study was based on state-of-the-art structural analysis by transmission electron microscopy techniques, including structural microanalysis of the layers with respect to the phases formed and the presence of inhomogeneities.
DTIC
Microanalysis; Structural Analysis; Transmission Electron Microscopy

19980211104 Joint Oil Analysis Program, Technical Support Center, Pensacola, FL USA
The Utilization of FT-IR for Army Oil Condition Monitoring
Toms, Allison M., Joint Oil Analysis Program, USA; Powell, Jay R., Bio-Rad Labs., Inc., USA; Dixon, John, Army Materiel Command, USA; Jan. 1998; 7p; In English
Report No.(s): AD-A347662; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper discusses the implementation and progress of Fourier transform infrared (FT-IR) spectroscopy in the U.S. Army Oil Analysis Program (AOAP). Improvements in the basic FT-IR method, the addition of new analysis capabilities and the impact FT-IR has made on AOAP are presented-expansion of FT-IR to cover hydraulic fluids (petroleum and phosphate ester fluids), new fuel analysis procedures and new cleaning solvent option. The implementation of FT-IR in the Army enabled the return of previously removed aircraft equipment (ODDS) to the AOAP.
DTIC
Infrared Spectroscopy; Fourier Transformation; Chemical Analysis; Crude Oil

19980211131 Norwegian Defence Research Establishment, Kjeller, Norway
Accurate Molecular Mass Determination of Peptides by Electrospray-Mass Spectrometry ***Noyaktig Molekylmassebestemmelse av Peptider ved Hjelp av Elektrospray-Massespektrometri***
Tornes, John Aasulf, Norwegian Defence Research Establishment, Norway; Mar. 25, 1998; 12p; In Norwegian
Report No.(s): FFI/RAPPORT-98/01735; FFITOX/757/137; ISBN 82-464-0241-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

Molecular masses of some peptides have been determined by electrospray mass spectrometry. A mass accuracy better than 10 parts per million has been obtained using a Finnigan MAT95Q mass spectrometer equipped with a mark II electrospray interface. Electric scan gave better mass accuracy than magnetic scan. High Resolution Centroid (HCENT) mode gave better precision that High Resolution Profile (HPROF) mode, but lower mass accuracy. Use of HPROF mode is recommended when analysing molecules with masses above 2000 u because HCENT mode in some cases gave erroneous results.
Author
Molecules; Mass; Peptides; High Resolution

19980211302 Dow Corning Corp., Midland, MI USA
Methyl chloride via oxhydrochlorination of methane
Jarvis, R. F., Jr., Dow Corning Corp., USA; 1997; 6p; In English; Natural Gas Conference, 24-27 Mar. 1997, Houston, TX, USA
Contract(s)/Grant(s): DE-FC22-96PC-96050
Report No.(s): DOE/PC/96050-97/C0856; CONF-970367-; DE97-054283; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Dow Corning is developing a route from methane to methyl chloride via oxyhydrochlorination (OHC) chemistry with joint support from the Gas Research Institute and the Department of Energy Federal Energy Technology Center. Dow Corning is the world's largest producer of methyl chloride and uses it as an intermediate in the production of silicone materials. Other uses include production of higher hydrocarbons, methyl cellulose, quaternary ammonium salts and herbicides. The objective of this project is to demonstrate and develop a route to methyl chloride with reduced variable cost by using methane instead of methanol raw materials. Methyl chloride is currently produced from methanol, but U.S. demand is typically higher than available domestic supply, resulting in fluctuating prices. OHC technology utilizes domestic natural gas as a feedstock, which allows a lower-cost source of methyl chloride which is independent of methanol. In addition to other uses of methyl chloride, OHC could be a key step in

a gas-to-liquid fuels process. These uses could divert significant methanol demand to methane. A stable and selective catalyst has been developed in the laboratory and evaluated in a purpose-built demonstration unit. Materials of construction issues have been resolved and the unit has been run under a range of conditions to evaluate catalyst performance and stability. Many technological advances have been made, especially in the areas of catalyst development, online FTIR analysis of the product stream, and recovery of methyl chloride product via an absorber/stripper system. Significant technological hurdles still remain including heat transfer, catalysts scaleup, orthogonality in modeling, and scaleable absorption data. Economics of the oxyhydrochlorination process have been evaluated an found to be unfavorable due to high capital and utility costs. Future efforts will focus on improved methane conversion at high methyl chloride selectivity.
DOE
Procedures; Catalysts; Chemical Analysis; Chemical Reactors; Methane; Methyl Chloride; Oxidation

19980211315 Lawrence Livermore National Lab., Livermore, CA USA
Aerial oxidation of tetraethyl silicate and effect on ammonia catalyzed hydrolysis
Thomas, I. M., Lawrence Livermore National Lab., USA; Jun. 25, 1997; 13p; In English; Sol-gel ’97, 31 Aug. - 5 Sep. 1997, Sheffield, UK
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-126812; CONF-9708125; DE98-051122; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Colloidal suspensions of Si02 in ethanol prepared by the ammonia catalyzed hydrolysis of tetraethyl silicate (TEOS) in ethanol have been routinely used for over 10 years to prepare antireflective (AR) coatings on the fused silica transmissive optical components of high power fusion lasers. Very high purity coatings are required to avoid laser damage and these are obtained when the TEOS is fractionally distilled under N2 prior to use. Recently we found that products from aerial oxidation of distilled TEOS, had a significant effect on the particle size of our coating suspensions to the detriment of the optical performance. We require particle sizes less than 20 nm to avoid light loss due to scatter and contaminated TEOS gave suspensions with much higher particle sizes. Oxidation products were identified by GC mass spectroscopy and included acetaldehyde, acetic acid, silicon acetates and reaction products of these compounds with ethanol. Acetic acid and silicon acetates were found to be the major cause of large particle formation. These could be removed by careful redistillation preferably in the presence of a small quantity of magnesium ethoxide. Storage in sealed containers over N2 avoided further problems.
DOE
Oxidation; Tetraethyl Orthosilicate; Ammonia; Catalysis; Hydrolysis; Colloids; Ethyl Alcohol; Silicon; Catalytic Activity

19980211330 Lawrence Livermore National Lab., Livermore, CA USA
Destruction of organic wastes by ammonium peroxydisulfate with electrolytic regeneration of the oxidant
Cooper, J. F., Lawrence Livermore National Lab., USA; Wang, J. F., Lawrence Livermore National Lab., USA; Krueger, R., Lawrence Livermore National Lab., USA; King, K., Lawrence Livermore National Lab., USA; Jul. 01, 1997; 11p; In English; 6th; ICEM ’97: Radioactive Waste Management and Environmental Remediation, 12-16 Oct. 1997, Singapore, Singapore
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-121979-Rev.2; CONF-971040-; DE98-051084; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Research is reported concerning a new aqueous process for oxidative destruction of solid- and liquid organic wastes. This process uses acidified ammonium peroxydisulfate and operates at ambient pressure and at 80- to 100 deg. C. The oxidant may be efficiently regenerated by electrolysis of the sulfate by-product at Pt anodes, even in the presence of organic and inorganic contaminants expected to be entrained in the cycle. Integral rate constants were determined for the oxidation of 25 diverse organic compounds at low 50 ppm concentrations through fixed-time experiments with excess oxidant and a Pt wire catalyst. For high initial concentrations, uncatalyzed mineralization rates were measured for waste surrogates including kerosene, triethylamine, ion exchange resin, oxalic acid, trinitrotoluene, and cellulose. A packed bed reactor was tested with ethylene glycol, with offgas analysis by mass spectroscopy. Rate data extrapolate to throughputs of approximately 200 kg/m(exp 3)-day. The process may benefit the destruction of highly toxic or specialized industrial wastes as well as the organic fraction of mixed wastes.
DOE
Ammonium Compounds; Electrolysis; Oxidation; Liquid Wastes; Destruction; Industrial Wastes; Sulfates; Solid Wastes; Cellulose; Oxalic Acid

19980211340 Heidelberg Univ., Heidelberg, Germany
Mathematical modelling and laser measurement technique of combustion processes ***Final Report, 1994-1996 Mathematische Modellierung und Lasermesstechnik von Verbrennungsvorgaengen. Abschlussbericht 1994 - 1996***
[1996]; 314p; In German
Contract(s)/Grant(s): BMBF 032678
Report No.(s): ETDE-DE-658; DE98-746291; ISBN 3-926751-19-3; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

Due to financial boundary conditions and greater industrially orientated targets, the project was restructured in its third phase. The general theme 'Mathematical modelling and laser measurement technique of combustion processes' was made more precise by the central questions of the Sub-heading 'Modelling and validation'. It applies equally as target for the three part projects (a) Modelling process, (b) Standard flames (c) Coal and solid combustion, soot formation, radiation. Due to the preliminary work done, good progress was achieved in all projects, in some cases discoveries were made and new types of projects were developed. The quality and quantity of the basic data as input parameters for modelling and validation data as test parameters for the prediction of the models was expanded further by comparison of different methods of measurement.
DOE
Lasers; Combustion Physics; Mathematical Models; Boundary Conditions

19980211360 New Energy and Industrial Technology Development Organization, Tokyo, Japan
Survey on synthesis and reaction of environmentally benign water-soluble metal complex catalysts ***Kankyo chowagata suiyosei sakutai shokubai no gosei hanno no chosa***
Mar. 1997; 90p; In Japanese
Report No.(s): NEDO-IT-9607; DE98-745351; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This report describes the research trend survey results on the synthesis and reaction of water-soluble metal complexes which are regarded as environmentally benign catalysts. For the synthesis and catalysis of water-soluble complexes, synthetic methods of water-soluble phosphines, such as sulfonated TPPMS and TPPTS, are described in detail. Synthesis and reactivity of hydroxymethylphosphines are introduced, and the application of electrospray mass spectroscopy is elucidated as a tool for the analysis of them. Changes of the application of transition metal complexes with water-soluble phosphines to catalysis are described. Dual catalysts which have both functions of phase transfer catalysts and homogeneous catalysts are introduced. Concept of counter phase transfer catalysts is also introduced, and some catalytic reactions are described. In addition, this report introduces catalysis of water-soluble polymer-supported metal complexes, immobilization of metal colloids with water-soluble ligands and their analysis, and water-soluble complexes as hybrid catalysts.
DOE
Complex Compounds; Catalysts; Transition Metals; Chemical Reactions; Catalysis; Ligands; Synthesis (Chemistry)

19980211376 Technical Research Centre of Finland, Espoo, Finland
Understanding vented gas explosions
Lautkaski, R., Technical Research Centre of Finland, Finland; 1997; 131p; In English
Report No.(s): VTT-TIED-1812; DE98-749195; ISBN 951-38-5087-0; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The report is an introduction to vented gas explosions for nonspecialists, particularly designers of plants for flammable gases and liquids. The phenomena leading to pressure generation in vented gas explosions in empty and congested rooms are reviewed. The four peak model of vented gas explosions is presented with simple methods to predict the values of the individual peaks. Experimental data on the external explosion of dust and gas explosions is discussed. The empirical equation relating the internal and external peak pressures in vented dust explosions is shown to be valid for gas explosion tests in 30 m(sup 3) and 550 m(sup 3) chambers. However, the difficulty of predicting the internal peak pressure in large chambers remains. Methods of explosion relief panel design and principles of vent and equipment layout to reduce explosion overpressures are reviewed.
DOE
Structural Design; Overpressure; Flammable Gases; Dust

19980211377 Swedish Transport and Communications Research Board, Stockholm, Sweden
Catalysts for biobased fuels. New catalyst formulations for vehicles fuelled by biobased motor fuels
Pettersson, L. J., Royal Inst. of Tech., Sweden; Wahlberg, A. M., Royal Inst. of Tech., Sweden; Jaeraas, S. G., Royal Inst. of Tech., Sweden; Dec. 1997; ISSN 1104-2621; 87p; In English

Report No.(s): KFB-97-40; DE98-750735; ISBN 91-88868-63-X; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The long-term objective for the project is to develop tailor-made exhaust gas catalysts for heavy-duty vehicles fuelled by bio-based motor fuels operating in urban traffic. In this report an experimental study of catalytic oxidation of ethanol in a laboratory flow reactor is presented. The miniature catalyst samples consisted of monolithic cordierite substrates onto which various combinations of washcoat material and active material were applied. Oxides of Cu and Cu-Mn, as well as different combinations of precious metals were evaluated as active material supported on various washcoat materials. The experimental conditions were chosen in order to simulate the exhaust from a diesel engine fuelled by neat ethanol. Catalyst characterization included measurements of BET surface area and pore size distribution as well as temperature programmed reduction (TPR) analysis. When comparing the TPR profiles with the light-off curves from the ethanol oxidation experiments, we have found an indication of a correlation between activity and reducibility of the catalyst. There also seems to be a correlation between TPR profile and pore size distribution for titania-supported catalysts. When combining two precious metals as active material, a positive synergistic effect has been observed. The light-off temperature (T(sub 50)) is considerably lower for some of these combinations than for the corresponding monometallic catalysts. The base metal oxide catalysts tested were more selective for oxidation of ethanol to carbon dioxide and water than the precious metal catalysts. The results also indicate that the oxidation of nitric oxide to the more hazardous nitrogen dioxide can be suppressed by using a suitable combination of active material and washcoat material.

DOE

Urban Transportation; Miniaturization; Exhaust Emission; Oxidation

19980211496 Air-Conditioning and Refrigeration Technology Inst., Inc., Arlington, VA USA

Infrared analysis of refrigerant mixtures *Final Report*

Morse, T. F., Air-Conditioning and Refrigeration Technology Inst., Inc., USA; Jan. 24, 1998; 28p; In English

Contract(s)/Grant(s): DE-FG02-91CE-23810; Proj. 660-54000

Report No.(s): DOE/CE/23810-82; DE98-005178; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

In order to assess the viability of using the concept of intra-cavity laser spectroscopy as a tool for the identification of newly approved refrigerant gases, we have performed a series of experiments on the infrared absorption characteristics of a series of these gases. In particular, we have obtained values for the absorption of these gases in the 1.65-2.0 micron range. This is of particular interest when applying the principle of FLICS (Fiber Laser Intra-Cavity Spectroscopy) in conjunction with the broad gain bandwidth of the Tm (thulium) fiber laser. In order to clarify how this concept can be carried out with regard to refrigerant gases, we have performed some model preliminary experiments using acetylene as a test gas. This was done to establish to principle of this new sensing technique.

DOE

Infrared Absorption; Infrared Radiation; Refrigerants; Mixtures

19980211582 Princeton Univ., Dept. of Mechanical and Aerospace Engineering, NJ USA

Pyrolysis and Oxidation Kinetics of Anisole and Phenol

Pecullan, Melissa S., Princeton Univ., USA; Jun. 1997; 199p; In English

Contract(s)/Grant(s): DE-FG02-86ER13554

Report No.(s): AD-A349061; MAE-2097-T; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

This thesis recounts an investigation of the high-temperature chemistry of the phenoxy radical and its parent phenol through the acquisition of reaction intermediate data from experiments performed in a turbulent flow reactor. Anisole, a chemical source of phenoxy at high temperature, and phenol were employed as reactor fuels at reaction temperatures near 1000 and 1170 K, respectively. Oxidation experiments were performed at fuel lean, stoichiometric, and fuel rich conditions. Pyrolysis experiments were also undertaken to provide bench mark data for comparison with oxidation data.

DTIC

Reaction Kinetics; Phenols; Pyrolysis; Anisole; Oxidation; Data Acquisition

19980211588 Pittsburgh Univ., Dept. of Chemistry, Pittsburgh, PA USA

Resonance Raman Spectrum Does Not Predict Vibrational State Distributions Caused by Ultrafast Reverse Electron Transfer of (CN)5FeCNRu(NH3)5

Wang, C., Pittsburgh Univ., USA; Walker, G. C., Pittsburgh Univ., USA; Jul. 1998; 15p; In English

Contract(s)/Grant(s): N00014-96-1-0735; Proj-96PRO05335-00

Report No.(s): AD-A349109; TR-98-6; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

It is generally thought that the resonance Raman spectrum can he used to predict the vibronic paths of radiationless decay or intramolecular Electron Transfer (ET) following electronic photoexcitation. We show that this assumption does not hold for the S(sub 1) approaches S(sub 0) ET of (CN)5 Fe-III CN Ru-II (NH3)5(-) in solution following S(sub 0) approaches S(sub 1) optical excitation. Instead, vibrational modes that are not observed in the charge transfer resonance Raman spectrum, i.e., are not immediately displaced with photoexcitation of the ground electronic state, are active in the reverse, radiationless ET process.
DTIC
Raman Spectra; Resonance; Vibrational States; Electron Transfer; Molecules

19980211624 Materials Research Society, Pittsburgh, PA USA
Interfacial Effects and Organization of Inorganic-Organic Composite Solids ***Quarterly Report No. 6, 1 Feb. 1997 - 31 Apr. 1998***
May 20, 1998; 17p; In English
Contract(s)/Grant(s): N00014-97-1-0498
Report No.(s): AD-A345582; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this forum was to explore underlying paradigms of molecular design as they impact structure-directed syntheses of inorganic-organic composite materials. Topics of particular interest include those that relate materials properties to the molecular attributes of the organic structure-directing agents. The organizers sought to bring together investigators from the various communities in order to define common attributes of these strategies and promote their application in new areas of materials science.
DTIC
Organic Materials; Composite Materials; Inorganic Materials

19980211722 Oak Ridge National Lab., TN USA
Excess Free Energies and Activity-Composition Relations for H2OCO2 Fluids at 400 deg. C and 1-4000 Bars
Blencoe, J. G., Oak Ridge National Lab., USA; Seitz, J. C., Oak Ridge National Lab., USA; Anovitz, L. M., Oak Ridge National Lab., USA; Jun. 1997; 6p; In English; ISHR 1997: 5Th International Symposium on Hydrothermal Reactions, 20-24 Jul. 1997, Gatlinburg, TN, USA
Contract(s)/Grant(s): DE-AC05-96OR-22464
Report No.(s): CONF-9707107-1; DE97-008432; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Experimentally determined excess molar volumes (V(sup ex)) for H2O CO2 fluids at 400 deg. C and 100-4000 bars have been used to calculate excess free energies (G(sup ex)) and activity-composition (a-X) relations for these mixtures. Excess free energies are continuously positive and asymmetric toward H2O at all pressures up to 4000 bars, rising to peak values of approximately 1300, 1800, 2000 and 2100 J/mol at 500, 1000, 2000 and 4000 bars, respectively. Calculated activities for H2O and CO2 vary correspondingly, increasing: substantially from 0 to 1000 bars, moderately from 1000 to 2000 bars, and slightly from 2000 to 4000 bars. In addition, because G(sup ex) is asymmetric toward H2O at 400 deg. C and pressures up to at least 4000 bars, a-X relations for H2O are distinctly different from a-X relations for CO2. These results imply that H2O-CO2 fluids are strongly nonideal at 400 deg. C and all pressures above approx. 300 bars, despite the fact that peak values for V(sup ex) decrease from approx. 50 cm3/mol at 300 bars to approx. 1 cm3/mol at 2000 bars, and remain small to pressures as high as 5000 bars. Excess free energies and a-X relations for H2O-CO2 fluids at 400 deg. C and pressures up to 4000 bars calculated from semi-empirical equations of state generally suggest significantly smaller positive deviations from ideality.
DOE
Free Energy; Carbon Dioxide; Water

19980213231 State Univ. of New York, Dept. of Chemistry, Buffalo, NY USA
The Dihydronaphthalene Elimination Reaction as a Route to Gallium-Nitrogen Compounds. Crystal and Molecular Structure of (PhMe2CCH2)2GaNHPh2
Beachley, O. T., State Univ. of New York, USA; Noble, Matthew J., State Univ. of New York, USA; Churchill, Melvyn R., State Univ. of New York, USA; Lake, Charles H., State Univ. of New York, USA; Mar. 16, 1998; 25p; In English
Contract(s)/Grant(s): N00014-96-1-0483
Report No.(s): AD-A346269; TR-51; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The dihydronaphthalene derivative Na2{C10H8Ga(CH2CMe2Ph)2Cl2} reacts at room temperature with NH3, n-PrNH2 and PhNH2 in THF solution to form high yields of (PhMe2CCH2)2GaNHR2 (R = H, n-Pr and Ph), C10H10 and NaCl. In contrast, the elimination reactions between Ga(CH2CMe2Ph)3 with these same amines to form (PhMe2CCH2)2GaNHR2 and PhCMe3

require temperatures of 150 C. The cyclopentadiene elimination reaction between (PhMe2CCH2)2Ga(C5H5) and aniline occurs at -10 C and is the fastest of these three. An X-ray structural study of (PhMe2CCH2)2GaNHPh2 identified it as the trans isomer.
DTIC
Gallium Compounds; Nitrogen Compounds; Molecular Structure; Chemical Reactions; Crystal Structure; Amines; Naphthalene

19980213286 Department of the Navy, Washington, DC USA
Process for Preparing Ammonium Dinitramide
Stern, Alfred G., Inventor, Department of the Navy, USA; Koppes, William M., Inventor, Department of the Navy, USA; Sitzmann, Michael E., Inventor, Department of the Navy, USA; Nock, Lori A., Inventor, Department of the Navy, USA; Cason-Smith, Donna M., Inventor, Department of the Navy, USA; Feb. 03, 1998; 4p; In English
Patent Info.: Filed 15 Oct. 1992; US-Patent-Appl-SN-990116; US-Patent-5,714,714
Report No.(s): AD-D018972; No Copyright; Avail: US Patent and Trademark Office, Microfiche
A process for preparing ammonium dinitramide by: (1) nitrating either ethyl carbamate or methyl carbamate to form the corresponding nitrocarbamate compound, ethyl N-nitrocarbamate or methyl N-nitrocarbamate; (2) reacting the N-nitrocarbamate with ammonia under anhydrous conditions to produce the corresponding ammonium salt ammonium ethyl N-nitrocarbamate or ammonium methyl N-nitrocarbamate: (3) nitrating the ammonium salt and then treating the reaction mixture with ammonia to produce ammonium dinitramide, ammonium nitrate, and regenerate the original ethyl carbamate or methyl carbamate compound.
DTIC
Chemistry; Ammonium Compounds; Ammonia

19980213291 Department of the Navy, Washington, DC USA
Two Phase HFB2-SIB4 Material
Wuchina, Eric J., Inventor, Department of the Navy, USA; Nov. 25, 1997; 8p; In English; Supersedes US-Patent-Appl-SN-669673, AD-D018401
Patent Info.: Filed 24 Jun. 1996; US-Patent-Appl-SN-669673; US-Patent-5,691,258
Report No.(s): AD-D018986; No Copyright; Avail: US Patent and Trademark Office, Microfiche
A two phase HfB2-SiB4 material which is useful as a high temperature oxidation resistant coating.
DTIC
Borides; Ceramic Coatings; Hafnium; Phases

19980213292 Patent Office, Washington, DC USA
Method of Preparing Monoclinic BaO.Al2O3.2SiO2
Talmy, Inna G., Inventor, Patent Office, USA; Haught, Deborah A., Inventor, Patent Office, USA; Dec. 09, 1997; 4p; In English; Supersedes US-Patent-Appl-SN-382979
Patent Info.: US-Patent-Appl-SN-382979; US-Patent-5,695,725
Report No.(s): AD-D018987; No Copyright; Avail: US Patent and Trademark Office, Microfiche
Monoclinic celsian (BaO.Al2O3.2SiO2) is produced by heating a stoichiometric, powder mixture of BaCO3 (or BaC2O4), Al2O3, and SiO2 (preferably SiO2 gel) with monoclinic celsian seeds at from 1250 deg. C to 1500 deg. C.
DTIC
Barium Oxides; Aluminum Oxides; Silicon Dioxide; Powder (Particles); Ceramics

19980214892 Department of the Navy, Washington, DC USA
Internal Gelation Method for Forming Multilayer Microspheres and Product Thereof
Price, Ronald R., Inventor, Department of the Navy, USA; Monshipouri, Mariam, Inventor, Department of the Navy, USA; Apr. 28, 1998; 10p; In English; Supersedes US-Patent-Appl-SN-587798, AD-D017956
Patent Info.: Filed 26 Dec. 1995; US-Patent-Appl-SN-587798; US-Patent-5,744,337
Report No.(s): AD-D018959; No Copyright; Avail: US Patent and Trademark Office, Microfiche
Microspheres, of controllable shape and size, encapsulating active ingredients, are made by the internally controlled gelation of an emulsion including a water-soluble polysaccharide, a salt of a di- or trivalent metal cation, a polymerization inhibitor, water, a water-immiscible solvent (as a non-aqueous phase), and the active ingredient. The components of the aqueous phase, containing the water-soluble polysaccharide, polymerization inhibitor, di- or trivalent metal salt, active substance, and water, are blended together. This aqueous phase is then gradually mixed with the oil phase and agitated to form an emulsion. After sufficient time

for solidification, the emulsion is broken and the resulting microspheres are collected. The active ingredient may be various substances, including live microorganisms.
DTIC
Gelation; Microorganisms; Microparticles

19980214897 Massachusetts Inst. of Tech., Dept. of Chemical Engineering, Cambridge, MA USA
Processing of Nanocrystalline Nitrides and Oxide Composites ***Progress Report, 1 Apr - 30 Jun. 1998***
Ying, Jackie Y., Massachusetts Inst. of Tech., USA; Panchula, Martin L., Massachusetts Inst. of Tech., USA; Jun. 30, 1998; 4p; In English
Contract(s)/Grant(s): N00014-95-1-0626
Report No.(s): AD-A349443; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The direct synthesis of nanocrystalline AlN in the forced flow reactor is described, along with initial characterization and chemical analysis results. The AlN has a surface area in excess of 100 square meters per gram and a volume average crystallite size of 40 nm. The particles are not entirely spherical and show some faceting and elongation, which explains the discrepancy between the high surface area and the XRD determined crystallite size.
DTIC
Composite Materials; Nitrides; Oxides; Aluminum; Procedures; Synthesis (Chemistry)

19980214923 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Catalytic Antibodies for Acetylcholine Hydrolysis. Synthesis of a Transition State Analogue and Catalytic Activity of TEPC 15 ***Final Report***
Noort, D., Prins Maurits Lab. TNO, Netherlands; Platenburg, D. H., Prins Maurits Lab. TNO, Netherlands; VanderWiel, H. J., Prins Maurits Lab. TNO, Netherlands; DeJong, L. P., Prins Maurits Lab. TNO, Netherlands; Feb. 1998; 18p; In English
Contract(s)/Grant(s): A94M445
Report No.(s): AD-A346497; PML-1997-A52; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Compounds that can replace nerve agent inhibited AChE and hydrolyze acetylcholine are potentially useful for therapy of nerve agent intoxications. A commercially available antibody against phosphorylcholine, TEPC 15, was tested as a catalyst for acetylcholine hydrolysis, but showed only very low activity. Furthermore, the synthesis of O-(2-trimethylammonioethyl) O-hydrogen 2-aminoethylphosphonate is described. This compound resembles the negatively charged, tetrahedral transition state for the hydrolysis of acetylcholine and will be used to generate catalytic antibodies. These antibodies might be useful for the therapy of nerve agent intoxications.
DTIC
Antibodies; Hydrolysis; Acetyl Compounds; Catalysts

26
METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

19980210914 Lawrence Livermore National Lab., Livermore, CA USA
Magnetic dichroism effect of binary alloys using circularly-polarized x-ray
Wu, S. Z., Lawrence Livermore National Lab., USA; Schumann, F. O., Lawrence Livermore National Lab., USA; Willis, R. F., Lawrence Livermore National Lab., USA; Goodman, K. W., Lawrence Livermore National Lab., USA; Tobin, J. G., Lawrence Livermore National Lab., USA; Carr, R., Lawrence Livermore National Lab., USA; May 01, 1997; 7p; In English
Contract(s)/Grant(s): W-7405-eng-48
Report No.(s): UCRL-ID-127551; DE98-050703; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We have studies the magnetic propertied of CoNi binary alloy films with various atomic compositions using soft x-ray magnetic circular dichroism (XMCD) technique. The alloy films were deposited on single Cu(100) crystals in situ using our well-established epitaxial growth technique to achieve a layer-by-layer growth and a metastable fcc structure, with all films exhibiting an in-plane magnetic anistrophy. Utilizing the element-specific ability and nanostructure magnetization sensitivity of this technique, we have been able to perform the absorption measurements at L2 and L3 edge of Co and Ni atoms and observed large dichro-

ism signals. The extraction of spin moment and orbital moment for varying elemental stoichiometry using magneto- optical sum rules is discussed.
DOE
Magnetization; Magnetic Effects; Dichroism; Binary Alloys; X Rays; Atoms

19980210939 Argonne National Lab., IL USA
Atomic structure of [110] tilt grain boundaries in FCC materials
Merkle, K. L., Argonne National Lab., USA; Thompson, L. J., Argonne National Lab., USA; Apr. 1997; 4p; In English; Microscopy and Microanalysis '97, 10-14 Aug. 1997, Cleveland, OH, USA
Contract(s)/Grant(s): W-31-109-ENG-38
Report No.(s): ANL/MSD/CP-93077; CONF-970834-28; DE97-008372; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

High-Resolution Electron Microscopy (HREM) has been used to study the atomic-scale structure and localized relaxations at Grain Boundaries (GBs) in Au, Al, and MgO. The [110] tilt GBs play an important role in polycrystalline fcc metals since among all of the possible GB geometries this series of misorientations as a whole contains the lowest energies, including among others the two lowest energy GBs, the (111) and (113) twins. Therefore, studies of the atomic-scale structure of [110] tilt GBs in fcc metals and systematic investigations of their dependence on misorientation and GB plane is of considerable importance to materials science. [110] tilt GBs in ceramic oxides of the fcc structure are also of considerable interest, since in this misorientation range polar GBs exist, i.e. GBs in which crystallographic planes that are made up of complete layers of cations or anions can join to form a GB.
DOE
Atomic Structure; Crystallography; Crystal Structure; Grain Boundaries; Face Centered Cubic Lattices

19980211028 Argonne National Lab., IL USA
Progress in vanadium alloy development for fusion applications
Smith, D. L., Argonne National Lab., USA; Chung, H. M., Argonne National Lab., USA; Matsui, H., Tohoku Univ., Japan; Rowcliffe, A. F., Oak Ridge National Lab., USA; Apr. 1997; 20p; In English; 4th; Fusion Nuclear Technology, 6-11 Apr. 1997, Tokyo, Japan
Contract(s)/Grant(s): W-31109-ENG-38
Report No.(s): ANL/TD/CP-91214; CONF-970404-11; DE97-053533; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Vanadium alloys have been identified as a leading candidate low- activation structural material for fusion first-wall blanket applications. Candidate vanadium alloys exhibit favorable safety and environmental characteristics, good fabricability, high temperature and heat load capability, good compatibility with liquid metals and resistance to irradiation damage. The focus of the vanadium alloy development program has been on the vanadium-chromium-titanium (0-15% Cr, 1-20% Ti) alloy system. Investigations include effects of minor alloy elements such as Si, Al, and Y and substitution of iron fro chromium in the ternary alloy. A V-4Cr-4Ti alloy is currently regarded as the reference alloy. Significant progress has been made in the development of vanadium alloys for fusion applications, Two production-scale heats (500 kg and 1200 kg) of the V-4Cr-4Ti alloys have been produced with controlled levels of impurities. The baseline properties of the 500 kg heat are similar to those of the previous laboratory-scale heats. Additional data have been obtained on baseline tensile and fracture properties. Results obtained on several heats with minor variations in composition indicate high uniform and total elongation of these alloys at temperatures of 400-600 deg. C. The properties are not significantly different when modest amounts of helium are generated during neutron irradiation by the Dynamic Helium Charging Experiment methods. However, recent results have indicated that these alloys are susceptible to irradiation embrittlement at lower temperatures. Additional irradiation experiments are in progress to investigate these effects at temperatures of 200-400 deg. C. This paper presents and update on the experimental results on candidate low activation vanadium alloys.
DOE
Vanadium; Vanadium Alloys; Fusion

19980211029 Sandia National Labs., Albuquerque, NM USA
Impact failure and fragmentation properties of metals
Grady, D. E., Applied Research Associates, Inc., USA; Kipp, M. E., Sandia National Labs., USA; Mar. 1998; 126p; In English
Contract(s)/Grant(s): DE-AC04-94AL-85000
Report No.(s): SAND-98-0387; DE98-004766; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

In the present study we describe the development of an experimental fracture material property test method specific to dynamic fragmentation. Spherical test samples of the metals of interest are subjected to controlled impulsive stress loads by acceleration to high velocities with a light-gas launcher facility and subsequent normal impact on thin plates. Motion, deformation and fragmentation of the test samples are diagnosed with multiple flash radiography methods. The impact plate materials are selected to be transparent to the x-ray method so that only test metal material is imaged. Through a systematic series of such tests both strain-to-failure and fragmentation resistance properties are determined through this experimental method. Fragmentation property data for several steels, copper, aluminum, tantalum and titanium have been obtained to date. Aspects of the dynamic data have been analyzed with computational methods to achieve a better understanding of the processes leading to failure and fragmentation, and to test an existing computational fragmentation model.
DOE
Impact Resistance; Impact Strength; Failure; Fragmentation; Metals

19980211035 National Renewable Energy Lab., Golden, CO USA
Energy-efficient process for hot-dip batch galvanizing
Apr. 1998; 2p; In English
Contract(s)/Grant(s): DE-AC36-83CH-10093
Report No.(s): DOE/GO-10098-561; DE98-004970; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Hot-dip galvanizing of steel sheets, pipes, and other fabrication items is a popular method of corrosion protection. Currently, steel articles are immersed in molten zinc at 860 deg. F, thereby forming a 'frozen' metal (interfacial zinc iron intermetallic layer) on the surface. Drawbacks to the current technology include the expense of heating parts at such a high temperature and the generation of by-products such as zinc alloys, zinc oxides, and smoke. Furthermore, new federal regulations have significantly reduced acceptable lead levels in coatings, because lead from galvanized, coated steel will dissolve in water. Such dissolved lead may accumulate in human bodies with deleterious results. Additionally, the use of a molten salt layer on top of zinc (top-flux) causes kettle smoke and ash evolution. Ferro Technologies, Inc. has proposed a lead-free batch technology that will significantly improve the galvanizing process. The new Thermo Prep(trademark) process protects steel surfaces with a thermally stable flux by preheating parts to 400 deg. F to 450 deg. F in a separate furnace, and then immersing them in molten, lead-free zinc for a short period of time. The use of a thermally stable pre-flux would eliminate the need for top-flux, thereby reducing associated wastes.
DOE
Steels; Pipes (Tubes); Fabrication; Corrosion Prevention; Metal Sheets

19980211044 Oak Ridge National Lab., TN USA
Micro-toughened titanium-based intermetallics for high-temperature service ***Final Report***
Sikka, V. K., Oak Ridge National Lab., USA; Liu, C. T., Oak Ridge National Lab., USA; Blue, C. A., Oak Ridge National Lab., USA; Nov. 1997; 23p; In English
Contract(s)/Grant(s): DE-AC05-96OR-22464
Report No.(s): ORNL-98051439; DE98-051439; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This Cooperative Research and Development Agreement (CRADA) report deals with the composition development, processing parameter development, microstructural evaluation, and mechanical properties development of the (beta) TiAl alloys. Two series of alloy compositions were identified. The first series consisted of four alloys, and the second series consisted of three alloys. The powders were packed in titanium cans, evacuated, and sealed. The titanium cans were hot extruded at 1150, 1250, and 1400(degrees)C to an area reduction ratio of 16:1. The extruded bars were heat treated between 800 and 1320(degrees)C, and their microstructure characterized in the extended and heat-treated condition by optical, scanning, and transmission electron microscopy (TEM). The microstructural features such as colony size, width of colony boundary (beta) layer, interlamellar spacing, (alpha)(sub 2)-(alpha)(sub 2) spacing, (beta)lamellar width, and (alpha)(sub 2)-(beta) layer ratio were quantified. Tensile bars were prepared from the extruded bars by electrodischarge machining followed by grinding. Tensile tests were conducted from room temperature to 1000(degrees)C. Three-point-bend tests were used to measure the fracture toughness at both room temperature and 800(degrees)C. The effect of long-term annealing at 800 and 1000(degrees)C on one of the alloys was measured at room temperature. Tensile properties of the alloys of this study were compared with the data reported in literature.
DOE
Cans; Fracture Strength; Intermetallics; Mechanical Properties; Microstructure; Scanning Electron Microscopy; Transmission Electron Microscopy

19980211067 California Univ., Dept. of Physics, Irvine, CA USA

Modification of Material Surface Using Plasma-Enhanced Ion Beams ***Final Report, 1 May 1996 - 30 Apr. 1998***

Bystritskii, V., California Univ., USA; Jun. 1998; 48p; In English

Contract(s)/Grant(s): F49620-96-1-0181; AF Proj. D700

Report No.(s): AD-A347696; AFRL-SR-BL-TR-98-0505; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Final report presents review of the experimental data obtained during the first and the second year of the 2-years research effort on Application of Microsecond Plasma Opening Switch (MPOS) Technology for Materials Surface Modification. Following second year programmatic plan, formulated in the conclusion of the 1-st year report we focused our effort on study of aluminum alloys modification (Al2024, 6061, 7075), including enhancement of their corrosion resistance, testing feasibility of treatment of non-planar surfaces, testing new technology of composite film formation (TiAl) and improvement of aluminum alloys bulk fatigue properties. The ion beam parameters used are 250 keV energy, and current and energy densities of 150 A/sq cm and 2.2 J/sq cm, respectively. Characterization of the treated samples showed structural changes to a depth of about +1 micron. We demonstrated factor of 3 enhancement of corrosion resistance for the treated Al alloys samples, as measured by their mass loss. EDAX and Auger analysis of irradiated Al samples with pre-deposited thin Ti films indicate that mixing due to ion beam irradiation occurs to a depth of up to 1 micron. The systematic study on the bulk tensile and fatigue properties of the MPOS treated Al2024, Al7075 alloy samples were carried out both in air and in corrosive media. The measurements indicate no deterioration of the fatigue life time in the air for the MFOS treated samples, compared with non-treated. In the same time significant enhancement of fatigue life time for the treated 7075 alloy in corrosive media (1.5 times higher in fatigue limit) was registered. For the 2024 alloy the enhancement of fatigue lifetime was detectable only for higher stresses.

DTIC

Aluminum Alloys; Corrosion Resistance; Surface Finishing; Data Acquisition; Technology Assessment

19980211094 Helsinki Univ. of Technology, Lab. of Materials Processing and Powder Metallurgy, Otaniemi, Finland

Isothermal CFD-model of Peirce-Smith converting process

Vaarno, J., Helsinki Univ. of Technology, Finland; Pitkaelae, J., Helsinki Univ. of Technology, Finland; Ahokainen, T., Helsinki Univ. of Technology, Finland; Jokilaakso, A., Helsinki Univ. of Technology, Finland; 1997; 29p; In English

Report No.(s): TKK-V-B127; DE98-737098; ISBN 951-22-3463-7; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The Peirce-Smith converter has been a dominating copper and nickel matte refining process since 1905. Due to extremely difficult process conditions, very little measured data has been available for studying interactions of the gas injection and molten sulphide matte. Detailed information on fluid dynamics of the gas injection is needed in solving gas injection related problems like refractory wear, accretion growth and tuyere blockage as well as optimising the efficiency of momentum and mass transfer created by the gas jets. A commercial CFD-code PHOENICS was used to solve isothermal flow field of gas and liquid in a Peirce-Smith converter. An Euler-Euler based algorithm was chosen for modelling fluid dynamics and evaluating controlling forces of a submerged gas injection generally. Predictions were made with a (kappa)-(epsilon) turbulence model in the body fitted co-ordinate system. The model has been verified with a 1/4 scale water model, and a parametric study with the mathematical model of submerged gas injection was made for the PS-process and the ladle injection processes. Limits of the modelling technique used were recognized, but calculated results indicates that the present model predicts the general flow field with reasonable accuracy and it can be used as input for more detailed mathematical models of gas plumes. Predicted bubble distribution, pattern of the flow field and magnitude of flow velocities were also used to evaluate scaling factors of physical models and general flow conditions of an industrial PS-converter.

DOE

Isothermal Flow; K-Epsilon Turbulence Model; Computational Fluid Dynamics; Flow Distribution; Flow Velocity; Gas Dynamics; Gas Injection

19980211137 Lawrence Livermore National Lab., Livermore, CA USA

Effects of symmetry on circular and linear magnetic dichroism in angle-resolved photoemission spectra of Gd/Y(0001) and Fe-Ni//Cu(001)

Goodman, K. W., Pennsylvania State Univ., USA; Tobin, J. G., Pennsylvania State Univ., USA; Schumann, F. O., Pennsylvania State Univ., USA; Willis, R. F., Pennsylvania State Univ., USA; Gammon, J. W., Virginia Commonwealth Univ., USA; Pappas, D. P., Virginia Commonwealth Univ., USA; Kortright, J. B., California Univ., Lawrence Berkeley Lab., USA; Denlinger, J. D., California Univ., Lawrence Berkeley Lab., USA; Rotenberg, E., California Univ., Lawrence Berkeley Lab., USA; Warwick, A., California Univ., Lawrence Berkeley Lab., USA; Smith, N. V., California Univ., Lawrence Berkeley Lab., USA; Mar. 26, 1997; 7p; In English, 31 Mar. - 4 Apr. 1997, San Francisco, CA, USA; Sponsored by Materials Research Society, USA

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Report No.(s): UCRL-JC-127023; CONF-970302; DE98-051160; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We have observed circular and linear magnetic dichroism in angle-resolved photoemission spectra of 50-monolayer Gd film grown on Y(0001) and 6-monolayer Fe-Ni alloy films grown on Cu(001). The 4f level of Gd and the Fe 3p level of the Fe-Ni alloy were measured. A different geometry was used for the magnetic circular dichroism than was used to measure the magnetic linear dichroism. The geometries were chosen so that the shape of the magnetic circular dichroism is predicted to be equal to the shape of the magnetic linear dichroism for four-fold symmetric Fe-Ni/Cu(001) but not for three-fold symmetric Gd/Y(0001). Experimental results are presented. In this paper we examine the effect of symmetry (experimental geometry and sample geometry) on magnetic linear and circular dichroism in angle- resolved photoemission. In particular we chose separate geometries for measuring magnetic circular and magnetic linear dichroism. The geometries were chosen such that samples with four-fold symmetry about the sample normal may have magnetic circular and magnetic linear dichroism of the same shape. But samples with three-fold symmetry should not exhibit circular and magnetic linear dichroism of the same shape. The samples studied are three-fold symmetric Gd films grown on Y(0001) and four-fold symmetric Fe-Ni alloy grown on Cu(001). After presenting the methods of the experiment, we briefly review parts of a model of magnetic dichroism developed by Venus and coworkers and our specialization and extension of it, particularly for FeNi/Cu(001). We then show the results of our measurements.
DOE
Symmetry; Dichroism; Photoelectric Emission; Metal Films; Iron Alloys; Magnetic Properties; Gadolinium Alloys

19980211319 Lawrence Livermore National Lab., Livermore, CA USA
History of ultrahigh carbon steels
Wadsworth, J., Lawrence Livermore National Lab., USA; Sherby, O. D., Lawrence Livermore National Lab., USA; Jun. 20, 1997; 42p; In English; Materials Week ’97, 14-18 Sep. 1997, Indianapolis, IN, USA
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-125846; CONF-970980-; DE98-050759; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The history and development of ultrahigh carbon steels (i.e., steels containing between 1 and 2.l% C and now known as UHCS) are described. The early use of steel compositions containing carbon contents above the eutectoid level is found in ancient weapons from around the world. For example, both Damascus and Japanese sword steels are hypereutectoid steels. Their manufacture and processing is of interest in understanding the role of carbon content in the development of modern steels. Although sporadic examples of UHCS compositions are found in steels examined in the early part of this century, it was not until the mid-1970s that the modern study began. This study had its origin in the development of superplastic behavior in steels and the recognition that increasing the carbon content was of importance in developing that property. The compositions that were optimal for superplasticity involved the development of steels that contained higher carbon contents than conventional modern steels. It was discovered, however, that the room temperature properties of these compositions were of interest in their own right. Following this discovery, a period of intense work began on understanding their manufacture, processing, and properties for both superplastic forming and room temperature applications. The development of superplastic cast irons and iron carbides, as well as those of laminated composites containing UHCS, was an important part of this history.
DOE
Carbon Steels; Chemical Composition; Carbon; Histories; Carbides

19980211369 Oak Ridge Y-12 Plant, TN USA
Lightweight materials for automotive applications/topic, 2, Wear resistant aluminum alloy
Viswanathan, S., Oak Ridge Y-12 Plant, USA; Jan. 31, 1997; 4p; In English
Contract(s)/Grant(s): DE-AC05-84OR-21400
Report No.(s): Y/AMT-418; DE98-004780; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The replacement of cast iron by aluminum alloys in automotive engine blocks and heads represents a significant weight reduction in automobiles. The primary hurdle to the widespread use of aluminum alloy engine blocks in the North American automobile industry was high cost. The lack of wear resistance in most aluminum alloys added to manufacturing cost, since expensive procedures such as the incorporation of cast iron liners or special coatings were needed to achieve the required wear properties. The project targeted the development of a wear resistant aluminum alloy, as well as tools and the knowledge-base required to design the casting process, to allow it to be cast economically into engine blocks without the use of a cast iron liner or special coating, thereby providing benefits to both the material and manufacturing aspects of the process. The project combined the alloy develop-

ment, wear and microstructural characterization, and casting modeling capabilities of the laboratory with the partners extensive alloy and casting process development and manufacturing experience to develop a suitable wear resistant aluminum alloy and casting process.
DOE
Aluminum Alloys; Automobile Engines; Microstructure; Project Management; Wear; Wear Resistance; Weight Reduction

19980211404 Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht, Germany
The use of titanium alloys for dynamic risers: A literature review
Torster, F., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Kocak, M., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; dosSantos, J. F., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Hutt, G., Stolt Comex Seaway Ltd., UK; 1997; ISSN 0344-9629; 35p; In English
Report No.(s): GKSS-97/E/38; DE98-746526; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The main topic of this short literature review is to describe the material related aspects concerning the production and purpose of flexible titanium risers for offshore oil and gas production. Metallurgy and alloying of titanium are briefly introduced. The review concentrates on the materials properties that are relevant for the intended use in marine environment. The focus is put on (alpha)+(beta) Ti-alloys, because earlier investigations have shown that this alloy family is the most suitable one for this purpose. Further topics which are taken into account are welding processes for titanium, weld properties and aspects of the associated weld defects as well. This literature review has been carried out at GKSS-Forschungszentrum Geesthacht GmbH within the framework of the project 'Titanium Risers for Deepwater Developments (contract nr. OG/175/95), supported by the THERMIE-JOULE Programme of the European Commission. The project consortium is formed by Stolt Comex Seaway Ltd. (UK), Seaflex AS (Norway) and GKSS (Germany). (orig.)
DOE
Titanium Alloys; Marine Environments; Natural Gas; Offshore Energy Sources; Alloying

19980211406 Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht, Germany
Strength mis-match effect on R-curve behaviour of austenitic steel welds
Bauschke, H. M., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Kocak, M., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Second International Symposium on Mis-Matching of Interfaces and Welds: Performance of Strength Mis-Matched Welded or Bonded Joints; 1997; ISSN 0344-9629, pp. 385-397; In English; 2nd; Mis-Matching of Interfaces and Welds: Performance of Strength Mis-Matched Welded or Bonded Joints, 24-26 Apr. 1996, Reinstorf-Lueneburg, Germany
Report No.(s): GKSS-97/E/42; CONF-9604243; DE98-746531; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

This paper deals with the influence of yield strength mis-match on crack resistance curves obtained from homogeneous and electron beam welded bimaterial SENB specimens out of two austenitic steels. CTOD ((delta)(sub 5)), standard CTOD ((delta)(sub BS)) and J(sub CMOD) R-curves were used to characterize the fracture toughness. The R-curves of the bimaterial specimens are compared with those obtained for homogeneous material. The mis-match-factor M was 1.25 or 0.80 and specimens with shallow (a/W=0.15) and deep (a/W=0.5) cracks were tested. The CTOD ((delta)(sub 5)), CTOD ((delta)(sub BS)) and J(sub CMOD) R-curves of the specimens investigated were generally independent of the mis-match configuration. The shallow cracked specimens showed significantly steeper R-curves than the deep cracked specimens in the case of CTOD ((delta)(sub BS)) and J(sub CMOD) as fracture parameter, whereas the CTOD ((delta)(sub 5)) R-curves were nearly identical.
DOE
Welded Joints; Fracture Strength; Austenitic Stainless Steels; Cracks; Yield Strength

19980211524 Army Armament Research, Development and Engineering Center, Benet Labs., Watervliet, NY USA
Residual Stress in a Swage Autofrettaged Steel Cylinder with Semi-Circular Mid-Wall Channels *Final Report*
Lee, S. L., Army Armament Research, Development and Engineering Center, USA; Hyland, E., Army Armament Research, Development and Engineering Center, USA; Neese, J., Army Armament Research, Development and Engineering Center, USA; Windover, D., Army Armament Research, Development and Engineering Center, USA; May 1998; 20p; In English
Report No.(s): AD-A346749; ARCCB-TR-98-007; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

X-ray diffraction residual stress distribution analysis was performed for a swage autofrettaged, thick-walled, A723 steel compound cylinder with axial semi-circular mid-wall channels. Because of the existence of high stress gradient components in the stress distribution, the effect of spatial resolution and the x-ray beam spread function were investigated. Experimental stress mea-

surements were compared with results from Tresca's model of a partially autofrettaged solid cylinder. Measured residual stresses were interpreted using an ABAQUS finite element model. Our experimental results verified most features of the predicted hoop stress distribution, including the high stress gradients and compressive stresses near the channel root areas. However, significantly reduced compressive stress levels were observed both near the bore and near the channel roots. An overestimate of fatigue lifetime could result if the reduction of compressive stresses observed experimentally were not taken into account. In solid autofrettaged cylinders, reduction of compressive stresses near the bore has been attributed to the Bauschinger effect. However, there is no analytical model incorporating the Bauschinger effect in the current geometry. This work demonstrated that the introduction of the semi-circular channels in a solid cylinder significantly modified the magnitude and location of stress fields. Both the bore and the channel roots are critical sites for stress concentration. Our analysis further determined that the channel roots were the most critical sites where cracks and failure should occur. Fatigue test results verified that cracking and failure occurred at the channel roots.
DTIC
Stress Measurement; Stress Concentration; Finite Element Method; Computer Programs; Compression Loads; Bauschinger Effect

19980211556 General Electric Co., Corporate Research and Development Center, Schenectady, NY USA
Electron beam physical vapor deposition through tungsten
Corderman, R., General Electric Co., USA; Dobbs, J., General Electric Co., USA; Dupree, P., Department of Energy, USA; Oct. 17, 1997; 194p; In English
Contract(s)/Grant(s): DE-FG02-94ER-12142
Report No.(s): DOE/ER/12142-T1; DE98-005129; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

High temperature alloys for application to power generation and aircraft engine gas turbine components are presently at their performance limits. New alloys that use intermetallic matrix composites (IMCs) offer a path to higher efficiency engines. Cost-effective synthesis of these revolutionary materials will depend on the development of more efficient processing techniques. Electron beam physical vapor deposition (EB-PVD), enhanced by refractory element addition, offers a key to both increased deposition rate and composition control for these demanding new materials. Initial results with tungsten-assisted EB-PVD had been so dramatic that it became important to investigate the mechanism of this process and to determine the ease with which it could be implemented in EB-PVD machines of different design. The research presented in this report investigates the effects of refractory metal addition on electron beam physical vapor deposition (EB-PVD) of Ni-base alloys containing Co, Cr and Al. Experiments were conducted in which W, Nb, Ta, Mo, or Re was added to pure Ni or Ni-base alloy evaporation pools to study the effects that the various refractory elements had on evaporation rate and the composition control of the deposit. These experiments employed three distinctly different sets of evaporation equipment, so that the effects of processing variables could also be examined. Deposit compositions, deposition rates, and evaporation pool compositions were evaluated in order to determine the effects of refractory addition on the evaporation process. The relationship between deposit properties such as deposition rate, chemistry, and microstructure, and processing parameters such as applied power, electron beam pattern frequency, beam focus, and height of the liquid pool in the crucible were also investigated.
DOE
Electron Beams; Vapor Deposition; Tungsten; Heat Resistant Alloys; Aircraft Engines; Evaporation; Gas Turbine Engines

19980211690 New Energy and Industrial Technology Development Organization, Tokyo, Japan
Worldwide clean energy system technology using hydrogen (WE-NET), 6, Development of low temperature material technology *Suiso riyo kokusai clean energy system gijutsu (WE-NET), 6, Teion zairyo gijutsu no kaihatsu*
Mar. 1997; 366p; In Japanese
Report No.(s): NEDO-WE-NET-966; DE98-745414; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Low temperature embrittlement and hydrogen embrittlement have been investigated for candidate weld metals (stainless steels of SUS304L and SUS316L, and aluminum alloy of A5083) as cryogenic structural materials using existing cryogenic (4 K) test apparatuses. For the stainless steels, effects of (sigma)-ferrite content and hydrogen charge treatment on the material properties were investigated. In addition, a high nitrogen content welding electrode (sigma = 0%), which has been reported to possess excellent low temperature properties as a result of studies conducted by overseas research agencies, was tested by means of the same methods. For the aluminum alloy, study was carried out on the material properties of weld metals by altering the welding wire composition. A system for testing materials in liquid hydrogen circumstance was newly fabricated, installed and operated to enable materials testing to be carried out under actual liquid hydrogen circumstance. It was shown that both SUS304L and

SUS316L weld metals not containing sigma-ferrite have high crack sensitivity. Weld metals containing 4% to 10% sigma-ferrite were all found to possess a low level of high temperature crack sensitivity.
DOE
Clean Energy; Hydrogen Embrittlement; Welded Structures; Cryogenics; Fabrication; Liquid Hydrogen; Hydrogen Fuels; Metals; Welding

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NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see 24 Composite Materials.

19980210891 Hungarian Academy of Sciences, Research Group og Molecular Chemistry, Budapest, Hungary
Isodisperse Telechelic Polymers and their Polyurethane Derivatives Sample Preparation ***Final Report, Aug. 1995 - Jun. 1998***
Tuedoes, Ferenc, Hungarian Academy of Sciences, Hungary; Tuedoes, Helga, Hungarian Academy of Sciences, Hungary; Foeldes-Berezsnich, Tamara, Hungarian Academy of Sciences, Hungary; Jun. 16, 1998; 53p; In English
Contract(s)/Grant(s): N68171-95-C-9105
Report No.(s): AD-A348675; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report describes the preparation of six hydroxy-terminated polybutadiene (HTPBD) samples and their hydrogenated (polyethylene) derivatives (HTPE). The polybutadiene samples, with nominal average molecular weights Mn of 1000, 1500, 2000, 3000, 5000, and 10000, have been prepared using the so-called ”isodisperse telechelic polymerization” method under non-isothermal conditions. The HTPBD samples produced were characterized by gel permeation chromatography, FT-IR and 1H-NMR and showed a narrow polydispersity approaching the theoretical limit. From the HTPBD samples isodisperse HTPE samples were prepared by hydrogenation under heterogeneous conditions, using a freshly prepared 30% palladium/charcoal catalyst. Between July 1995 and May 1997, 100-g batches of the twelve samples thus prepared were sent to the U.S. army research laboratory for further experiments.
DTIC
Polyurethane Resins; Polymerization; Polyethylenes

19980210943 Pall Corp., Port Washington, NY USA
Impact of Test Dust Changes on Particle Size, Particle Count, and Fluid Cleanliness Classes
Bensch, Leonard, Pall Corp., USA; Madhavan, Puliyur; Jan. 1998; 10p; In English
Report No.(s): AD-A347636; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

For several decades, AC Fine Test Dust (ACFTD) has been utilized for a number of purposes in the area of hydraulic and lubrication contamination control. It was used for primary calibration of automatic optical particle counters, utilized in laboratories to measure the particle size distribution of a fluid sample, either on-line or collected from the operating system in a sample bottle. ACFTD is no longer being produced and many standards organizations are now selecting replacement dusts, most notably ISO 12103-A3, for calibration and testing purposes. Because none of the replacement dusts has identical particle size distribution characteristics to ACFTD, all associated test results are somewhat different. This paper presents typical changes found with the new dusts including the impact on automatic particle counter calibration, resultant particle sizes, particle counts, and fluid cleanliness classes and codes defined in fluid cleanliness standards commonly used in the industry. It should be pointed out that, although the particle sizes defined by the new calibration, and hence, fluid cleanliness codes or classes, will be changing, this is an artifact of the measurement, and actual contamination levels in the field will remain the same as before.
DTIC
Contamination; Lubrication; Dust; Particle Size Distribution; Cleanliness; Radiation Counters; Hydraulic Control

19980210944 Thermal-Lube, Inc., Pointe-Claire, Quebec Canada
Validation of a FTIR Spectroscopy Method for Measuring and Monitoring Fuel Dilution in Lubricating Oils
Akochi-Koble, E., Thermal-Lube, Inc., Canada; Pelchat, M., Thermal-Lube, Inc., Canada; Pinchuk, D., Thermal-Lube, Inc., Canada; Pinchuk, J., Thermal-Lube, Inc., Canada; Dwight, Stephen, Thermal-Lube, Inc., Canada; Jan. 1998; 9p; In English; Prepared in cooperation with the Department of Food Science and Agricultural Chemistry, McGill University, Ste Anne de Bellevue, Que. Canada, Dwight Analytical Solutions Toronto, Ont. Canada, Naval Engineering Test Establishment Ville LaSalle, Que. C
Report No.(s): AD-A347664; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A FT-IR based fuel dilution analysis system was validated for long term reliability and precision. Frequency shift and spectral reproducibility tests showed that the instrument could operate for up to 10 months without maintenance. Changes in ambient temperature and humidity levels and the proximity to mechanical and acoustic noise generators did not affect the performance of the instrument. This was accomplished due to the methodic analytical procedures, data analysis and isolation devices developed and employed. The system was calibrated using actual used oils and fuel dilution values determined by the standard ASTM Gas Chromatography method. The calibration model developed with multivariate algorithms was able to predict fuel in SAE 30, 40, 50 and Mil-L-9000 engine oils down to 0.4% dilution.
DTIC
Dilution; Fuel Oils; Fuel Systems; Gas Chromatography; Lubricating Oils; Reliability Analysis; Infrared Spectroscopy; Proving

19980210945 Castrol Industrial North America, Downers Grove, IL USA
PFPE, A Unique Lubricant for a Unique Application
Fowzy, Mahmoud A., Castrol Industrial North America, USA; Jan. 1998; 11p; In English
Report No.(s): AD-A347666; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

PFPE (PErfluoroPolyEther) is a clear colorless fluorinated synthetic oil that is nonreactive, nonflammable, safe in chemical and oxygen service, and is long lasting. PFPE grease is made by mixing different types of non-soap thickeners with the PFPE base oil. This paper highlights the unique properties (physical and chemical) of the PFPE as well as its unique application in areas where other lubricants are deficient. This paper includes methods of applying PFPE in oil and grease form, manufacturing of PFPE, and the benefits of using PFPE lubricants. Also, it includes a general overview of a hybrid grease--a grease suitable for less severe applications than PFPE yet superior to conventional greases produced by combining fluorinated greases with mineral/synthetic oils.
DTIC
Lubricants; Procedures; Chemical Properties; Synthetic Fuels; Density (Mass/Volume)

19980210946 Naval Research Lab., Washington, DC USA
New Dimensions in Oil Debris Analysis: the Automated, Real Time, On Line Analysis of Debris Particle Shape
Roylance, Brian, Wales Univ., UK; Reintjes, John, Naval Research Lab., USA; Schultz, Abe, Naval Research Lab., USA; Howard, Paul L., Howard (Paul L.) Enterprises, Inc., USA; Jan. 1998; 10p; In English
Report No.(s): AD-A347676; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Analysis of debris particles in machinery lubricating oil has long been used to detect the onset of wear and failure of oil wetted components in machinery. This paper explores the potential for direct linkage between on line particle shape detection and the automated early detection of machinery failures. The development and application of an optimum set of feature vectors based upon extensive particle shape data bases is designed to allow automation of the shape detection process, separation of fault and non-fault related debris, tracking of specific fault types, the elimination of false calls from non-failure related debris, and the ability to provide direct fault specific corroboration of machinery faults to vibration based analysis systems, such as HUMS. The paper contrasts this capability with current on line and off line particle detection and classification practice and capability. Finally the paper briefly describes LaserNet Fines on Line, a new technology embodying this capability designed to detect and classify metallic and non metallic particles sized from 5 microns to greater than 1000 microns.
DTIC
Lubricating Oils; Debris; Data Bases; Dynamic Structural Analysis; Real Time Operation; Oil Fields

19980210964 Los Alamos National Lab., NM USA
New directions in materials for thermomagnetic cooling
Migliori, A., Los Alamos National Lab., USA; Freibert, F., Los Alamos National Lab., USA; Darling, T. W., Los Alamos National Lab., USA; 1998; 7p; In English; Space Technology and Applications International Forum, 25 - 29 Jan. 1998, Albuquerque, NM, USA
Contract(s)/Grant(s): W-7405-ENG-36
Report No.(s): LA-UR-97-3882; CONF-980103; DE98-001605; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The authors review thermoelectric effects in a magnetic field at a phenomenological level. Discussions of the difficulties in computing the limiting performance for both Peltier and Ettingshausen coolers are presented. New principles are discussed to guide the materials scientist in the search for better Ettingshausen materials. These principals are based on the tensor transport

and solid state electronic properties of Bi(sub 1 -x)Sb(sub x) alloys. A brief review of the subtle measurement problems is presented.
DOE
Thermomagnetic Cooling; Thermoelectric Cooling; Thermoelectricity; Magnetic Fields; Phenomenology; Ettingshausen Effect

19980210993 Oak Ridge National Lab., TN USA
Gelcasting of CRYSTAR(tradename) silicon carbide ceramics *Final Report*
Nunn, S. D., Oak Ridge National Lab., USA; Willkens, C. A., Oak Ridge National Lab., USA; [1998]; 10p; In English
Contract(s)/Grant(s): DE-AC05-96OR-22464
Report No.(s): ORNL-98051355; C/ORNL-94-0250; DE98-051355; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This Cooperative Research and Development Agreement (CRADA) was undertaken to assess the applicability the gelcasting process for forming ceramic green bodies using Saint-Gobain/Norton Industrial Ceramics Corporation's proprietary CRYSTAR(reg sign) silicon carbide powder. A gelcasting process, specifically tailored to Saint-Gobain/Norton's powder composition, was developed and used successfully to form green bodies for property evaluation. This preliminary evaluation showed that the gelcast material had characteristics and properties comparable to Norton's baseline material. Wafer carrier molds were received from Norton for gelcasting a complex-shaped configuration with CRYSTAR(reg sign) silicon carbide. Gelcasting experiments showed that Norton's standard plaster of paris molds were incompatible with the gelcasting process. Mold surface treatments and the use of alternative castable mold materials were investigated, however, a successful process was not identified. The highest quality parts were cast in either glass or aluminum molds.
DOE
Ceramics; Glass; Plasters; Powder (Particles); Silicon Carbides; Symbols

19980211048 Lawrence Livermore National Lab., Livermore, CA USA
Characterization of modular and thermal defects in hafnia/silica multilayer coatings using optical, photothermal, and atomic force microscopy
Stolz, C. J., Lawrence Livermore National Lab., USA; Yoshiyama, J. M., Lawrence Livermore National Lab., USA; Salleo, A., Lawrence Livermore National Lab., USA; Wu, Z. L., Lawrence Livermore National Lab., USA; Green, J., Lawrence Livermore National Lab., USA; Krupka, R., Lawrence Livermore National Lab., USA; Dec. 24, 1997; 12p; In English; 29th; Optical Materials for High Power Lasers, 6-8 Oct. 1997, Boulder, CO, USA
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-128046; CONF-9710116; DE98-052073; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Multilayer coatings manufactured from metallic hafnium and silica sources by reactive electron beam deposition, are being developed for high fluence optics in a fusion laser with a wavelength of 1053 nm and a 3 ns pulse length. Damage threshold studies have revealed a correlation between laser damage and nodular defects, but interestingly laser damage is also present in nodule-free regions. Photothermal studies of optical coatings reveal the existence of defects with strong optical absorption in nodule-free regions of the coating. A variety of microscopic techniques were employed to characterize the effects for a better understanding of the thermal properties of nodular defects and role of thermal defects in laser damage. Photothermal microscopy, utilizing the surface thermal lensing technique, was used to map the thermal characteristics of 3 mm x 3 mm areas of the coatings. High resolution subaperture scans, with a 1 pm step size and a 3 um pump beam diameter, W= conducted on the defects to characterize their photothermal properties. Optical and atomic force microscopy was used to visually identify defects and characterize their topography. The defects were then irradiated to determine the role of nodular and thermal defects in limiting the damage threshold of the multilayer.
DOE
Antireflection Coatings; Atomic Force Microscopy; Electromagnetic Absorption; Electron Beams

19980211064 Analysts, Inc., Stafford, TX USA
Fuel Soot Monitoring by Light Extinction Measurement (LEM)
Yunkers, David N., Analysts, Inc., USA; Jan. 1998; 7p; In English
Report No.(s): AD-A347720; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Fuel soot is the primary contaminant in diesel engine lubricants. Evolving emission regulations, engine designs and oil formulations are all centered around the control and retention of soot particles and advanced gel formations. Accurate, reliable and cost effective measurement of soot is now an essential requirement for an effective oil analysis program.
DTIC
Soot; Lubricants; Oils; Cost Effectiveness; Accuracy; Gels; Monitors

19980211068 Bio-Rad Labs., Inc., Digilab. Div., Cambridge, MA USA
Molecular Condition Monitoring in the Commercial World: Objectives and Applications of FT-IR Analysis
Powell, Jay R., Bio-Rad Labs., Inc., USA; Jan. 1998; 8p; In English
Report No.(s): AD-A347690; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Chemical and physical analysis of lubricants and hydraulic fluids is a common tool employed in equipment condition monitoring programs. Periodically checking these fluids for common contaminants and breakdown products allows a fast diagnosis of the general ”health” of a machine or component, and thus permits maintenance activities effectively directed or deferred as necessary. A variety of different wet chemical and spectroscopic tests have been developed and applied to meet these needs. Condition monitoring of engine oils is perhaps the most common, with spectroscopic wear metal analysis complimented by molecular analysis by Fourier Transform Infrared (FT-IR). Much information has been presented in the past towards applying FT-IR analysis to engine lubricant condition monitoring. However, analysis of engine lubricants may only be a part of or entirely unrelated to, other condition monitoring operations. Here, we will present additional information, examples, and statistical analysis of non-engine lubricants and machinery enrolled in commercial condition monitoring programs.
DTIC
Lubricants; Monitors; Molecular Dynamics; Physical Chemistry; Hydraulic Fluids

19980211075 Lawrence Livermore National Lab., Livermore, CA USA
Manufacturing and coating by kinetic energy metallization
Kang, S. W., Lawrence Livermore National Lab., USA; Feb. 09, 1998; 7p; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-ID-129791; DE98-052277; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The purpose of this effort was to theoretically model the underlying metal-coating phenomena when metal particles impact a metal surface at high velocities under room temperature conditions. The physical processes involved in the novel metal-coating process called Kinetic Energy Metallization (KEM) have been theoretically and numerically analyzed. A bonding model between the incident and the target metals has been proposed and preliminary numerical results agree reasonably well with the laboratory-obtained metal samples and suggest promise of validity for the present model. However, to put the proposed bonding model on a firmer basis further numerical effort is needed to be carried for various metals and operating conditions.
DOE
Metal Coatings; Metal Particles; Metallizing; Mathematical Models; Metal Surfaces

19980211089 New Energy and Industrial Technology Development Organization, Tokyo, Japan
Study on formation of heterostructure for single-crystalline semiconductor thin films ***Tankessho no handotai usumaku hetero kozo no keiseiho ni kansuru kenkyu***
Mar. 1997; 42p; In Japanese
Report No.(s): NEDO-ITK-9603; DE98-735430; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

For development of the new formation method of heterostructure for single-crystalline semiconductor thin films, ion implantation was studied. Since defect formation in crystals by ion implantation, and hydrogen invasion and precipitation cause degradation of quality and strength, these techniques have been avoided. However, this study prepared single-crystalline thin films of submicron thickness by implantation of H(sup +) at a target depth, H-deposition in crystal defects by annealing, and delamination of single crystals at a target depth by hydrogen embrittlement. Delamination of Si single crystals required a dose of 5 x 10(exp 17)/sq cm and annealing over 600 C. Si single crystals were divided into crystal regions of several nm by H-implantation, and distortion was found at a boundary because of dislocation of crystal axes. The boundary disappeared by annealing at 600 C, and

the secondary defects were formed in (111) planes. H atoms were bonded to the secondary defects by annealing at 600 C, causing delamination, while H atoms jumped out from Si crystals by annealing at high temperature of 700 C.
DOE
Semiconductors (Materials); Single Crystals; Thin Films; Crystal Defects; Hydrogen Embrittlement; Degradation; Ion Implantation; Annealing

19980211103 Academy of Sciences (USSR), Applied Physics Inst., Irkutsk, USSR
Scintillation Method of Analysis for Determination of Properties of Wear Particles in Lubricating Oils
Skudaev, Juriy D., Academy of Sciences (USSR), USSR; Alkhimov, Andrey B., Academy of Sciences (USSR), USSR; Drokov, Victor G., Academy of Sciences (USSR), USSR; Zarubin, Valentin P., Academy of Sciences (USSR), USSR; Kazmirov, Alexandr P., Academy of Sciences (USSR), USSR; Jan. 1998; 16p; In English
Report No.(s): AD-A347665; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Nowadays there is a demand for effective methods and equipment for early detection of failures of aircraft engines. The spectral diagnostics methods used in Russian civil aviation have a low information capacity and poor metrological features and they can not be used for reliable prognosis of the engine serviceability. Applied Physics Institute of Irkutsk State University (Russia) together with Joint-Stock Company 'Baikal Airlines' have elaborated the scintillation method of analysis of lubricating oils for wear products. It enables to obtain quickly and with high accuracy the information on: (1) a metal wear particles content, (2) a dissolved metal content, (3) an amount of wear particles, (4) an amount of simple particles, (5) an amount of complex particles, and (6) a composition of each particle. The exact determination of wear particle composition (including micron-sized particles of Fe-Cu, Fe-Ni, Fe-Ag) permits to pursue the unit-to-unit diagnostics of aircraft engines. In addition to the civil aviation the scintillation method is applicable for diagnostics of an equipments in airforce, a navy, a petroleum and engineering industries, in automobile, railway and sea transport and other engines and machines. Besides, this method may be useful for tribological investigation of a quality of lubricant materials, in the development of new lubricants.
DTIC
Wear Resistance; Lubricating Oils; Technology Assessment; Aircraft Engines; Commercial Aircraft; Diagnosis; Failure

19980211122 Sandia National Labs., Albuquerque, NM USA
PbO-free glasses for low temperature packaging
Brow, R. K., Sandia National Labs., USA; Bencoe, D. N., Sandia National Labs., USA; Tallant, D. R., Sandia National Labs., USA; Oct. 1997; 43p; In English
Contract(s)/Grant(s): DE-AC04-94AL-85000
Report No.(s): SAND-97-2391; DE98-000424; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Zinc polyphosphate glasses were examined as potential candidates for low temperature sealing applications. Glass-formation and properties were determined for the ZnO-P2O5, ZnO-B2O3-P2O5 and ZnO-SnO-P2O5 systems, and information about the short-range structures of these glasses was obtained by Raman and solid state nuclear magnetic resonance spectroscopies. In general, the most durable polyphosphate glasses have structures based on relatively short pyrophosphate chain lengths (i.e., 2 P-tetrahedra). Modified phosphate compositions are given, including compositions used to seal float glass substrates at temperatures as low as 500 C.
DOE
Lead Oxides; Glass; Low Temperature; Packaging; Sealing; Zinc Oxides

19980211309 Lawrence Livermore National Lab., Livermore, CA USA
Technical applications of aerogels
Hrubesh, L. W., Lawrence Livermore National Lab., USA; Aug. 18, 1997; 15p; In English; 5th; International Symposium on Aerogels, 8-10 Sep. 1997, Montpellier, France
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-127015; CONF-9709147-; DE98-051346; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Aerogel materials posses such a wide variety of exceptional properties that a striking number of applications have developed for them. Many of the commercial applications of aerogels such as catalysts, thermal insulation, windows, and particle detectors are still under development and new application as have been publicized since the ISA4 Conference in 1994: e.g.; supercapacitors, insulation for heat storage in automobiles, electrodes for capacitive deionization, etc. More applications are evolving as the scientific and engineering community becomes familiar with the unusual and exceptional physical properties of aerogels, there are also

scientific and technical application, as well. This paper discusses a variety of applications under development at Lawrence Livermore National Laboratory for which several types of aerogels are formed in custom sizes and shapes. Particular discussions will focus on the uses of aerogels for physics experiments which rely on the exceptional, sometimes unique, properties of aerogels. DOE

Aerogels; Technology Assessment; Technology Utilization

19980211321 Lawrence Livermore National Lab., Livermore, CA USA

Temperature and moisture dependence of dielectric constant for silica aerogels

Hrubesh, L. H., Lawrence Livermore National Lab., USA; Mar. 1997; 10p; In English, 31 Mar. - 4 Apr. 1997, San Francisco, CA, USA; Sponsored by Materials Research Society, USA

Contract(s)/Grant(s): W-7405-ENG-48

Report No.(s): UCRL-JC-125666; CONF-970302-; DE98-050728; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The dielectric constants of silica aerogels are among the lowest measured for any solid material. The silica aerogels also exhibit low thermal expansion and are thermally stable to temperatures exceeding 500 deg. C. However, due to the open porosity and large surface areas for aerogels, their dielectric constants are strongly affected by moisture and temperature. This paper presents data for the dielectric constants of silica aerogels as a function of moisture content at 25 deg. C, and as a function of temperature, for temperatures in the range from 25 deg. C to 450 deg. C. Dielectric constant data are also given for silica aerogels that are heat treated in dry nitrogen at 500 deg. C, then cooled to 25 deg. C for measurements in dry air. All measurements are made on bulk aerogel spheres at 22GHz microwave frequency, using a cavity perturbation method. The results of the dependence found here for bulk materials can be inferred to apply also to thin films of silica aerogels having similar nano-structures and densities. DOE

Moisture Content; Temperature Dependence; Aerogels; Silicon Dioxide; Moisture; Permittivity

19980211395 Westinghouse Electric Corp., Pittsburgh, PA USA

Evaluation of replacement thread lubricants for red lead and graphite in mineral oil

Jungling, T. L., Westinghouse Electric Corp., USA; Rauth, D. R., Westinghouse Electric Corp., USA; Goldberg, D., Westinghouse Electric Corp., USA; Apr. 30, 1998; 150p; In English

Report No.(s): WPAD-QES-ME-1206; DE98-005594; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Eight commercially available thread lubricants were evaluated to determine the best replacement for Red Lead and Graphite in Mineral Oil (RLGMO). The evaluation included coefficient of friction testing, high temperature anti-seizing testing, room temperature anti-galling testing, chemical analysis for detrimental impurities, corrosion testing, off-gas testing, and a review of health and environmental factors. The coefficient of friction testing covered a wide variety of factors including stud, nut, and washer materials, sizes, manufacturing methods, surface coatings, surface finishes, applied loads, run-in cycles, and relubrication. Only one lubricant, Dow Corning Molykote P37, met all the criteria established for a replacement lubricant. It has a coefficient of friction range similar to RLGMO. Therefore, it can be substituted directly for RLGMO without changing the currently specified fastener torque values for the sizes, materials and conditions evaluated. Other lubricants did not perform as well as Molykote P37 in one or more test or evaluation categories.

DOE

Mineral Oils; Graphite; Lubricants; Threads; Coefficient of Friction; Corrosion Tests; Lead (Metal)

19980211433 Tektrend International, Inc., Montreal, Quebec Canada

Intelligent Debris Analyzer: A New Tool For Monitoring Lubrication Machines

Brassard, Michel, Tektrend International, Inc., Canada; Zhang, Karen, Tektrend International, Inc., Canada; Hay, D. R., Tektrend International, Inc., Canada; Chahbaz, Ahmad, Tektrend International, Inc., Canada; Jan. 1998; 6p; In English

Report No.(s): AD-A347663; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Critical aircraft and marine components such as turbine engines and gear boxes usually require health monitoring techniques to periodically assess their condition. Debris entrapped in their oil filters contains a vast amount of untapped information. If interpreted properly, this information can be interpreted and applied for monitoring the overall machine condition and can be used to make important and relevant maintenance recommendations. Standard oil analysis methods do not generate the results required to make similar recommendations for the operation of systems with fine filtration units. Furthermore, current manual methods for filter debris analysis rely on expert knowledge and expertise and are time-consuming, expensive and inconsistent. They are, therefore, not really exportable from the laboratory to the shop floor. This paper describes a novel Intelligent Debris Analyzer

(IDA) system for detection of impending failures and diagnosis of wear trending. IDA is a hybrid artificial intelligence system incorporating digital image processing, pattern recognition and an expert system. This new system automatically evaluates the debris image, draws an expert conclusion on wear conditions and recommends maintenance actions.
DTIC
Artificial Intelligence; Lubrication; Filtration; Debris; Wear; Diagnosis

19980211448 California Univ., Dept. of Materials Science and Mineral Engineering, Berkeley, CA USA
Design of Inorganic Water Repellent Coatings for Thermal Protection Insulation on an Aerospace Vehicle ***Final Report***
Fuerstenau, D. W., California Univ., USA; Ravikumar, R., California Univ., USA; Nov. 1997; 14p; In English
Contract(s)/Grant(s): NCC2-5161; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this report, thin film deposition of one of the model candidate materials for use as water repellent coating on the thermal protection systems (TPS) of an aerospace vehicle was investigated. The material tested was boron nitride (BN), the water-repellent properties of which was detailed in our other investigation. Two different methods, chemical vapor deposition (CVD) and pulsed laser deposition (PLD), were used to prepare the BN films on a fused quartz substrate (one of the components of thermal protection systems on aerospace vehicles). The deposited films were characterized by a variety of techniques including X-ray diffraction, X-ray photoelectron spectroscopy, and scanning electron microscopy. The BN films were observed to be amorphous in nature, and a CVD-deposited film yielded a contact angle of 60 degrees with water, similar to the pellet BN samples investigated previously. This demonstrates that it is possible to use the bulk sample wetting properties as a guideline to determine the candidate waterproofing material for the TPS.
Author
Thermal Protection; Thin Films; Inorganic Coatings; Waterproofing; Vapor Deposition; Boron Nitrides; Pulsed Laser Deposition

19980211489 Computational Systems, Inc., Knoxville, TN USA
The Misapplication of 'Composite Correlation of Cleanliness Levels'
Garvey, Ray, Computational Systems, Inc., USA; Lin, Mong Ching, Computational Systems, Inc., USA; Mountain, John, Computational Systems, Inc., USA; 1998; 12p; In English
Report No.(s): AD-A347347; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Contamination control for hydraulics and lubricants is a proactive approach to achieve extended machine life. Particle counting is a proven contamination monitoring method and is an essential part of contamination control. Many particle counting standards have been developed and are in widespread use. Some include ISO 4406 code, particles per ml greater than 10 micron, gravimetric method (mg/L), MIL STD 1246a, NAS 1638 code, and SAE code (Disavowed). The table, "Composite Correlation of Cleanliness Levels," has been used in many referenced publications to show equivalent relationships between all of these standards. In its correct application, this table shows the equivalence between these standards when using air cleaner fine test dust (ACFTD) standard contaminant. A frequent misapplication of this chart is to assume (incorrectly) that it describes equivalence when testing used hydraulic and lubricant oil samples instead of ACFTD standard contaminant. This paper shows the extent to which particle count data collected from actual samples does not comply with this table. It shows how one can be led to incorrect condition monitoring analysis and wrong recommended actions by using this table to translate 'particles per ml greater than 10 microns' into ISO and NAS code levels. It shows the importance of actually counting particles at multiple sizes rather than assuming the size distribution of ACFTD standard contaminant.
DTIC
Cleanliness; Contamination; Service Life; Hydraulic Fluids; Lubricating Oils

19980211490 Computational Systems, Inc., Knoxville, TN USA
The Application of Time Resolved Dielectric Instruments to Air Force Ground Fleet Maintenance
Thompson, Stephanie, Computational Systems, Inc., USA; 1998; 5p; In English
Report No.(s): AD-A347346; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In 1993 the Military Equipment Evaluation Program (MEEP) located at Eglin Air Force Base, FL, evaluated a time resolved dielectric instrument for use in air force ground fleet maintenance applications. They identified this instrument as a useful device for what they termed bumper testing intended to measure oil quality before changing oil rather than simply changing oil based on calendar months or equipment usage (miles or hours). Since that time the instrument has been accepted and is in use at many US Air Force installations world wide. Typically an air base will have approximately 40 ground vehicles for every one flight vehicle. For example, Eglin has approximately 1200 ground vehicles supporting 30 fighting aircraft. The aircraft get oil analysis done very frequently. Until the time resolved dielectric instrument was made available, no oil analysis was performed on the

ground fleet. This paper describes the application, use and results achieved by using a multifunctional oil analyzer in the maintenance shops to determine oil conditions before taking maintenance actions.
DTIC
Lubricating Oils; Aircraft Maintenance; Dielectrics

19980211520 Army Research Lab., Aberdeen Proving Ground, MD USA
Modeling Ceramic Defeat Mechanisms and Variations in Ballistic Data ***Final Report, Oct. 1995 - Jan. 1997***
Rupert, Nevin L., Army Research Lab., USA; Grace, Fred I., Army Research Lab., USA; May 1998; 51p; In English
Report No.(s): AD-A347130; ARL-TR-1670; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Bi-element or layered targets have been used to obtain depth-of-penetration (DOP) data so that performance of ceramic materials under ballistic impact can be evaluated. While the data have been particularly useful for ranking ceramics as possible armor candidates, interpretation of the data has been difficult and little insight into the dynamics and mechanisms of the penetration process has been obtained from such data. Prior analytical work into the penetration mechanics of ceramics by the authors included two important factors (i.e., a dynamic target interaction resulting from pressure wave reflection at the interface between target elements and a time dependent damage mechanism describing the response of the ceramic material). In the present work, a 'size' effect, known to be associated with ceramic behavior, and the introduction of a third process zone have been included in the analysis to address a portion of the variations (scatter) in the DOP test data. The analysis now includes results of the weakest-link theory in terms of the Weibull distribution and measured parameters for Al2O3. Calculated results are compared with the original data and prior analysis to provide relationships between all three mechanisms and indicate the influence of the size effect on the data.
DTIC
Ceramics; Weibull Density Functions; Wave Reflection; Elastic Waves

19980211578 NASA Lewis Research Center, Cleveland, OH USA
Sintering and Creep Behavior of Plasma-Sprayed Zirconia and Hafnia Based Thermal Barrier Coatings
Zhu, Dongming, Ohio Aerospace Inst., USA; Miller, Robert A., NASA Lewis Research Center, USA; Jul. 1998; 20p; In English; 25th; Metallurgical Coatings and Thin Films, 27 Apr. - 1 May 1998, San Diego, CA, USA; Sponsored by American Vacuum Society, USA
Contract(s)/Grant(s): RTOP 505-23-2U
Report No.(s): NASA/TM-1998-208406; NAS 1.15:208406; E-11239; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The sintering and creep of plasma-sprayed ceramic thermal barrier coatings under high temperature conditions are complex phenomena. Changes in thermomechanical and thermophysical properties and in the stress response of these coating systems as a result of the sintering and creep processes are detrimental to coating thermal fatigue resistance and performance. In this paper, the sintering characteristics of ZrO2-8wt%y2O3, ZrO2-25wt%CeO2-2.5wt%Y2O3, ZrO2-6w%NiO- 9wt%Y2O3, ZrO2-6wt%Sc2O3-2wt%y2O3 and HfO2-27wt%y2O3 coating materials were investigated using dilatometry. It was found that the HfO2-Y2O3 and baseline ZrO2-Y2O3 exhibited the best sintering resistance, while the NiO-doped ZrO2-Y2O3 showed the highest shrinkage strain rates during the tests. Higher shrinkage strain rates of the coating materials were also observed when the specimens were tested in Ar+5%H2 as compared to in air. This phenomenon was attributed to an enhanced metal cation interstitial diffusion mechanism under the reducing conditions. It is proposed that increased chemical stability of coating materials will improve the material sintering resistance.
Author
Plasmas (Physics); Sprayed Coatings; Zirconium Oxides; Barrier Layers; Thermal Control Coatings; Thermophysical Properties

19980211581 South Carolina Univ., Dept. of Chemistry and Biochemisty, Columbia, SC USA
Synthesis of Polymeric Families with Highly Delocalized Electronic States for Electronic and Photonic Applications
Tour, James M., South Carolina Univ., USA; Jun. 18, 1998; 11p; In English
Contract(s)/Grant(s): N00014-96-1-0088
Report No.(s): AD-A347297; 96PR01257-00; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The program objective is to demonstrate new synthetic organometallic reactions which can be used to synthesize novel, well defined conjugated polymer systems for interesting electronic, photonic, and high performance materials applications.
DTIC
Electron States; Polymers; Chemistry; Synthesis (Chemistry)

19980211585 Pittsburgh Univ., Dept. of Chemistry, Pittsburgh, PA USA

Single Polymer Chain Elongation by Atomic Force Microscopy

Bemis, Jason E., Pittsburgh Univ., USA; Akhremitchev, Boris B., Pittsburgh Univ., USA; Walker, Gilbert C., Pittsburgh Univ., USA; Jan. 1998; 37p; In English

Contract(s)/Grant(s): N00014-96-1-0735

Report No.(s): AD-A349098; TR-98-4; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have investigated the elastic deformation of single polystyrene-b-poly-2-vinyl-pyridine chains from spun cast films by Atomic Force Microscopy (AFM). A non-linear elastic response is shown to be present hundreds of nanometers above the bulk surface. The length of the elastic response monotonically increases with molecular weight of the polymer. These non-linear elastic responses are fit to Worm Like Chain (WLC) and Freely Joined Chain (FJC) models giving persistence and Kuhn lengths of approximately 5A. The entropic models reveal that the polymer chains are stretched to 80-90% of their contour length before the attachment to the tip is ruptured.

DTIC

Microscopy; Elongation; Chains; Atomic Structure; Atomic Force Microscopy; Polystyrene

19980211621 Naval Surface Warfare Center, Coastal Warfare Systems Dept., Panama City, FL USA

Summary of Fy 97 Work on Multipore Suction Techniques

Mittleman, John, Naval Surface Warfare Center, USA; Oct. 1997; 11p; In English

Report No.(s): AD-A346254; CSS/TN-97/27; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Non-adhesive attachment systems are used by abalone, octopus, and other gastropods (shellfish) to attach and move securely over surfaces of virtually any condition or roughness using dozens or hundreds of small suction cups. This effort complements adhesive attachment research by trying to synthesize the abalone system, creating a nonadhesive alternative for attaching equipment to surfaces underwater. The proposed embodiment uses a urethane composite material basically formed as a honeycomb with flexible yet somewhat stiff walls with each pore filled with an extremely soft material. Embedded in the soft core of each honeycomb would be a strand of muscle wire (titanium nickel (Ti-Ni) alloy) that would pull a small vacuum under electrical stimulation. A further improvement that was proposed, should the basic idea prove%useful, would be to develop a smart system which would use a strain sensor embedded in each pore to detect vacuum. The system would control the suction of each pore by using a release/retry pump loop for those cells not holding a vacuum.

DTIC

Adhesion; Suction; Honeycomb Structures; Composite Materials; Surface Roughness; Urethanes; Octopuses

19980213232 Naval Postgraduate School, Monterey, CA USA

The Use of Rigid Polyurethane Foam as a Landmine Breaching Technique

Alba, Albert L., Naval Postgraduate School, USA; Dec. 1997; 75p; In English

Report No.(s): AD-A346255; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The results of a feasibility test using Rigid Polyurethane Foam (RPF) as an operational anti-personnel mine counter-mine technique are presented. RPF, at a given density and thickness, can withstand the explosive effects of anti-personnel blast mines and mitigate or neutralize the effects of surface laid anti-vehicular mines. A 12-inch thick, 4 pound per cubic foot foam block completely contained a 10 gram explosive charge of PETN while a 30-inch foam block with the same density contained a 30 gram charge. A 24-inch thick pad supported 50 passes of an M88A2 Recovery Vehicle, crushing the foam no more than 2-3 inches throughout the length of a 56 foot foam roadway. Underneath this roadway, simulated land mines set at 14 psi were not detonated by the passage of an M88A2 and a HMMWV. Our experiments indicate that RPF can provide additional traction in muddy conditions and set-off explosives connected to trip wires. The pressure and trafficability experiments were conducted at the Waterways Experiment Station, Vicksburg, MS in July-August 1997, and the explosive experiments were conducted at the Energetic Materials Research and Testing Center (EMRTC) of the New Mexico Institute of Mining and Technology, Socorro, NM in August and October 1997.

DTIC

Polyurethane Foam; Explosives; Recovery Vehicles; Mining

19980213276 Department of the Navy, Washington, DC USA

Epoxy Pipeline Composition and Method of Manufacture

Brady, Robert F., Inventor, Department of the Navy, USA; Adkins, James D., Inventor, Department of the Navy, USA; Jan. 13, 1998; 20p; In English

Patent Info.: Filed 26 Jun. 1996; US-Patent-Appl-SN-673638; US-Patent-5,707,702

Report No.(s): AD-D018976; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A cross-linked pipelining network polymer composition for the in situ rehabilitation of pipes is formed. The polymer composition comprises at least one liquid epoxy resin and an effective amount of a liquid curing agent blend comprising an aliphatic polyamine, an aliphatic imidazoline, and an aliphatic amidoamine. The polymer composition may further comprise a pigment, a diluent and/or a viscosity controlling agent.

DTIC

Pipelines; Polymers; Epoxy Resins; Crosslinking; Pipelining (Computers); Pipes (Tubes)

19980213293 Department of the Navy, Washington, DC USA

Bonding Method and the Resulting Article

Malotky, Lyle O., Inventor, Department of the Navy, USA; Pedersen, Marvin A., Inventor, Department of the Navy, USA; Spencer, Dana E., Inventor, Department of the Navy, USA; Nov. 18, 1997; 4p; In English; Supersedes US-Patent-Appl-SN-519468

Patent Info.: Filed 25 Oct. 1974; US-Patent-Appl-SN-519468; US-Patent-5,689,084

Report No.(s): AD-D018988; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A filler combined with a quick-setting adhesive such as a cyanoacrylate adhesive, or an anaerobic adhesive forms an adhesive composite having high compressive strength suitable for immobilizing a mechanical fuze.

DTIC

Bonding; Acrylates; Adhesives; Immobilization

19980213333 Department of the Navy, Washington, DC USA

Photoactivatable Polymers for Producing Patterned Biomolecular Assemblies

Conrad, David W., Inventor, Department of the Navy, USA; Charles, Paul T., Jr., Inventor, Department of the Navy, USA; Apr. 07, 1998; 15p; In English; Supersedes US-Patent-Appl-SN-428454, AD-D017506

Patent Info.: Filed 25 Apr. 1995; US-Patent-Appl-SN-428454; US-Patent-5,736,257

Report No.(s): AD-D018961; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The presently claimed invention is directed to novel biochips and a method for forming said biochips and novel photoactivatable compounds. 2.6-DOCA, 2-NOCA and LC-ASA Amine.

DTIC

Polymers; Inventions

19980214833 NASA Lewis Research Center, Cleveland, OH USA

Thermal Barrier Coating Workshop, 1997

Brindley, William J., Compiler, NASA Lewis Research Center, USA; Thermal Barrier Coating Workshop, 1997; May 1998; 191p; In English; Thermal Barrier Coating, 19-21 May 1997, Fort Mitchell, KY, USA; Sponsored by Air Force Office of Scientific Research, Bolling AFB, USA; Also announced as 19980214834 through 19980214849

Contract(s)/Grant(s): RTOP 523-21-13

Report No.(s): NASA/CP-1998-207429; E-11007; NAS 1.55:207429; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

This document contains papers from the 1997 Thermal Barrier Coatings Workshop, sponsored by the TBC Interagency Coordination Committee. The Workshop was held in Fort Mitchell, Kentucky, May 19-21, 1997. The papers cover the topics of heat transfer and conductivity of thermal barrier coatings, failure mechanisms and characterization of the coatings as well as characterization of coating deposition methods. Speakers included research, development and user groups in academia, industry and government.

Author

Thermal Control Coatings; Failure Modes; Thermal Conductivity; Vapor Deposition; Ceramic Coatings; Conferences

19980214834 Connecticut Univ., Inst. of Materials Science, Storrs, CT USA

Thermal Conductivity of Thermal Barrier Coatings

Klemens, P. G., Connecticut Univ., USA; Gell, M., Connecticut Univ., USA; Thermal Barrier Coating Workshop, 1997; May 1998, pp. 1-15; In English; Also announced as 19980214833; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

In the absence of significant high temperature structural materials development over the last ten years, thermal barrier coatings (TBCS) have played an increasingly important role in enhancing gas turbine engine durability and performance. The material almost universally used has been yttria stabilized zirconia (7YSZ). This ceramic has performed admirably as a TBC because of

its favorable combination of properties, including: low thermal conductivity, high thermal expansion coefficient, phase stability to 1400 C, and good erosion resistance. There is considerable interest in developing TBCs with even lower thermal conductivity to provide further improvements in engine performance. To assist in this effort, this paper will describe some of the fundamental concepts of thermal conduction and how thermal conductivity may be reduced by changes in microstructure and composition.
Derived from text
Thermal Control Coatings; Microstructure; Ceramic Coatings; Thermal Conductivity; Refractory Coatings; Yttria-Stabilized Zirconia

19980214835 NASA Lewis Research Center, Cleveland, OH USA
Analysis of Thermal Radiation Effects on Temperatures in Turbine Engine Thermal Barrier Coatings
Siegel, Robert, NASA Lewis Research Center, USA; Spuckler, Charles M., NASA Lewis Research Center, USA; Thermal Barrier Coating Workshop, 1997; May 1998, pp. 17-26; In English; Also announced as 19980214833; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Thermal barrier coatings are important, and in some instances a necessity, for high temperature applications such as combustor liners, and turbine vanes and rotating blades for current and advanced turbine engines. Some of the insulating materials used for coatings, such as zirconia that currently has widespread use, are partially transparent to thermal radiation. A translucent coating permits energy to be transported internally by radiation, thereby increasing the total energy transfer and acting like an increase in thermal conductivity. This degrades the insulating ability of the coating. Because of the strong dependence of radiant emission on temperature, internal radiative transfer effects are increased as temperatures are raised. Hence evaluating the significance of internal radiation is of importance as temperatures are increased to obtain higher efficiencies in advanced engines.
Derived from text
Thermal Control Coatings; Radiation Effects; Temperature Dependence; Radiative Heat Transfer

19980214836 TPRL, Inc., West Lafayette, IN USA
Thermal Conductivity Determination of Thermal Barrier Coatings
Taylor, R. E., TPRL, Inc., USA; Thermal Barrier Coating Workshop, 1997; May 1998, pp. 27-31; In English; Also announced as 19980214833; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Most determinations of the thermal conductivity of TBCs have been made using the laser flash method to measure diffusivity (alpha) and differential scanning calorimetry (DSC) to measure specific heat (C(sub p)). Bulk density (rho) values are calculated from sample geometry and mass. Thermal conductivity values are calculated as the product of these quantities, i.e. lambda = (alpha)(C(sub p))(rho). This approach enjoys the advantages of using small samples of simple shapes, ability to measure over wide temperature ranges rapidly (and hence being cost-effective) and enjoys a relatively high degree of accuracy when properly performed with suitable geometry samples. Computer programs which calculate the thermal diffusivity of one layer of a two-layer or three-layer composite from the half-time, t(sub 1/2), measured in the conventional manner by the flash technique have been developed.
Derived from text
Thermal Control Coatings; Thermal Conductivity; Computer Programs

19980214837 National Inst. of Standards and Technology, Materials Reliability Div., Boulder, CO USA
Thermal Conductivity of Functionally Graded Thermal Barrier Coatings
Slifka, Andrew J., National Inst. of Standards and Technology, USA; Filla, B. James, National Inst. of Standards and Technology, USA; Phelps, John M., National Inst. of Standards and Technology, USA; Thermal Barrier Coating Workshop, 1997; May 1998, pp. 33-39; In English; Also announced as 19980214833; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Functionally graded materials (FGMs) are being developed for high heat flux and large thermal gradient applications. The use of a compositional grading under high thermal load has been shown to reduce thermal stresses compared to a monolithic ceramic coating. Applications are found primarily in aerospace, where this type of thermal loading is encountered by nose caps, leading edges, and engines. The thermal properties of these coatings are needed for efficient design and development of thermal barrier and wear related systems. We have measured the thermal conductivity of two FGM coatings from 400 K to 1200 K using an absolute, steady-state technique. We did thermal conductivity testing only to 1200 K in order to remain below the sintering temperature of the coatings, which would have complicated interpretation of the results. One specimen is a 1.1 mm thick Ni2OCr - 8% yttria-stabilized zirconia (YSZ) FGM with a linear grading from metal to ceramic. The second coating is a 1.8 mm thick

NiCoCrAlY - 25% ceria- 2.5% yttria-stabilized zirconia (CYSZ) FGM, also with a linear grading from metal to ceramic. Both coatings were obtained from commercial sources and deposited on 410 stainless steel substrates.
Derived from text
Thermal Control Coatings; Thermal Conductivity; Yttria-Stabilized Zirconia; Ceramic Coatings; Cerium

19980214838 Pratt and Whitney Aircraft, West Palm Beach, FL USA
Development of Low Thermal Conductivity Thermal Barrier Coatings
Maloney, M. J., Pratt and Whitney Aircraft, USA; Achter, H. S., Pratt and Whitney Aircraft, USA; Barkalow, B. K., Pratt and Whitney Aircraft, USA; Thermal Barrier Coating Workshop, 1997; May 1998, pp. 41; In English; Also announced as 19980214833; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only

Thermal barrier coatings are currently being employed in the turbine section of gas turbine engines on blades to provide insulation from the hot flow path environment and to provide a 170 C increase in effective temperature capability. Turbine blade thermal barrier coatings typically utilize partially stabilized zirconia to provide thermal insulation. Under support from the NAVY, Pratt & Whitney has been evaluating the use of alternate ceramic compounds with improved thermal resistance over zirconia base systems. The use of low thermal conductivity thermal barrier coatings can have a significant impact on the performance of gas turbine engines in terms of increased efficiency and durability. Work is currently focused on development of a yttria-ceria thermal barrier coating processed by electron beam physical vapor deposition. Thermal resistance and performance of the ceria base thermal barrier coating relative to current systems will be discussed.
Derived from text
Thermal Control Coatings; Thermal Resistance; Thermal Conductivity; Yttria-Stabilized Zirconia; Ceramic Coatings; Cerium

19980214839 Pratt and Whitney Aircraft, East Hartford, CT USA
Degradation Modes of Thermal Barrier Coatings: Experiences in High Thrust Experimental Engines at Pratt and Whitney
Bose, S., Pratt and Whitney Aircraft, USA; Marcin, J. D., Pratt and Whitney Aircraft, USA; Thermal Barrier Coating Workshop, 1997; May 1998, pp. 43; In English; Also announced as 19980214833; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only

The gas path temperatures in the high pressure turbine section of today's high thrust engines far exceed the temperature capability of turbine materials. Thermal Barrier Coatings (TBC) in combination with innovative cooling schemes make it possible for the turbine components to survive. TBCs, consisting of a metallic bond coat and a thermally insulating ceramic top coat, are processed either by air plasma spray (APS) or Electron Beam Vapor Deposition (EB-PVD). The predominant degradation mode of TBCs is thermal spallation. In the EB-PVD system, failure generally occurs either within the thermally grown oxide (TGO) scale that forms at the ceramic - bond coat interface or at the TGO - bond coat interface. Oxidation, bond coat creep and other kinetic factors play varying roles in this spallation. Other degradation modes of lesser importance are impact damage and erosion. Examples of some of these degradation modes and their implications will be presented.
Author
Thermal Control Coatings; Spallation; Failure Modes; Thermal Degradation; Oxidation

19980214840 Harvard Univ., Cambridge, MA USA
Mechanism-Based Life Prediction Issues for Thermal Barrier Coatings
Evans, A. G., Harvard Univ., USA; Wang, J. S., Harvard Univ., USA; Mum, D., Harvard Univ., USA; Thermal Barrier Coating Workshop, 1997; May 1998, pp. 45-52; In English; Also announced as 19980214833; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Thermal barrier coatings (TBCs) are susceptible to spalling from superalloy substrates with an intermediate bond coat. The event occurs upon cooling from an exposure that causes a thermally grown oxide (TGO), typically alumina, to form at the TBC/bond coat interface. Moreover, thermal cycling reduces the exposure time needed to form spalls. The mechanisms are dependent upon the TBC deposition method. For electron-beam deposited (EBPVD) coatings having a columnar grain structure, the low in-plane modulus imparts sufficient strain tolerance that the failure comprises separation of the TGO from the bond coat. This occurs by formation and initial propagation of a separation along the interface, followed by deflection into and through the TBC. Elucidation of the mechanisms is contingent on an understanding of interface cracking in compressed film. Plasma spray deposited TBCs spall more readily by crack evolution within the oxide layers. The fracture properties of both the TGO and the TBC are involved. The compressive stress in the alumina is crucially important. It is the primary source for the energy release rate that motivates cracking and spalling. Recent measurements of this stress provide insight. The growth stresses, while relatively small, 0.2-1 GPa (dependent on composition), nevertheless dictate the interface separation dynamics. These stresses can be partially

relieved by creep or wrinkling. The thermal expansion mismatch stresses are much larger, of order 3-5 GPa, dependent on the alloy. They dominate crack growth and spalling. The time and cycle dependence of these stresses, combined with the fracture toughnesses of the oxides and the interfaces, underlie a mechanistic interpretation of the life. Measurements of these properties made in conjunction with mechanics solutions for the prospective crack trajectories comprise the principal content of a mechanism-based life prediction methodology. Fracture measurements made on interfaces produced by diffusion bonding provide relevant background. The Ni/alumina interface is susceptible to stress corrosion caused by moisture, with a relatively low effective toughness, gamma(sub i) approx. = 10 J/sq m. Segregation to this interface, particularly of C, activates the mechanism. Alloying with a small amount of Cr eliminates the problem. It enables the interface to be so tough that cracks blunt, causing fractures to extend in the oxide, rather than along the interface. This effect has been attributed to the ability of Cr to getter the C as Cr carbides, thereby inhibiting its segregation to the interface. S segregation to the TGO/bond coat interface may have an analagous (perhaps, even more profound) consequence for interface toughness. TBCs have anisotropic fracture properties. Measurements on plasma spray TBCs indicate an exceptionally low toughness on planes parallel to the interface K(sub c) approx. = .2 MPam(exp 1/2), caused by deposition defects. This compares with K(sub c) approx. = 2 MPam(exp 1/2) for bulk cubic zirconia. There are no data for EBPVD coatings.
Derived from text
Thermal Control Coatings; Spalling; Solid-Solid Interfaces; Aluminum Oxides; Vapor Deposition; Temperature Effects; Failure Modes

19980214841 NASA Lewis Research Center, Cleveland, OH USA
Modeling Oxidation Induced Stresses in Thermal Barrier Coatings
Ferguson, B. L., Deformation Control Technology, Inc., USA; Freborg, A. M., Deformation Control Technology, Inc., USA; Petrus, G. J., Deformation Control Technology, Inc., USA; Brindley, William J., NASA Lewis Research Center, USA; Thermal Barrier Coating Workshop, 1997; May 1998, pp. 53-71; In English; Also announced as 19980214833; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

The use of thermal barrier coatings (TBC's) in gas turbines has increased dramatically in recent years, due mainly to the need for component protection from ever increasing service temperatures. Oxidation of the bond coat has been identified as an important contributing factor to spallation of the ceramic top coat during service. Additional variables found to influence TBC thermal cycle life include bond coat coefficient of thermal expansion, creep behavior of both the ceramic and bond coat layers, and modulus of elasticity. The purpose of this work was to characterize the effects of oxidation on the stress states within the TBC system, as well as to examine the interaction of oxidation with other factors affecting TBC life.
Author
Thermal Control Coatings; Spallation; Ceramic Coatings; Oxidation; Thermal Stresses; Solid-Solid Interfaces; Mathematical Models

19980214842 General Electric Co., Aircraft Engines, Cincinnati, OH USA
Influence of Cycle Strain on PVD TBC Life
Wright, P. Kennard, General Electric Co., USA; Thermal Barrier Coating Workshop, 1997; May 1998, pp. 73-81; In English; Also announced as 19980214833; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Thermal barrier coatings are increasing in application in turbine engines because of their ability to reduce the temperature and extend the life of air cooled parts. However, if the coating does not remain adherent to the part, but spalls off, then its function is lost. As turbine designers grow increasingly reliant on TBC's, the consequence of such spalling increases. The factors contributing to spalling have been studied for many years, and significant efforts have been directed at developing quantitative models for predicting when spalling is likely to occur. These models involve the oxidation which occurs at the interface between the ceramic and its bond coat, and the stress or strain developed in the coating from several sources. However, the effect of such strains has never been directly quantified, but only inferred from thermal analyses of laboratory specimens tested without external stress. The objective of this study was to directly determine the effect of strain on life of an EB-PVD thermal barrier coating so that strain effects could be incorporated into coating life models.
Author
Thermal Control Coatings; Oxidation; Spalling; Mathematical Models; Ceramic Coatings; Fatigue (Materials)

19980214843 United Technologies Research Center, East Hartford, CT USA
Industrial Environment-Hot Corrosion-TBC-Interactions
Bornstein, Norman S., United Technologies Research Center, USA; Allen, William P., United Technologies Research Center, USA; Trubeljia, Mladen, Pratt and Whitney Aircraft, USA; Nissley, David M., Pratt and Whitney Aircraft, USA; Thermal Barrier

Coating Workshop, 1997; May 1998, pp. 83-97; In English; Also announced as 19980214833; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

Thermal barrier coatings afford protection and allow turbine components to operate more efficiently. Historically the ranking of coating systems is based upon accelerated laboratory tests. The approach taken is that the environment and/or exposure conditions are made more aggressive than that expected in service. Acceptance implies a complete understanding of the processes that govern materials behavior. Without this knowledge there is no basis for prediction and no means for assessing or limiting the uncertainty of a prediction. This paper describes the strengths and weakness of the current test procedures, and outlines a procedure that duplicates field results.

Author

Thermal Control Coatings; Hot Corrosion; Corrosion Tests; Salts

19980214844 General Electric Co., Aircraft Engines, Evendale, OH USA

The Effect of Alumina Phase Transformations on Thermal Barrier Coating Durability

Schaeffer, Jon C., General Electric Co., USA; Thermal Barrier Coating Workshop, 1997; May 1998, pp. 99-108; In English; Also announced as 19980214833; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

The typical TBC system has a superalloy substrate, an alumina (Al2O3) forming bond coat and a 6-8 weight % yttria-partially stabilized zirconia ceramic top coat. Thermal barrier coating (TBC) adhesion and durability is dependent upon the characteristics of the interface to which it is bound. Surface preparation controls the morphology of the interface and bond coat chemistry combined with pretreatment determine the oxide that forms. The initial interface is mostly a thin alumina scale that forms during heat treatments and TBC deposition. Reviews are available in the literature concerning the microstructure, growth and adhesion of alumina scales on compositions representing aluminide and overlay bond coats. One interesting aspect is the formation of transitional alumina scales like theta, gamma and delta on model bond coat compositions after exposures at relatively low temperatures and times. In a study on single crystal NiAl, low temperature oxidation at 800 C produced delta and gamma-alumina scales with epitaxial relationships to the Beta-NiAl substrate. Final transformation of these scales to alpha-alumina occurs after 3-5 Hr at 1100 C in air. The gamma to alpha-alumina transformation has a delta V of -14.3% resulting in cracking and residual tensile stresses. The impact of the phase transformation on TBC systems has not been studied, however, pretreatments prior to ceramic deposition that undoubtedly stabilize the alumina scale have been patented and reported. This study shows that alumina transformations do occur during normal TBC processing and may impact durability as measured by a laboratory thermal cycle test. Additionally the study indicates that alpha-alumina stabilization should be considered prior to TBC deposition.

Author

Thermal Control Coatings; Phase Transformations; Aluminum Oxides; Durability; Solid-Solid Interfaces; Thermal Cycling Tests

19980214845 Oak Ridge National Lab., Metals and Ceramics Div., TN USA

Substrate and Bond Coat Compositions: Factors Affecting Alumina Scale Adhesion

Pint, Bruce, Oak Ridge National Lab., USA; Wright, Ian, Oak Ridge National Lab., USA; Lee, Woo, Oak Ridge National Lab., USA; Zhang, Ying, Oak Ridge National Lab., USA; Pruessner, Karin, Oak Ridge National Lab., USA; Alexander, Kathleen, Oak Ridge National Lab., USA; Thermal Barrier Coating Workshop, 1997; May 1998, pp. 109-125; In English; Also announced as 19980214833

Contract(s)/Grant(s): DE-AC05-96OR-22464; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

Thermally-grown oxide scales that form beneath ZrO2 top coats play an important role in determining the performance of a thermal barrier coating (TBC). Numerous factors, including the composition of both the alloy substrate and the bond coat, affect adhesion of the alpha-Al203 scale to the metal substrate. In order to study the problem of oxidation-related failure, a model substrate was selected: cast, Zr-doped Beta-NiAl. With the addition of a reactive element (RE) like Zr, Beta-NiAl is one of the most highly oxidation-resistant alumina-forming alloys. Beta-NiAl+Zr substrates were coated with a 125 gm thick, electron beam, physical vapor deposited (EB-PVD), Y2O3-stabilized ZrO2 (YSZ) coating by GE Aircraft Engines and furnace cycled at 1150 C (1h cycles at temperature) and 1200 C (2h cycles at temperature). The coating lifetime is > 1650 cycles at 1150 C and > 275 cycles at 1200 C. Neither coating has failed to date, except for chipping at the edge of the coupons. A similar-thickness, EB-PVD YSZ coating on Rene N5 (plus Pt aluminide bond coat) exhibited failure at 1150 C after 600 cycles and after 106 cycles at 1200 C. These results indicate that a significant improvement in TBC lifetime (>=3 fold) may be garnered from having a more oxidation-resistant substrate beneath the YSZ coating.

Derived from text

Thermal Control Coatings; Solid-Solid Interfaces; Aluminum Oxides; Substrates; Bonded Joints; Thermal Cycling Tests; Oxidation

19980214846 Westinghouse Electric Corp., Pittsburgh, PA USA

Developing NDE Methods for Coated Combustion Turbine Components

Zombo, Paul J., Westinghouse Electric Corp., USA; Thermal Barrier Coating Workshop, 1997; May 1998, pp. 127-137; In English; Also announced as 19980214833; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

Ever-demanding performance improvements on the land based combustion turbine engines has increased combustion temperatures and placed a great demand on turbine blades. Coating systems have been developed to further protect the cooled blade base material from oxidation and creep damage. The coating systems discussed within this paper are comprised of a metallic coating, or a combination of metallic bond coat and a ceramic top coat. These coatings have a finite life and as the operating conditions increase in severity, the life of the coating decreases. As the coating deteriorates the potential for substrate degradation increases. After a predetermined operating time, the blades are stripped, inspected and recoated for further use. This paper highlights the training sets manufactured as well as the comparison of a variety of NDE results from examination of the training set.
Derived from text

Turbine Blades; Nondestructive Tests; Ultrasonic Flaw Detection; Damage Assessment; Thermal Control Coatings

19980214847 NASA Lewis Research Center, Cleveland, OH USA

Investigation of Thermal High Cycle and Low Cycle Fatigue Mechanisms of Thick Thermal Barrier Coatings

Zhu, Dong-Ming, National Academy of Sciences - National Research Council, USA; Miller, Robert A., NASA Lewis Research Center, USA; Thermal Barrier Coating Workshop, 1997; May 1998, pp. 139-150; In English; Also announced as 19980214833; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

Ceramic thermal barrier coatings have attracted increased attention for diesel engine applications. The advantages of using the ceramic coatings include a potential increase in efficiency and power density and a decrease in maintenance cost. Zirconia-based ceramics are the most important coating materials for such applications because of their low thermal conductivity, relatively high thermal expansivity and excellent mechanical properties. However, durability of thick thermal barrier coatings (TBCS) under severe temperature cycling encountered in engine conditions, remains a major question. The thermal transients associated with the start/stop and no-load/full-load engine cycle, and with the in-cylinder combustion process, generate thermal low cycle fatigue (LCF) and thermal high cycle fatigue (HCF) in the coating system. Therefore, the failure mechanisms of thick TBCs are expected to be quite different from those of thin TBCs under these temperature transients. The coating failure is related not only to thermal expansion mismatch and oxidation of the bond coats and substrates, but also to the steep thermal stress gradients induced in the coating systems. Although it has been reported that stresses generated by thermal transients can initiate surface and interface cracks in a coating system, the mechanisms of the crack propagation and of coating failure under the complex LCF and HCF conditions are still not understood. In this paper, the thermal fatigue behavior of an yttria partially stabilized zirconia coating system under simulated LCF and HCF engine conditions is investigated. The effects of LCF and HCF on surface crack initiation and propagation are also discussed.
Author

Thermal Control Coatings; Ceramic Coatings; Yttria-Stabilized Zirconia; Thermal Cycling Tests; Thermal Fatigue; Fatigue Tests

19980214848 General Electric Co., Corporate Research and Development, Schenectady, NY USA

Intelligent Processing of Materials for Thermal Barrier Coatings

Lau, Y. C., General Electric Co., USA; Johnson, Curtis A., General Electric Co., USA; Gray, Dennis M., General Electric Co., USA; Houpt, Paul, General Electric Co., USA; Penney, Murray, General Electric Co., USA; Wang, H. P., General Electric Co., USA; Thermal Barrier Coating Workshop, 1997; May 1998, pp. 151-155; In English; Also announced as 19980214833
Contract(s)/Grant(s): NIST-70NANB5H1132; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Advanced land-based gas turbine performance is highly dependent on operating or firing temperatures, which has increased rapidly in recent years because of market needs and technology advances. High operating temperatures require improved material performance throughout the turbine hot sections. To meet this goal, state-of-the-art superalloy technology must be complemented with high-performance thermal barrier coatings (TBCs) with improved capabilities including maximum surface temperature, temperature gradient, life and reliability. Thermal barrier coatings are currently applied to many land-based turbine components by air plasma spray process. The standard air plasma spray process is an open-loop process with no feedback of the process and coating conditions during deposition. Thus on-line disturbances and the continuous wearing of the torch hardware during deposition may adversely affect the coating quality and create significant part-to-part, operator-to-operator and booth-to-booth variations. As a result, these coatings may not have the consistent quality and durability needed. The objective of this work is to develop a more knowledge-based and data-intensive ”intelligent process” for air plasma spray that will improve the reproducibility, quality and reliability of TBCs, thus allowing the potential payoffs of TBCs, such as increased efficiency, reduced maintenance, and lower

emission, to be optimized in future turbine designs. This ”intelligent process” must also be capable of scaleup to industrial manufacturing operations.
Author
Thermal Control Coatings; Plasma Spraying; Knowledge Based Systems

19980214849 General Electric Co., Corporate Research and Development, Schenectady, NY USA
Dynamic Model for Simulation of Heat Transfer, Vaporization, Vapor Transport and Deposition in EB-PVD Process
Azad, Farzin H., General Electric Co., USA; Thermal Barrier Coating Workshop, 1997; May 1998, pp. 157-169; In English; Also announced as 19980214833
Contract(s)/Grant(s): MDA972-95-3-0039; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

The intelligent processing of materials (IPM) concept involves the integrated use of process models, sensors and control systems to achieve reproducible manufacturing processes and increased product quality. Detailed models provide in-depth process understanding by enabling extensive exploration of the process parameter space, but require large computation time and resources. The simplified or reduced-order models capture the key dynamics of the system and are suitable for control algorithm design and real-time implementation. These models are typically based on a combination of simplified process physics and selected empirical data. This paper describes a reduced-order model for dynamic simulation of heat transfer, vaporization, vapor transport, and deposition in an electron beam physical vapor deposition (EB-PVD) process for thermal barrier coating production.
Author
Dynamic Models; Thermal Control Coatings; Computerized Simulation; Process Control (Industry); Electron Beams; Vapor Deposition; Knowledge Based Systems

19980214894 Department of the Navy, Washington, DC USA
Inter-Level Dielectrics with Low Dielectric Constants
Buckley, Leonard J., Inventor, Department of the Navy, USA; Snow, Arthur W., Inventor, Department of the Navy, USA; Griffith, James R., Inventor, Department of the Navy, USA; Ray, Mark, Inventor, Department of the Navy, USA; Mar. 31, 1998; 8p; In English; Supersedes US-Patent-Appl-SN-810501
Patent Info.: Filed 28 Feb. 1997; US-Patent-Appl-SN-810501; US-Patent-5,733,606
Report No.(s): AD-D019002; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A metallization is coated with a network polymer. The network polymer may he either a cross-linked polyfluorinated polyallylether-polyhydromethylsiloxane copolymer or a network polymer formed from cross-linked fluoromethylene cyanate ester monomers. These polymer networks are resistant to the diffusion of a metallization, such as copper, therethrough.
DTIC
Networks; Polymers; Metallizing; Constants; Dielectrics; Permittivity

19980214898 Central Inst. of Aviation Motors, Quality Certification Centre, Moscow, Russia
Development of Methods and Experimental Investigation of Ceramic, Carbon-Carbon and Other Composite Materials Structural Strength at Ultra-High Temperature *Final Report*
Nozhnitskiy, Y. A., Central Inst. of Aviation Motors, Russia; Fishgoyt, A. V., Central Inst. of Aviation Motors, Russia; Fedina, Y. A., Central Inst. of Aviation Motors, Russia; Demidov, A. G., Central Inst. of Aviation Motors, Russia; Rozanov, M. A., Central Inst. of Aviation Motors, Russia; Jan. 1998; 27p; In English
Report No.(s): AD-A349444; EOARD-SPC-97-4019; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Quality Certification Centre as follows: The contractor will investigate ceramic carbon-carbon and other composite materials to determine structural strength at ultra-high temperatures for various aerospace applications.
DTIC
Ceramics; Carbon Compounds; Procedures; Experimentation; High Temperature

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PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

19980210971 Prins Maurits Lab. TNO, Rijswijk, Netherlands
A Stand-Off Test to Investigate the Ignitability of Propellants/Pyrotechnics and the Ignition Capacity of Igniters ***Final Report***
vanderMeer, B. J., Prins Maurits Lab. TNO, Netherlands; Jan. 1998; 13p; In English
Contract(s)/Grant(s): A95KLu425; TNO Proj. 221495322
Report No.(s): TD97-0449; TNO-PML-1997-A90; Copyright; Avail: Issuing Activity (Prins Maurits Lab., PO Box 45, 2280 AA Rijswijk, The Netherlands); US Sales Only, Hardcopy, Microfiche

In many munition articles igniters are used to initiate a train of effects, which finally result in phenomena like burning, detonation, a light flash, etc. Each step in this initiation train has equal importance for the final intended functioning. It is therefore important that each component of the munition article has sufficient capacity to initiate its successor (the acceptor) and that each successor can be initiated by its predecessor (the donor). In this report, a so called stand-off test set-up is described to investigate the interrelation of donor ignition capacity and the acceptor ignitability. The construction is described together with the test experiments. The test-sup has already been used satisfyingly to investigate the ignition capacity and ignitability of flare components. Author
Propellants; Combustion; Ignition; Performance Tests

19980211003 Department of the Navy, Washington, DC USA
Fuel System Icing Inhibitor and Deicing Composition
Mushrush, George W., Inventor, Department of the Navy, USA; Hardy, Dennis, Inventor, Department of the Navy, USA; Jan. 06, 1998; 9p; In English; Supersedes US-Patent-Appl-SN-655789, AD-D018214
Patent Info.: Filed 31 May 1996; US-Patent-Appl-SN-655789; US-Patent-5,705,087
Report No.(s): AD-D018911; No Copyright; Avail: US Patent and Trademark Office, Microfiche

This invention pertains to hydrocarbon fuel composition and deicing composition prepared with a compound selected from the group consisting of acetates. ketals. esters. derivatives thereof and mixtures thereof; and a process for deicing a substrate using the noted deicing composition.
DTIC
Fuel Systems; Ice Formation; Deicing; Inhibitors; Hydrocarbon Fuels; Deicers; Concentration (Composition)

19980211333 Swedish Transport and Communications Research Board, Stockholm, Sweden
An introductory study of multifunctional catalysts for ethanol and biogas vehicles
Pettersson, L. J., Royal Inst. of Tech., Sweden; Wahlberg, A. M., Royal Inst. of Tech., Sweden; Jaeraas, S. G., Royal Inst. of Tech., Sweden; Mar. 1998; ISSN 1104-2621; 26p; In English
Report No.(s): KFB-98-12; DE98-750734; ISBN 91-88868-85-0; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The long-term goal for the project is to develop highly efficient exhaust gas catalysts for heavy-duty vehicles fuelled by bio-based motor fuels operating in urban traffic. In this report an experimental study of catalytic oxidation of ethanol in a laboratory flow reactor is presented. The miniature catalyst samples consisted of monolithic cordierite substrates onto which various combinations of washcoat material and active material were applied. The experimental conditions were chosen in order to simulate the composition of the exhaust from a diesel engine fuelled by neat ethanol. A series of precious metal-based catalysts has been tested where different metal loadings and different complex washcoat compositions have been evaluated. Earlier studies have been concentrated on model washcoats such as alumina, ceria, silica, and titania (see KFB Report 1997:40). The choice of materials for the complex washcoats is based on the results from these experiments. One of the catalysts with the advanced washcoat Z exhibits lower light-off temperatures (T(sub 50)) for ethanol oxidation than the corresponding catalysts with washcoat X. The by-product formation shows a more complex picture. A number of parallel and consecutive reactions occur simultaneously in the reactor, where formation of acetaldehyde is by far the most common. Generally, the formation of acetaldehyde follows the conversion of ethanol, so that the catalysts with the lowest light-off temperature also form most acetaldehyde. If the peak for acetaldehyde

formation can be shifted towards 150 deg C or temperatures below, this means that the acetaldehyde formation will not occur in practical fleet operation, since this is outside the normal exhaust temperature of the engine.
DOE
Aluminum Oxides; Exhaust Emission; Ethyl Alcohol; By-Products

19980211401 New Energy and Industrial Technology Development Organization, Tokyo, Japan
Demonstration technology development of new hydrogen energy ***Shinsuiso energy jissho gijutsu kaihatsu***
Mar. 1997; 219p; In Japanese
Report No.(s): NHE-9301; DE98-745373; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A phenomenon of excess heat generation through the electrolysis of heavy water using palladium metals as electrode can be recognized as new hydrogen energy. Its mechanism has been investigated for four years since FY 1993. In FY 1993, the New Hydrogen Energy Demonstration Research Center and the New Hydrogen Energy Demonstration Laboratory were organized, and the research was initiated. For the excess heat generation demonstration model tests, two types of electrolysis experimental units were constructed, and the Pd/D-based electrolysis experiments were initiated. For the measurements of excess heat using an open type electrolysis cell, there were rather large errors ranging from -13% to +7%. It is necessary to improve the accuracy. For the measurements using a fuel cell type electrolysis cell, generation of the excess heat ranging from 0% to 6% was observed. For the validity of this, it is required to confirm the long-term stability of calibration and cell components. For the correlation between the increase in absorbing rate and the generation of excess heat, results of 2 to 3% lower were obtained.
DOE
Energy Technology; Heavy Water; Hydrogen; Palladium; Calibrating; Electrolysis

19980211507 Technical Univ. of Denmark, Inst. for Energiteknik, Lyngby, Denmark
High pressure injection of dimethyl ether
Glensvig, M., Technical Univ. of Denmark, Denmark; Sorenson, S. C., Technical Univ. of Denmark, Denmark; Abata, D. L., Technical Univ. of Denmark, Denmark; Aug. 1997; 41p; In English; Sponsored by Trafikpule 95
Report No.(s): DTU-ET-EO-97-01; DE98-726253; ISBN 87-7475-179-4; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The purpose of this investigation was to achieve a better understanding of the fundamental spray behavior of DME (Dimenthyl Ether) using a standard diesel pump with pintle and hole nozzles. Fundamental spray behavior was characterized by determining fuel spray penetration and angle, atomization and evaporation. The influences of opening pressure, nozzle geometry and ambient pressure above and below the critical pressure of the fuel on the spray behavior were investigated. The influence of opening pressures on the spray characteristics for the hole nozzle was investigated. The results showed that for opening pressures of 120 bar and 180 bar the spray has a similar appearance. For the higher opening pressure (200 bar and 240 bar), the initial spray breaks up very rapidly giving a high initial spray angle. The opening pressure had little influence on spray penetration. The spray angle later in the injection increased as the opening pressure was decreased. Above the critical pressure, the spray from the hole nozzle had a more irregular shape. Penetration decreased and the spray angle increased above the critical pressure. Three pintle nozzles with different geometries and opening pressures were tested. The appearance of the three sprays were very similar. The sprays seemed to be more sharply pointed as the nozzle hole angle decreased. The nozzle with the 4 deg. hole nozzle angle and an opening pressure of 280 bar had the highest penetration and highest initial spray angle. The pintle nozzle with the 12 deg. hole nozzle angle and opening pressure of approx. 450 bar was tested above the critical ambient pressure. Penetration was very similar for injection above and below the critical ambient pressure, while the spray angle decreased for the spray above the critical ambient pressure.
DOE
High Pressure; Spray Characteristics; Fuel Sprays; Methyl Compounds; Fuel Injection; Diethyl Ether

19980211681 New Energy and Industrial Technology Development Organization, Tokyo, Japan
International Clean Energy System Using Hydrogen Conversion (WE-NET), 2, Research study on promotion of international cooperation (standardization of hydrogen energy technology) ***Suiso riyo kokusai clean energy system gijutsu (WE-NET), 2, Kokusai kyoryoku suishin no tame no chosa kento (suiso energy gijutsu hyojunka ni kansuru chosa kento)***
Mar. 1997; 155p; In Japanese
Report No.(s): NEDO-WE-NET-962(2); DE98-745403; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This paper describes the basic study on standardization of hydrogen energy technology, and the research study on ISO/TC197 in fiscal 1996. As a part of the WE-NET project, the subtask 2 aims at preparation of standards necessary for practical use and promotion. Developmental states in every field of hydrogen energy technologies, current states of domestic/overseas related standards and laws, and needs and issues of standardization were surveyed. In particular, the needs and issues were clarified in relation to existing standards and laws from the viewpoint of specific hydrogen property. ISO/TC197 was established in 1989 for standardization of the systems and equipment for production, storage, transport, measurement and utilization of hydrogen energy. Four working groups are in action for the supply system and tank of liquid hydrogen fuel for automobiles, the container and ship for complex transport of liquid hydrogen, the specifications of hydrogen products for energy, and the hydrogen supply facility for airports. The draft international standards were proposed to the international conference in 1996.
DOE
Energy Technology; Clean Energy; Hydrogen Fuels; Automobiles

19980211685 New Energy and Industrial Technology Development Organization, Tokyo, Japan
International Clean Energy System Using Hydrogen Conversion (WE-NET), 4, Development of hydrogen production technology ***Suiso riyo kokusai clean energy system gijutsu (WE-NET), 4, Suiso seizo gijutsu no kaihatsu***
Mar. 1997; 299p; In Japanese
Report No.(s): NEDO-WE-NET-964; DE98-745408; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This paper describes development of hydrogen production technology as a part of the WE-NET project. For the solid polymer water electrolysis method higher in efficiency and lower in cost than the previous methods, 5 companies have developed element technologies for improving electrolysis cells and synthesis technologies of hot solid polymer electrolyte based on each proper catalyst electrode production method. In fiscal 1996, the initial study on large-scale systems by middle laboratory cells was made as well as improvement of electrolysis performance by small laboratory cells and endurance tests. Among the previous methods such as a hot press method (bonding of an ion exchange membrane to an electrode), an electroless plating method (preparation of porous surface onto a membrane electrode assembly), a zero gap method (preparation of high-efficiency high-current density cells), and a sintered porous electrode method (carrying of the mixture of catalytic powder and ion exchange resin-dissipated solution onto sintered metallic porous electrode surface), the former two methods were adopted for development of bench-scale cells as effective promising methods.
DOE
Clean Energy; Electrolysis; Solid Electrolytes; Energy Technology; Hydrogen Fuels; Hydrogen Production; Electrodes; Electrolytic Cells; Polymers

19980211686 New Energy and Industrial Technology Development Organization, Tokyo, Japan
International Clean Energy system Using Hydrogen Conversion (WE-NET), 5, Development of hydrogen transport/storage technology (development of large scale hydrogen liquefaction facility) ***Suiso riyo kokusai clean energy system gijutsu (WE-NET), 5, Suiso yuso chozo gijutsu no kaihatsu (ogata suiso ekika setsubi no kaihatsu)***
Mar. 1997; 47p; In Japanese
Report No.(s): NEDO-WE-NET-9651; DE98-745409; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

As a part of the WE-NET project, the basic technology necessary for large-scale hydrogen liquefaction facilities was studied. The process efficiency over 40% was targeted, and the plant cost was evaluated by complexity of the liquefaction process. Since the recycling line consumes a large amount of gas, the cost and supply method of gas were evaluated. The refrigerant cost for open inspection and leakage refilling was also estimated. Since the stage of centrifugal compressors decreases with an increase in average gas molecular weight followed by increase in compression ratio, the compressor was evaluated by average molecular weight. The expansion turbine was also evaluated by the same way. The heat exchanger was evaluated by volumetric flow balance. Since the liquefaction line uses combustible hydrogen, the safety of the recycling line was evaluated by combustibility of hydrogen. Five liquefaction processes such as hydrogen Claude, helium Brayton, neon Brayton, mixed refrigerant and nelium Brayton cycles were compared. Based on the relative evaluation result, the former two cycles were selected for the future precise study.
DOE
Clean Energy; Hydrogen Fuels; Liquefaction; Refrigerants; Energy Technology

19980211687 New Energy and Industrial Technology Development Organization, Tokyo, Japan
International Clean Energy System Using Hydrogen Conversion (WE-NET), 5, Development of hydrogen transport/storage technology (development of tanker for liquid hydrogen) ***Suiso riyo kokusai clean energy system gijutsu (WE-NET), 5, Suiso yuso chozo gijutsu no kaihatsu (ekitai suiso yuso tanker no kaihatsu)***
Mar. 1997; 102p; In Japanese
Report No.(s): NEDO-WE-NET9652; DE98-745410; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

As a part of the WE-NET project, the tanker for liquid hydrogen transport was studied. In fiscal 1996, some experiments and numerical analyses were proposed which are necessary to solve technological issues extracted in fiscal 1995 for heat insulation structure. The issue was roughly classified into vacuum and non-vacuum insulation, and their basic functions and required performance were arranged. Boil-off rate of 0.2-0.4%/d was targeted. The insulation system which applies polyurethane form (PUF) to tank surfaces and injects atmospheric N2 gas into the surrounding hold space, could achieve the targeted insulation performance by PUF of 1m in thickness. The system of vacuum panel insulation and atmospheric N2 gas injection into a hold space required the panel of 500mm in thickness because of the large effect of metallic outer panel material. The system of vacuum hold and PUF panels was faced with the essential issue for realizing and maintaining vacuum hold. The super insulation system featured by layered insulation materials and vacuum layer spaces was also strongly affected by degree of vacuum.
DOE
Clean Energy; Polyurethane Resins; Liquid Hydrogen; Hydrogen Fuels; Fuel Tanks

19980211688 New Energy and Industrial Technology Development Organization, Tokyo, Japan
International Clean Energy System Using Hydrogen Conversion (WE-NET), 5, Development of hydrogen transport/storage technology (development of storage facility for liquid hydrogen) ***Suiso riyo kokusai clean energy system gijutsu (WE-NET), 5, Suiso yuso chozo gijutsu no kaihatsu (ekitai suiso chozo setsubi no kaihatsu)***
Mar. 1997; 158p; In Japanese
Report No.(s): NEDO-WE-NET9653; DE98-745411; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

As a part of the WE-NET project, the storage facility for a large amount of liquid hydrogen (LH) was studied. Gasification loss caused by heat input of LH delivery pumps was studied for liquefaction and power generation bases assuming an pump efficiency of 70%, and the total heat and mass balance such as interface conditions for calculating the amount of boil-off gas was reviewed. The target storage capacity of 50,000 cu m was reasonable, however, the performance of loading arms should be examined. The capacity around 5,000 cu m of coastal localized bases was reasonable for control delivery loss caused by coastal tanker or LH container system to 2.6%. The capacity of 500 cu m was suitable for inland bases, resulting in the loss of 1.2%. The concept design of the storage tank of 50,000 cu m extracted confirmation of low-temperature characteristics of adiabatic materials and structures, and development of leakage inspection technology and vacuum holding technology as issues. The concept design of the underground storage tank showed that the material specifications for LNG ones are applicable to it by using proper adiabatic structures.
DOE
Clean Energy; Liquid Hydrogen; Storage Tanks; Hydrogen Fuels; Liquefaction; Gasification; Energy Technology

19980211689 New Energy and Industrial Technology Development Organization, Tokyo, Japan
Worldwide clean energy system technology using hydrogen (WE-NET), 5, Development of hydrogen transfer and storage technology (development of various common equipment) ***Suiso riyo kokusai clean energy system gijutsu (WE-NET), 5, Suiso yuso chozo gijutsu no kaihatsu (kakushu kyotsu kikirui no kaihatsu)***
Mar. 1997; 109p; In Japanese
Report No.(s): NEDO-WE-NET9654; DE98-745412; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This report describes large pumps for liquid hydrogen, large-size vacuum-insulated tubes, valves for liquid hydrogen, and instrumentation equipment. In the WE-NET Project, large pumps for liquid hydrogen are to be used for feeding pressurized liquid hydrogen to the combustors in power generative facilities as well as transferring large amounts of liquid hydrogen in liquefying facilities, and to or from tankers, etc. As a result of the examination, axial flow pump and mixed flow pump are to be applied to the large pumps, and centrifugal pump is to be applied to the pressurized pump. A vertical shaft wet motor pump which is directly connected to wound-rotor induction motor has been adopted as a basic specification. For the large-size vacuum-insulated tubes, examination has been conducted with the emphasis on method of relaxing the thermal stress from the viewpoint of transferring the liquid hydrogen at large flow-rate and cryogenic temperature in a stable and safe manner over long distances. It has been shown

that the development of marine loading arm is indispensable. For the valves for liquid hydrogen, a ball valve and a butterfly valve, which are operated pneumatically, have been investigated. For the instrumentation equipment, level sensor for tanks, flow meter, and method of leakage detection have been examined.
DOE
Liquid Hydrogen; Hydrogen Fuels; Vacuum Tubes; Pumps; Clean Energy; Multiphase Flow; Liquefied Gases; Measuring Instruments; Thermal Insulation

19980214927 Prins Maurits Lab. TNO, Rijswijk, Netherlands
The Response of an Energewtic Material Due in an External Stimulus ***Final Report (De responsie van energetische materialen als gevolg van externe opwarming)***
Scholtes, J. H., Prins Maurits Lab. TNO, Netherlands; vanderMeer, B. J., Prins Maurits Lab. TNO, Netherlands; Apr. 1998; 63p; In Dutch
Report No.(s): AD-A347334; PML-1997-A69; TDCK-97-0296; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Within the scope of the project 'Feasibility study of an IM-ignitor' research has been carried out to develop a new ignitor to be used in a rocket system. In this project many aspects have been highlighted, especially on the area of Cook-off. The aspects of interest for Cook-off, the Thermal Initiation project, will be described in this report. With the computer models, partly developed during the feasibility-project, combined Thermal/chemical and thermal/chemical/pressure calculations have be performed and compared with experimental results. Using the Tarver-McGuire reaction kinetics with combined pressure simulation good results have been accomplished. The temperature distribution calculations gave a good insight in the temperature gradients of the test item and the time and temperature to explosion were fully in agreement with the experimental values. Using a pressure calculation in combination with a thermal/chemical calculation, a much better stopping criterion for a simulation is found than in a simple thermal/chemical calculation and is more in agreement with the experimental results.
DTIC
Igniters; Explosions; Firing (Igniting); Temperature Gradients; Thermodynamic Properties

29
MATERIALS PROCESSING

Includes space-based development of products and processes for commercial applications. For biological materials see 55 Space Biology.

19980211090 New Energy and Industrial Technology Development Organization, Tokyo, Japan
Study on the creation of inorganic materials using micro-gravity environment ***Bisho juryoku kankyo riyo muki zairyo no sosei kenkyu***
Mar. 1997; 73p; In Japanese
Report No.(s): NEDO-ITK-9608; DE98-735439; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Creation of new functional inorganic materials using micro-gravity environment was studied. Observation of an electrode interface phenomenon under micro-gravity clarified that time variation in interference fringe is dependent on current density and electrode thickness in ground experiment, while it is dependent on not electrode thickness but current density under micro-gravity. In fabrication of glass fine particles under micro-gravity, true spherical glass fine particles of 4-7 micrometers in size were obtained corresponding to a charge of 40 mg by evaporation and solidification of sodium tellurate glass as raw material under micro-gravity. In fabrication of non-harmonic Pb-Zn system alloy, the homogeneous alloy texture of 5 micrometers level was observed which has never been observed in previous metal phase diagrams by fusion of 80 atom%Pb-20 atom%Zn mixture under micro-gravity and quenching from 500 C. On the study on fabrication of spherical semiconductor crystals, 7 spherical Si single crystals of 300(mu)m in size were obtained.
DOE
Microgravity; Semiconductors (Materials); Single Crystals; Fabrication; Sodium; Current Density

31
ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

19980210883 Lockheed Idaho Technologies Co., Idaho Falls, ID USA
INEEL portable vapor generator operations and maintenance manual
Gresham, G. L., Lockheed Idaho Technologies Co., USA; Hartenstein, S. D., Lockheed Idaho Technologies Co., USA; Leppert, Y. M., Lockheed Idaho Technologies Co., USA; Mottishaw, P., Lockheed Idaho Technologies Co., USA; Jul. 1997; 17p; In English
Contract(s)/Grant(s): DE-AC07-94ID-13223
Report No.(s): INEEL/EXT-97-00767; DE98-050480; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The Idaho National Engineering and Environmental Laboratory (INEEL) has developed a calibrated vapor generator, which delivers reproducible vapor aliquots of a standard in the picogram to low nanogram range. The basic system design includes: (a) a reservoir that contains the target analyte, (b) a head, which contains the equipment (valves, filters, transducers) necessary to use the reservoir, and (c) a controller assembly that contains the CPU, pump, and air filtering system. The reservoir consists of a known quantity of target or analyte material (i.e., explosive, narcotic, etc.) dissolved in a solvent and deposited on an inert substrate (e.g., glass wool, stainless steel beads, etc.), which is located in a stainless steel block. The reservoir temperature is controlled via thermal electric cooler to generate a level of saturation of the target analyte in the reservoir. Each reservoir contains only a single target analyte; therefore, each analyte has its own complete head. The controller houses a small computer that performs all of the control functions. Also included in the controller are the power supplies, an air pump, a pressure regulator, air filters, flow controllers, and displays.
DOE
Vaporizers; Vapors; Calibrating; Air Filters; Display Devices; Systems Engineering; Generators

19980210936 Giessen Univ., Inst. fuer Angewandte Physik, Germany
Cryosystem for low-noise cooling of high-sensitivity sensors. Research report *Final Report Kryosystem zur stoerarmen Kuehlung hochempfindlicher Sensoren. Forschungsbericht/Abschlussbericht*
Heiden, C., Giessen Univ., Germany; Thummes, G., Giessen Univ., Germany; Oct. 1997; 80p; In German
Contract(s)/Grant(s): Foerderkennzeichen BMBF 13N617
Report No.(s): ETDE-DE-616; DE98-723827; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The project task was to realize a low-noise cooling device for sensors, primarily of the type SQUID or SQUID gradiometer made of HT superconducting materials. Two approaches were chosen: cooling within a closed gas loop system (project part A), and cooling by means of a low-noise pulse tube refrigerator (project part B). A common design feature of both systems is that the cold tip with the SQUIDs on the one hand and the refrigerator components prone to noise form spatially separate units.
DOE
Squid (Detectors); Low Noise; Cryogenic Cooling; Cryogenic Equipment; Cooling Systems

19980211004 Department of the Navy, Washington, DC USA
Method and Apparatus for Measuring Diesel Engine Cylinder Pressure
Reed, Jay R., Inventor, Department of the Navy, USA; Jan. 27, 1998; 13p; In English; Supersedes US-Patent-Appl-SN-621276
Patent Info.: Filed 25 Mar. 1996; US-Patent-Appl-SN-621276; US-Patent-5,712,424
Report No.(s): AD-D018909; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A nonintrusive diesel engine cylinder pressure transducer includes a congruous shaped fuel injector stud which has been internally instrumented with full-bridge electrical resistance strain gage circuitry. The instrumented fuel injector stud has a bole which has been bored axially lengthwise and a full Wheatstone bridge strain gage unit which has been situated in the hole. While the engine is running the operative instrumented fuel injector stud which has been replaced in its normal position in the fuel-injector-cylinder assembly acts in combination with other assembly components as a cylinder pressure transducer. Measurements of tension and compression of the stud are provided which are reflective of pressure mainly due to compression and combustion. in the engine cylinder. The full-bridge configuration eliminates bending effects and affords electrical temperature compensation. Practice of this invention advantageously avails existing structure. The present invention involves no structural impairment and there-

fore risks none of the concomitant deleterious mechanical effects. thus obviating the conventional need to compromise the structural and functional integrity of the diesel engine in order to measure cylinder pressure.
DTIC
Diesel Engines; Cylindrical Bodies; Pressure Measurement; Fuel Injection

19980211021 Essen Univ., Inst. fuer Angewandte Thermodynamik und Klimatechnik, Germany
Development of a stirling refrigerator with a higher coefficient of performance ***Final Report Entwicklung einer Stirling-Kaeltemaschine mit verbesserter Leistungszahl. Abschlussbericht***
Steimle, F., Essen Univ., Germany; Schiefelbein, K., Essen Univ., Germany; Schikora, H. H., Essen Univ., Germany; Siegel, A., Essen Univ., Germany; Oct. 1997; 287p; In German
Contract(s)/Grant(s): Foerderkennzeichen BMBF 032697
Report No.(s): ETDE-DE-644; DE98-742320; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

With the ban of the refrigerant R22, beginning on January 1st, 2000, there will result a need for the development of alternative refrigerators for the refrigeration at temperatures from -50 C to -20 C. During the finished research project it should be tested if Stirling refrigeration plants could efficiently produce cold in that temperature range, because they can use the working gas helium without any environmental influence. Two types of Stirling refrigeration plants have been tested. For one type there should be used a new concept of transferring heat out and into the machine. In this concept a heat carrier should be atomized into the working spaces of the Stirling refrigeration machine to receive a higher coefficient of performance. The other type is a usual Stirling refrigeration machine with heat exchangers for the heat removal and supply. The calculated coefficients of performance in the above mentioned temperature range reach the level of usual R22-refrigeration systems for both types of Stirling refrigeration plants. Comparing both types higher coefficients of performance could be calculated for the machine with heat carrier injection. But during the atmomizing experiments it came out that a realisation of this type of machine is coupled with a high need of instrumentation. Compared to that the machine with heat exchangers is easily constructed. For this reason that kind of machine is built at present however for other applications. During the project there could be found a very interesting and as well important application for Stirling refrigeration plants that produce cold in a temperature range from -50 C to -20 C. This is the low-temperature cooling in supermarkets. For that application a stirling refrigeration plant shows a number of benefits, so that a machine put on the market could be successful.
DOE
Carrier Injection; Heat Exchangers; Refrigerants; Refrigerating; Stirling Cycle

19980211350 Spectro, Inc., Littleton, MA USA
Diesel Engine Coolant Analysis, New Application for Established Instrumentation
Anderson, Daniel P., Spectro, Inc., USA; Lukas, Malte, Spectro, Inc., USA; Lynch, Brian K., Spectro, Inc., USA; Jan. 1998; 10p; In English
Report No.(s): AD-A347981; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Rotating disk electrode (RDE) arc emission spectrometers are used in many commercial, industrial and military laboratories throughout the world to analyze millions of oil and fuel samples each year. In fact, RDE spectrometers have been used exclusively for oil and fuel analysis for so long, that most practitioners have probably forgotten that when RDE spectrometers were first introduced more than 40 years ago, they were also routinely used for aqueous samples. This paper describes recent work to calibrate and modify Rotating Disk Electrode (RDE) arc emission spectrometers for the analysis of engine coolant samples; a mixture of approximately 50% water and 50% glycol. The technique has been shown to be effective for the analysis of wear metals, contamination and supplemental coolant additives in ethylene and propylene glycol. A comparison of results for coolant samples measured by both Inductively Coupled Plasma (ICP) and RDE spectrometers will be presented. The data correlates extremely well on new and relatively clean coolants. However, not surprisingly, RDE results are sometimes higher for samples containing particles larger than a few micrometers. This paper suggests that RDE spectrometers are appropriate, and sometimes preferred, for most types of coolants and certain types of aqueous samples. Actual field data is be presented to support the arguments.
DTIC
Diesel Engines; Coolants; Spectrometers; Rotating Disks

19980211366 Oak Ridge Y-12 Plant, TN USA
Advanced hardware and software methods for thread and gear dimensional metrology. CRADA final report ***Final Report***
Miller, A. C., Jr., Oak Ridge Y-12 Plant, USA; Grann, E. B., Oak Ridge Y-12 Plant, USA; Mar. 05, 1997; 13p; In English
Contract(s)/Grant(s): DE-AC05-84OR-21400

Report No.(s): Y/AMT-421; DE98-004767; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The Oak Ridge Centers for Manufacturing Technology (ORCMT) and Apeiron Incorporated have collaborated on an effort to develop a frequency modulated continuous wave (FMCW) fiber lidar system for dimensional metrology of internal threads, gears, and splines. The purpose of this effort was to assist a small company in developing an instrument that would exceed the performance of competing foreign instruments and provide measurement capabilities necessary to assure compliance for NASA facilities and other industrial facilities. The two parties collaborated on design, assembly, and bench testing of the prototype instrument. The prototype system was targeted to have the capability of profiling internally machined gears and threads to an accuracy of less than a micron.

DOE

Computer Programs; Computers; Continuous Radiation; Frequency Modulation; Gears; Optical Radar

19980211430 Texas Technological Univ., Pulsed Power Lab., Lubbock, TX USA

Ultraclean Experiments for Directed Energy Plasma Science DURIP-97 ***Final Report, 1 Mar. 1997 - 28 Feb. 1998***

Kristiansen, M., Texas Technological Univ., USA; May 31, 1998; 12p; In English

Contract(s)/Grant(s): F49620-97-1-0106

Report No.(s): AD-A347795; AFRL-SR-BL-TR-98-0509; AFOSR,XC-98-DURIP; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Equipment required for the performance of research funded by DoD agencies was purchased and installed in the grantee's laboratories. This included a wide variety of high vacuum ultra clean systems and instruments. The equipment consisted of dry turbopump systems, stainless steel chambers and fittings, bakable high vacuum valves, ion pumps, vacuum gauges, a leak detector, a residual gas analyzer, a cryopump, and associated electronics. The proposed equipment list and the actual equipment purchased list with prices is presented. This equipment has been used on the projects "Tri-University, Multidisciplinary, High Energy, Microwave Device Consortium" (AFOSR/DoD MURI), "Fundamental Limits to Compact, Expendable Pulsed Power and Microwave Sources" (AFOSR New World Vistas), High Power Microwaves (AASERT), and Advanced Power System Technology for Ground Based Radar (WL/POOC-WPAFB).

DTIC

Vacuum Apparatus; Experimentation; Radiation Sources; Plasmas (Physics); Microwave Equipment; Procurement Management

32
COMMUNICATIONS AND RADAR

Includes radar; land and global communications; communications theory; and optical communications. For related information see also 04 Aircraft Communications and Navigation and 17 Space Communications, Spacecraft Communications, Command and Tracking. For search and rescue see 03 Air Transportation and Safety, and 16 Space Transportation.

19980210879 Norwegian Defence Research Establishment, Kjeller, Norway

Carrier Sense for Direct Sequence Spread Spectrum Radio ***Baerebolgedeteksjon for Direkte Sekvens Spredt Spektrum Radio***

Arneson, Vegard, Norwegian Defence Research Establishment, Norway; Farsund, Bodil Hvesser, Norwegian Defence Research Establishment, Norway; Feb. 26, 1998; 64p; In English; Original contains color illustrations

Report No.(s): FFI/RAPPORT-97/05704; FFIE/742/110; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

This document examines two algorithms for carrier sense of a Gaussian Minimum Shift Keying (GMSK) modulated Direct Sequence Spread Spectrum (DSSS) signal, one implemented with the Fast Fourier Transform (FFT) algorithm and one based on mixing. Both algorithms utilize the spectral lines which occur when GMSK-signals are squared. Theoretical models for calculating the probability of false alarm and the probability of detection are established. Analytical results from these models are compared with simulation results. Finally the two algorithms are compared in scenarios with and without frequency deviation. Author

Algorithms; Spread Spectrum Transmission; Mathematical Models; Detection; Magnetic Signals

19980210881 Physics and Electronics Lab. TNO, The Hague, Netherlands

Introduction to AGS Technology

Otten, M. P. G., Physics and Electronics Lab. TNO, Netherlands; Groeneveld, A. W., Physics and Electronics Lab. TNO, Nether-

lands; Dec. 1997; 27p; In English; Original contains color illustrations
Contract(s)/Grant(s): A97D695; TNO Proj. 6026486
Report No.(s): TD97-0353; TNO-FEL-97-A261; Copyright; Avail: Issuing Activity (TNO Physics and Electronics Lab., PO Box 96864, 2509 JG, The Hague, The Netherlands); US Sales Only, Hardcopy, Microfiche

AGS, or Allied Ground Surveillance is a NATO program aiming at the establishment of a fleet of airborne ground surveillance systems. The main types of systems considered are Synthetic Aperture Radar (SAR) and Moving Target Indication (MTI) radars. This report discusses the relevant radar technologies and the properties of the main candidate systems for the AGS capability.
Author
Surveillance; Aerial Reconnaissance; Technology Assessment; Military Technology

19980210920 Space and Naval Warfare Systems Command, San Diego, CA USA
VLF Cutler: September 1997, Four-Panel Tests; RADHAZ and Field Strength Measurement
Hansen, P., Space and Naval Warfare Systems Command, USA; Chavez, J., Space and Naval Warfare Systems Command, USA; Olsen, R., Space and Naval Warfare Systems Command, USA; Jan. 1998; 111p; In English
Report No.(s): AD-A345699; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The Navy's very low frequency (VLF) station at Cutler Maine provides communication to the USA strategic submarine forces. The antenna consists of two completely separate arrays designated the north array and the south array. Each array consists of six diamond shaped panels supported by 13 towers. The system was designed to allow transmission by one array (single) or both arrays (dual). Antenna maintenance is performed during the summer months by transmitting on one array while working on the other array, which is grounded. This allows continuous transmission, crucially important since the Navy closed Annapolis, the only other East Coast station. The region where the two arrays come close together is called the bow-tie area. There are two panels and three towers from each array in this area. The fields on the grounded array are highest in the bow-tie area due to proximity to the active array. The present station operating procedure, based on a past RADHAZ survey, does not allow work on the bow-tie area towers or panels while transmitting on the other array. There is an ongoing tower painting project at Cutler scheduled for completion over the next few years. Under the present station policy, completion of this project would require several months of total downtime, now unacceptable. The objective of the four-panel tests was to provide VLF Cutler with the capability of performing the special painting project and normal maintenance on the bow-tie area towers of an inactive array while transmitting with the other array. A secondary objective was to determine the antenna operating parameters which had not been measured since changing to 24.0 kllz.
DTIC
Panels; Field Strength; Very Low Frequencies; Antenna Arrays

19980210973 Physics and Electronics Lab. TNO, The Hague, Netherlands
Speckle Reduction in SAR Imagery by Various Multi-Look Techniques
deVries, F. P. Ph., Physics and Electronics Lab. TNO, Netherlands; Jan. 1998; 47p; In English; Original contains color illustrations
Contract(s)/Grant(s): A93KM727; TNO Proj. 24923
Report No.(s): TD97-0122; TNO-FEL-96-A015; Copyright; Avail: Issuing Activity (TNO Physics and Electronics Lab., PO Box 96864, 2509 JG, The Hague, The Netherlands); US Sales Only, Hardcopy, Microfiche

SAR images are contaminated by speckle noise. Multi-look images is used for its alleviation. In this report, we discuss the performance of several techniques to generate multi-look images. It is shown that the geometric resolution of the impulse response can be traded for the radiometric resolution. The various techniques differ in the use of single looks, number, size and weighting function. It is found that by properly positioning of overlapping looks in the spectral domain, the equivalent number of looks is substantially higher than the number of independent looks.
Author
Technology Assessment; Synthetic Aperture Radar; Radar Imagery; Procedures

19980210974 Physics and Electronics Lab. TNO, The Hague, Netherlands
LAPTEX Point Target Data Analysis
deJong, A. N., Physics and Electronics Lab. TNO, Netherlands; Winkel, J., Physics and Electronics Lab. TNO, Netherlands; Feb. 1998; 33p; In English
Contract(s)/Grant(s): A96KM626; TNO Proj. 25493
Report No.(s): TD97-0106; TNO-FEL-97-A067; Copyright; Avail: Issuing Activity (TNO Physics and Electronics Lab., PO Box 96864, 2509 JG, The Hague, The Netherlands); US Sales Only, Hardcopy, Microfiche

This report presents some results of point target measurements at low altitude in a Mediterranean environment. The point target was sailed in and out by a support ship of the Hellenic Navy. The signal strength for midwave and long wave IR sensors was measured as function of range. Simultaneously weather data were recorded at the same ship. These data were used to run the LOWTRAN7 transmission code. The predicted signal decrease with range corresponds quite well for the midwave and reasonably well for the long wave sensor. A problem is the variation of relative humidity along the path length. The data also show the strong scintillation of the signal for ranges of more than 10 km.
Author
Data Processing; Targets; Size Determination; Measuring Instruments

19980210976 Physics and Electronics Lab. TNO, The Hague, Netherlands
The Multi-Target Tracking Testbed: Functionality of the Tracking Module, Version 1.0
Theil, A., Physics and Electronics Lab. TNO, Netherlands; Huizing, A. G., Physics and Electronics Lab. TNO, Netherlands; Jan. 1998; 54p; In English
Contract(s)/Grant(s): B97KM785; TNO Proj. 26585
Report No.(s): TD97-0347; TNO-FEL-97-A232; Copyright; Avail: Issuing Activity (TNO Physics and Electronics Lab., PO Box 96864, 2509 JG, The Hague, The Netherlands); US Sales Only, Hardcopy, Microfiche

The functionality of the Tracking Module of the TNO-FEL Multi-Target Tracking Testbed (MT3) is considered. The phrase MT3 refers to a series of computer applications that are relevant to assess performance of tracking algorithms utilizing both recorded ('live') data and synthetically generated data. The TM is able to process data that originate from surveillance and tracking radars and it can be used to track features in a sequence of optical images. Characteristics are: 2D and 3D Kalman track filters, spherical and Cartesian system state description, extended Kalman filter, Interacting Multiple Models, Bayesian and possibilistic classification of both contacts and tracks, nearest-neighbor plot-track association with preference of plot-track pairs with identical classification. Near future expansions are: Multiple Hypothesis Testing plot-track association, image fusion and sensor fusion on both track and plot level.
Author
Performance Tests; Tracking (Position); Target Acquisition; Models; Computer Techniques

19980211008 Department of the Navy, Washington, DC USA
A General Fluctuation Sensitive Filter
Wagstaff, Ronald A., Inventor, Department of the Navy, USA; Apr. 30, 1998; 13p; In English
Patent Info.: Filed 30 Apr. 1998; US-Patent-Appl-SN-069856
Report No.(s): AD-D018902; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

An apparatus and method for filtering the effects of large amplitude signal fluctuations from elements of the cross-spectral density matrix of a detector array. The outputs of the array are sampled T times, and the values of each element of the matrix formed by using: Summation of i=1 to T of ZliZ(*)mi/absolute value of ZliZ(*)mik! where Zli is the complex output of an sensor of the array at time i; Z(*)mi is the complex conjugate of the output of an array sensor at said time i; and k is an integer greater than 1. Because of the exponent k, small, relatively constant, terms will dominate, reducing the effect of large amplitude fluctuations. Preferably, the above value will be scaled according to: ?Summation of i=1 to T of absolute value of ZliZ(*)mi(-k)(*)!(-1) which, besides being similarly filtered by the exponential terms, the resultant matrix element will have a magnitude corresponding to the actual power of the detected signal, after filtering.
DTIC
Signal Processing; Sensitivity; Variations

19980211012 California Univ., Electronics Research Lab., Berkeley, CA USA
Exploiting Chaos for Spread-Spectrum Communications ***Annual Report, Jul. 1997 - Jun. 1998***
Chua, Leon O., California Univ., USA; Jun. 23, 1998; 5p; In English
Report No.(s): AD-A348176; ERL-1-442427-23111; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We have made impressive research progress on several related aspects of our research grant during the period; namely, (1) robustness of chaotic synchronization schemes, (2) efficiency of chaotic synchronization systems, (3) design of practical chaotic spread-spectrum communication systems, (4) channel capacity of chaotic spread-spectrum communication systems, and (5) potential commercial applications of chaotic spread spectrum communication systems.
DTIC
Chaos; Spread Spectrum Transmission; Telecommunication

19980211016 Analytic Sciences Corp., Reading, MA USA

Visual Information Environment Prototype (VIEP) ***Final Report, Apr. 1994 - Oct. 1997***

Rohall, Steven L., Analytic Sciences Corp., USA; Apr. 1998; 81p; In English

Contract(s)/Grant(s): F30602-94-C-0072; AF Proj. 5581

Report No.(s): AD-A348155; AFRL-IF-RS-TR-1998-56; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report contains information from the work performed under the visual information environment prototype (VIEP) contract to evaluate and integrate technologies to perform collaborative functions involving several different sites, over high speed communication links, and using advanced human-computer interfaces (HCI). A demonstration system was developed to showcase collaborative multimedia technologies in a next-generation C4I scenario, utilizing advanced display and HCI technology.

DTIC

Computer Networks; Visual Perception; Prototypes; Communication Networks; Data Processing; Command and Control; Human-Computer Interface

19980211017 Naval Postgraduate School, Monterey, CA USA

Conduct and Assessment of A2C2 Experiment 3 and Guidelines for Future Experimentation

Benson, Robert E., Naval Postgraduate School, USA; Jun. 1998; 127p; In English

Report No.(s): AD-A348143; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The Adaptive Architectures for Command and Control (A2C2) project is sponsored by the Office of Naval Research (ONR) and is focused on analysis of joint decision-making at the operational level and adaptation of joint command and control architectures. to accomplish this objective, the A2C2 project team has conducted a series of human-in-the-loop experiments at the Naval Postgraduate School (NPS). The third experiment of the series was conducted during November 1997. This experiment differed from previous A2C2 experiments in that it focused on how organizations adapt their structures to maximize their effectiveness under changing events. This thesis reports on the planning and conduct of Experiment 3 with a focus on the contributions made by author and the Lead Team of officer-students and the analysis of their hypotheses. The author examines data collected during Experiment 3 in support of these hypotheses. A detailed statistical analysis is performed and results discussed. Finally, a discussion of lessons learned from the author's perspective pertaining to the experiment is given along with recommendations for conducting future experiments at NPS.

DTIC

Statistical Analysis; Decision Making; Command and Control; Adaptive Control

19980211060 Massachusetts Inst. of Tech., Lab. of Electronics, Cambridge, MA USA

Fractal Point Process and Queueing Theory and Application to Communication Networks ***Annual Report, 1 Jun. 1997 - 31 May 1998***

Wornell, Gregory W., Massachusetts Inst. of Tech., USA; Jun. 26, 1998; 6p; In English

Contract(s)/Grant(s): N00014-96-1-0930

Report No.(s): AD-A347783; ONR-96PR05999-00; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In the past year, our broad program of research has continued to explore efficient solutions fundamental problems of communication for wireless and wired networks, exploiting interrelated perspectives from communication theory, information theory, signal processing theory, control theory, and systems theory. As part of this work novel applications of fractal geometry, chaos, stochastic resonance, and other phenomena exhibited by nonlinear systems, are also being explored.

DTIC

Fractals; Queueing Theory; Communication Networks; Communication Theory

19980211423 Naval Postgraduate School, Monterey, CA USA

Wireless Local Area Networks: Simulation and Analysis

Kyriakidis, Efstathios D., Naval Postgraduate School, USA; Jun. 1998; 150p; In English

Report No.(s): AD-A347034; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Wireless communication is currently in a state of rapid evolution. This evolution is driven by the numerous advantages of the wireless networks. One major constraint to this evolution is the lack of standardization. Also a major concern are the interference problems of the signal at the reception point caused by the multiple paths that the electromagnetic waves travel (multi-path interference). This thesis presents two separate simulations. In the first, a realistic physical model of a wireless local area network is developed. In this simulation, the multi-path interference at the reception point is investigated. The results of this physics- based simulation are used to assess an important assumption in the second simulation. In the second simulation, we examine the reliability of the wireless standard for the medium access control (MAC) layer, using CACI COMNET III network simulation software.

This standard was published in 1997, by the IEEE's working group 802.11 and in this thesis is tested and analyzed under different network loads. One major result is that the optimum load for a five working stations wireless LAN, is from 80 to 200 packets per second. Below that load range the channel utilization is small and above that the network is overloaded.
DTIC
Local Area Networks; Electromagnetic Interference; Multipath Transmission; Wireless Communication; Computer Systems Programs

19980211429 Massachusetts Inst. of Tech., Plasma Science and Fusion Center, Cambridge, MA USA
Ionospheric Plasma Disturbances and Effects on Radio Waves ***Final Report, 1 Feb. 1995 - 31 Jan. 1998***
Lee, Min-Chang, Massachusetts Inst. of Tech., USA; May 20, 1998; 10p; In English
Contract(s)/Grant(s): F49620-95-1-0156
Report No.(s): AD-A347797; AFRL-SR-BL-TR-98-0511; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Ionospheric plasma heating experiments were conducted at Arecibo to investigate generation of ionospheric plasma bubbles, sheet-like ionospheric irregularities, Langmuir waves, upper hybrid waves, and ion Bernstein waves. This research has shed light on physics and effects of HF waves on naturally occurring ionospheric plasma turbulence. Laboratory experiments at MIT's Plasma Science and Fusion Center were carried out, using a student-built large plasma machine, the Versatile Toroidal Facility (VTF) to cross-check the Arecibo results and to simulate ionospheric effect caused by lightning-induced whistler waves. Recent VTF experiments have successfully reproduced the intriguing spectra of HF radio wave-enhanced Langmuir waves observed at Arecibo. Laboratory experiments were also performed to study the combined effect of gravity and magnetic field on the formation of aqueous crystals. This work leads to develop a practical technique for controlled growth of aqueous crystals. A comparison between TOPEX satellite vertical TEC measurements and GPS slant measurements shows that the ionospheric shell model with constant shell height and the assumption of horizontal homogeneity are not accurate for the low-latitude ionosphere.
DTIC
Ionospheric Disturbances; Radio Waves; Ionospheric Heating; Experimentation; Plasma Bubbles; Plasmas (Physics); Earth Ionosphere

19980211504 Lawrence Livermore National Lab., Livermore, CA USA
The Rubble Rescue Radar (RRR): A low power hand-held microwave device for the detection of trapped human personnel
Haddad, W. S., Lawrence Livermore National Lab., USA; Apr. 10, 1997; 11p; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-ID-127786; DE98-050904; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Each year, innocent human lives are lost in collapsed structures as a result of both natural and man-made disasters. We have developed a prototype device, called the Rubble Rescue Radar (RRR) as a aid to workers trying to locate trapped victims in urban search and rescue operations. The RRR is a motion sensor incorporating Micropower Impulse Radar and is capable of detecting human breathing motions through reinforced concrete. It is lightweight, and designed to be handled by a single operator for local searches in areas where trapped victims are expected. Tests of the first prototype device were conducted on site at LLNL using a mock rubble pile consisting of a reinforced concrete pipe with two concrete floor slabs placed against one side, and random concrete and asphalt debris piled against the other. This arrangement provides safe and easy access for instruments and/or human subjects. Breathing signals of a human subject were recorded with the RRR through one floor slab plus the wall of the pipe, two slabs plus the wall of the pipe, and the random rubble plus the wall of the pipe. Breathing and heart beat signals were also recorded of a seated human subject at a distance of 1 meter with no obstructions. Results and photographs of the experimental work are presented, and a design concept for the next generation device is described.
DOE
Rescue Operations; Microwave Equipment; Detection; Human Beings; Personnel; Prototypes; Disasters; Radar

19980211615 Range Commanders Council, White Sands Missile Range, NM USA
Radar Loop Gain Measurements
May 1998; 23p; In English
Report No.(s): AD-A346523; RCC-754-98; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document proposes a single method to be used by all support ranges for determining C-band radar loop gain, permits uniformity for reported loop gain values, and allows for a direct performance capability comparison between like kinds of radars. A brief discussion of the derivation of the radar equation is presented.
DTIC
Radar Data; Radar Tracking; Microwave Frequencies

19980213253 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA
RF-Environment Models for the ADSAM Program ***Final Report***
Reilly, J. P., Johns Hopkins Univ., USA; McDonald, R. L., Johns Hopkins Univ., USA; Dockery, G. D., Johns Hopkins Univ., USA; Stapleton, J., Johns Hopkins Univ., USA; Aug. 22, 1997; 94p; In English; Sponsored in part by PEO(TAD)-SC, Arlington, VA
Contract(s)/Grant(s): N00024-98-D-8124
Report No.(s): AD-A346190; APL/JHU-A1A97U-070; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Air-Directed Surface-to-Air Missile (ADSAM) Program Environmental Working Group (EWG) was tasked with compiling information related to modeling of RF environmental effects on RF sensor systems. The resulting report contains three major sections: ”Section A, Monostatic Clutter Models,” ”Section B, Bistatic Scattering Models,” and ”Section C, Atmospheric Propagation Models.” Section A addresses the spatial, temporal, and frequency characteristics of rain, cloud, sea, land, bird and insect clutter. Section B provides similar information for bistatic scattering from land and sea. Section C addresses refraction, diffraction, absorption and multipath interference.
DTIC
Radar Cross Sections; Surface to Air Missiles; Clutter; Radar Tracking; Environment Models; Multistatic Radar

19980213334 Department of the Navy, Washington, DC USA
Passive Intrusion Detection System
Wilson, Dopuglas H., Inventor, Department of the Navy, USA; Jan. 06, 1998; 14p; In English; Supersedes US-Patent-Appl-SN-649862, AD-D018063
Patent Info.: Filed 10 May 1996; US-Patent-Appl-SN-649862; US-Patent-5,705,984
Report No.(s): AD-D018925; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An RF energy source transmits energy into a transmission cable that has a characteristic impedance subject to change by deformation of the cable. The cable is buried along a path that corresponds to a perimeter to be monitored. When an intruder places weight in the vicinity of the cable the cable deforms and changes its characteristic impedance. Consequently a portion of energy transmitted into the cable reflects back where time-domain or frequency-domain reflectometry apparatus uses the reflected energy to identify the location of the intrusion along the cable and provide other characteristics of the intruder.
DTIC
Intrusion; Passivity; Transmission; Detection

33
ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry. For related information see also 60 Computer Operations and Hardware and 76 Solid-State Physics.

19980210859 Sandia National Labs., Albuquerque, NM USA
Novel low-permittivity dielectrics for Si-based microelectronics
Sullivan, J. P., Sandia National Labs., USA; Sep. 1997; 47p; In English
Contract(s)/Grant(s): DE-AC04-94AL-85000
Report No.(s): SAND-97-2092; DE98-000114; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The purpose of this Laboratory-Directed Research and Development (LDRD) project was to develop and assess novel low-permittivity dielectric materials for applications as interlevel dielectrics (ILDs) in Si-based microelectronics. There were three classes of materials investigated: (1) novel covalently-bonded ceramics containing carbon, boron, and/or nitrogen, (2) fluorinated SiO(sub 2) (SiOF), and (3) plasma polymerized fluorocarbon (PPFC). The specific advantages and disadvantages for each potential low k ILD material were evaluated. It was discovered that highly energetic deposition processes are required for the formation of thermally and environmentally stable carbon or boron nitride ceramics, and the resulting films may have many potentially valuable applications, such as diffusion barriers, tribological coatings, micro-sensor materials, etc. The films are not suitable as low

k ILDs, however, because the highly energetic deposition process leads to films with high atomic density, and this leads to high dielectric constants. SiOF shows a promise as low k ILD material for near-term applications, but special passivation or encapsulation strategies may be required in order to reduce two instability problems that the authors have discovered: moisture absorption and thermal instability of the SiOF/Al interface. PPFC films offer promise for even lower dielectric constant ILDs than SiOF, but it will be necessary to develop new strategies to passivate the free radicals in the films generated during deposition. These free radicals lead to increase in dielectric loss over time when the films are exposed to room ambient conditions.
DOE
Dielectric Properties; Silicon Isotopes; Thermal Stability; Fabrication; Synthesis (Chemistry); Dielectrics

19980210882 Lockheed Idaho Technologies Co., Idaho Falls, ID USA
PNGV battery test manual
Jul. 1997; 42p; In English
Contract(s)/Grant(s): DE-AC07-94ID-13223
Report No.(s): DOE/ID-10597; DE98-050485; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This manual defines a series of tests to characterize aspects of the performance or life cycle behavior of batteries for hybrid electric vehicle applications. Tests are defined based on the Partnership for New Generation Vehicles (PNGV) program goals, although it is anticipated these tests may be generally useful for testing energy storage devices for hybrid electric vehicles. Separate test regimes are defined for laboratory cells, battery modules or full size cells, and complete battery systems. Some tests are common to all three test regimes, while others are not normally applicable to some regimes. The test regimes are treated separately because their corresponding development goals are somewhat different.
DOE
Manuals; Electric Batteries; Service Life

19980210915 Lawrence Livermore National Lab., Livermore, CA USA
Computational electronics and electromagnetics
Shang, C. C., Lawrence Livermore National Lab., USA; Feb. 01, 1997; 42p; In English
Contract(s)/Grant(s): W-7405-eng-48
Report No.(s): UCRL-ID-125470; DE98-050270; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The Computational Electronics and Electromagnetics thrust area at Lawrence Livermore National Laboratory serves as the focal point for engineering R&D activities for developing computer-based design, analysis, and tools for theory. Key representative applications include design of particle accelerator cells and beamline components; engineering analysis and design of high-power components, photonics, and optoelectronics circuit design; EMI susceptibility analysis; and antenna synthesis. The FY-96 technology-base effort focused code development on (1) accelerator design codes; (2) 3-D massively parallel, object-oriented time-domain EM codes; (3) material models; (4) coupling and application of engineering tools for analysis and design of high-power components; (5) 3-D spectral-domain CEM tools; and (6) enhancement of laser drilling codes. Joint efforts with the Power Conversion Technologies thrust area include development of antenna systems for compact, high-performance radar, in addition to novel, compact Marx generators.
DOE
Computational Electromagnetics; Thrust; Computer Aided Design; Design Analysis; Particle Accelerators; Electromagnetic Interactions; Electromagnetic Radiation; Electromagnetic Fields

19980210958 Fermi National Accelerator Lab., Batavia, IL USA
The use of low resistivity substrates for optimal noise reduction, ground referencing, and current conduction in mixed signal ASICs
Zimmerman, T., Fermi National Accelerator Lab., USA; Dec. 1997; 21p; In English
Contract(s)/Grant(s): DE-AC02-76CH-03000
Report No.(s): FNAL-TM-2035; DE98-051275; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

This paper is distilled from a talk given at the 3rd International Meeting on Front End Electronics in Taos, N.M. on Nov. 7,1997. It is based on experience gained by designing and testing the SVX3 128 channel silicon strip detector readout chip. The SVX3 chip organization is shown in Fig. 1. The Front End section consists of an integrator and analog pipeline designed at Fermilab, and the Back End section is an ADC plus sparsification and readout logic designed at LBL. SVX3 is a deadtimeless readout

chip, which means that the front end is acquiring low level analog signals while the back end is digitizing and reading out digital signals. It is thus a true mixed signal chip, and demands close attention to avoid disastrous coupling from the digital to the analog sections. SVX3 is designed in a bulk CMOS process (i.e., the circuits sit in a silicon substrate). In such a process, the substrate becomes a potential coupling path. This paper discusses the effect of the substrate resistivity on coupling, and also goes into a more general discussion of grounding and referencing in mixed signal designs and how low resistivity substrates can be used to advantage. Finally, an alternative power supply current conduction method for ASICs is presented as an additional advantage which can be obtained with low resistivity substrates.
DOE
Electrical Grounding; Electrical Resistivity; Integrators; Noise Reduction; Analog Data

19980210962 Lockheed Idaho Technologies Co., Idaho Falls, ID USA
The evaluation of Federal Fabrics-Fibers electrochemical capacitors
Wright, R. B., Lockheed Idaho Technologies Co., USA; Murphy, T. C., Lockheed Idaho Technologies Co., USA; Sep. 1997; 60p; In English
Contract(s)/Grant(s): DE-AC07-94ID-13223; DE-AC07-94ID-13405
Report No.(s): DOE/ID-10604; DE98-050599; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The electrochemical capacitor devices described in this report were deliverables from the US Department of Energy-Idaho Operations Office (DOE-ID) as part of the US Department of Energy's (DOE) High Power Energy Storage Program. The Idaho National Engineering and Environmental Laboratory (INEEL) has the responsibility for technical management, testing, and evaluation of high-power batteries and electrochemical capacitors under this Program. The DOE is currently developing various electrochemical capacitors as candidate power assist devices for the Partnership for a New Generation of Vehicles (PNGV) fast response engine requirement. This contract with Federal Fabrics-Fibers was intended to evaluate the use of their novel Z-axis carbon fiber materials as candidate electrodes for electrochemical capacitors. Deliverables were sent to the INEEL's Energy Storage Technologies (EST) Laboratory for independent testing and evaluation. This report describes performance testing on four selected devices delivered over a 2-year period. Due to the highly experimental nature of the packages, life cycle testing was not conducted.
DOE
Fiber Composites; Fabrics; Electrodes; Capacitors; Electric Batteries

19980211005 Department of the Navy, Washington, DC USA
Self-Adjusting Statistical Noise Analyzer with Interference Suppression
Schlosser, Thomas W., Inventor, Department of the Navy, USA; Cain, Karl J., Inventor, Department of the Navy, USA; Evanoff, George A., Inventor, Department of the Navy, USA; Dec. 09, 1997; 9p; In English; Supersedes US-Patent-Appl-SN-497483
Patent Info.: Filed 29 Jun. 1995; US-Patent-Appl-SN-497483; US-Patent-5,696,691
Report No.(s): AD-D018908; No Copyright; Avail: US Patent and Trademark Office, Microfiche

Signals are processed along two paths, one determining the optimum frequency band from which atmospheric noise will be analyzed and the other which performs statistical analysis of the frequency band found to be optimum. The band setting path may include broadband filtering to limit a search to a desired band. A fast Fourier transform (FFT) sorts the analog to digitally converted signals into consecutive frequency bands identified herein as frequency bins. The magnitude of the signals falling within each frequency bin is determined and the average frequency bin magnitude is ascertained. Broadband peaks are searched by noting which frequency bin magnitudes are a predetermined amount over the average frequency bin magnitude. These frequency bins are marked and the bins are then searched to determine the longest series of frequency bins between marks, thereby determining the widest frequency band bounded by broadband signals. In the statistical path, band path filtering is used to eliminate the broadband signals by setting the lower and upper cutoff frequencies according to the optimum frequency band found. The analog to digitally converted signals are fast Fourier transformed and the magnitude of the frequency bins are determined. Harmonics are excised through calculating the average magnitude of the frequency bins and normalizing any frequency bin with a magnitude greater than a predetermined amount over the average frequency bin magnitude.
DTIC
Signal Processing; Statistical Analysis; Atmospherics

19980211009 Department of the Navy, Washington, DC USA

Thin-Film Edge Field Emitter Device

Hsu, David S., Inventor, Department of the Navy, USA; Gray, Henry F., Inventor, Department of the Navy, USA; Apr. 20, 1998; 60p; In English

Patent Info.: Filed 20 Apr. 1998; US-Patent-Appl-SN-062735

Report No.(s): AD-D018901; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A thin-film edge field emitter device includes a substrate having a first portion and having a protuberance extending from the first portion, the protuberance defining at least one side-wall, the side-wall constituting a second portion. An emitter layer is disposed on the substrate including the second port ion, the emitter layer being selected from the group consisting of semiconductors and conductors and is a thin-film including a portion extending beyond the second port ion and defining an exposed emitter edge. A pair of supportive layers is disposed on opposite sides of the emitter layer, the pair of supportive layers each being selected from the group consisting of semiconductors and conductors and each having a higher work function than the emitter layer.

DTIC

Thin Films; Emitters

19980211022 Forschungsgesellschaft fuer Informationstechnik m.b.H., Bad Salzdetfurth, Germany

High-T(sub c) elements for radio engineering ***Final Report Hoch-T(sub c)-Bauelemente fuer die Funktechnik. Abschlussbericht***

Klinger, M., Forschungsgesellschaft fuer Informationstechnik m.b.H., Germany; Hinken, J., Forschungsgesellschaft fuer Informationstechnik m.b.H., Germany; Apr. 1997; 69p; In German; In English

Contract(s)/Grant(s): Foerderkennzeichen BMBF 13N609

Report No.(s): ETDE-DE-641; DE98-742322; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

This project comprised two tasks, i.e. investigations of superconducting filter banks for commercial radio transmission systems and of SQUID systems. A filter bank is a system of several filters connected with each other. Filter banks must have high selectivity in order to ensure short distances between radio transmission channels. This requires maximum-quality resonators. The SQUID investigations comprised the following tasks: 1. Rock magnetometer; 2. Field distribution system; 3. SQUID magnetometers as sensors for measuring systems; 4. SQUID gradiometers as sensors for measuring systems; 5. Cryosystems for SQUID applications; 6. SQUID hermetisation.

DOE

Radio Transmission; Radio Communication; Radio Filters; Squid (Detectors); Superconductors (Materials); Broadcasting

19980211059 Materials Research Society, Warrendale, PA USA

Symposium G: Science and Technology of Organic Electroluminescent Devices, Part 1, Symposium Objective

Jun. 23, 1998; 5p; In English, 13-17 Apr. 1998, San Francisco, CA, USA; Sponsored by Materials Research Society, USA; Sponsored in part by Chemipro Kasei Kaisha, Ltd.; Futaba Corp.; IMES Co. Ltd.; Sanyo Vacuum Industries Co. Ltd.; and Sumtorno Electric Industries, Inc.

Contract(s)/Grant(s): N00014-98-1-0536

Report No.(s): AD-A347824; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Organic ElectroLuminescent (EL) devices promise a new and exciting form of emissive display technology. Unlike many of the existing display technologies, organic EL devices offer a path to low cost, large area emissive displays by virtue of their simple fabrication techniques. This symposium hopes to bring together scientists and engineers from the academic and industrial world to address the critical challenges the field is facing in the area of materials synthesis, device physics, engineering and display fabrication. Both types of devices made from small molecules and polymers will be covered. Focused sessions include electrochemical cells and prospects for organic laser diodes.

DTIC

Conferences; Research and Development; Organic Lasers; Electroluminescence; Technologies; Fabrication; Display Devices

19980211107 Minnesota Univ., School of Physics and Astronomy, Minneapolis, MN USA

Tunneling and Transport in Mesoscopic Structures ***Final Report, 1 Mar. 1992 - 28 Feb. 1998***

Goldman, Allen M., Minnesota Univ., USA; Jun. 23, 1998; 15p; In English

Contract(s)/Grant(s): N00014-92-J-1368

Report No.(s): AD-A347644; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A combination of electron beam lithography, reactive ion etching and low temperature vapor deposition was employed to produce ultra-small one- and two-dimensional arrays of tunneling junctions, and wires of small cross sectional area. The original goal, the production of side-by-side junctions, with tunneling occurring between metal electrodes in a plane rather than through an insulator could not be realized. Transport properties of wires with extremely small cross-sectional areas were studied. Tunneling junctions with solid inert gas barriers and metallic electrodes were prepared. The motivation for this work was to produce junctions on high temperature superconductors with robust barriers whose processing did not involve chemical reactions at the interface. Our approach was successful, although tunneling resistances have thus far been too high to observe the energy gap in a superconducting electrode. Heterostructures of cuprate superconductors and manganite ferromagnets were grown by MBE. The suppression of critical currents and critical temperatures by spin injection was observed, and the interfacial resistance across the boundary between the ferromagnet and the superconductor investigated. The effects observed are believed to be a consequence of the high degree of spin polarization in half-metallic manganite films, and may be the basis for a new superconducting device technology.
DTIC
Semiconductor Junctions; Manufacturing; Superconducting Devices; Wire; Superconductors (Materials); Two Dimensional Bodies; Electron Tunneling

19980211126 Sandia National Labs., Albuquerque, NM USA
Massively parallel solution of the inverse scattering problem for integrated circuit quality control
Leland, R. W., Sandia National Labs., USA; Draper, B. L., Sandia National Labs., USA; Naqvi, S., New Mexico Univ., USA; Minhas, B., New Mexico Univ., USA; Sep. 1997; 32p; In English
Contract(s)/Grant(s): DE-AC04-94AL-85000
Report No.(s): SAND-97-2330; DE98-000423; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The authors developed and implemented a highly parallel computational algorithm for solution of the inverse scattering problem generated when an integrated circuit is illuminated by laser. The method was used as part of a system to measure diffraction grating line widths on specially fabricated test wafers and the results of the computational analysis were compared with more traditional line-width measurement techniques. The authors found they were able to measure the line width of singly periodic and doubly periodic diffraction gratings (i.e. 2D and 3D gratings respectively) with accuracy comparable to the best available experimental techniques. They demonstrated that their parallel code is highly scalable, achieving a scaled parallel efficiency of 90% or more on typical problems running on 1024 processors. They also made substantial improvements to the algorithmics and their original implementation of Rigorous Coupled Waveform Analysis, the underlying computational technique. These resulted in computational speed-ups of two orders of magnitude in some test problems. by combining these algorithmic improvements with parallelism the authors achieve speedups of between a few thousand and hundreds of thousands over the original engineering code. This made the laser diffraction measurement technique practical.
DOE
Algorithms; Parallel Processing (Computers); Nondestructive Tests; Computerized Simulation; Integrated Circuits; Procedures; Laser Beams

19980211135 Lawrence Livermore National Lab., Livermore, CA USA
Compact high-voltage structures
Wilson, M. J., Lawrence Livermore National Lab., USA; Goerz, D. A., Lawrence Livermore National Lab., USA; Jun. 09, 1997; 9p; In English; 11th; Pulsed Power, 29 Jun. - 2 Jul. 1997, Baltimore, MD, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-125862; CONF-9706113; DE98-051088; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A basic understanding of the critical issues limiting the compactness of high-voltage systems is required for the next generation of impulse generators. In the process of optimizing the design of a highly reliable solid-dielectric over-voltage switch, an understanding of the limiting factors found are shown. Results of a l3O kV operating switch, having a modest field enhancement of 16% above the average field stress in the switching region, are reported. The resulting high reliability is obtained by reducing the standard deviation of the switch to 6.8%. The total height of the switch is 1 mm. The resulting operating parameters are

obtained by controlling field distribution across the entire switch package and field shaping the desired point of switch closure. The disclosed field management technique provides an approach to improve other highly stressed components and structures.
DOE
High Voltages; Impulse Generators; Dielectrics; Switches

19980211297 Wisconsin Univ., Dept. of Materials Science and Engineering, Madison, WI USA
Thermodynamic and kinetic stabilities of two-phase systems involving gallium arsenide and an intermetallic phase ***Final Report***
Chang, Y. A., Wisconsin Univ., USA; [1998]; 13p; In English
Contract(s)/Grant(s): DE-FG02-86ER-45274
Report No.(s): DOE/ER/45274-T2; DE98-005143; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Results are reported on the following:schottky barrier enhancement to n-GaAs and enhancement due to the formation of (Ga,Al)As at the contact interfaces via an exchange mechanism; results for the Ni(Ga,Al)/n-GaAs, Al/n-GaAs and Ni/Al/n-GaAs contacts; phase relationship studies on reciprocal systems; and results for the contact of Pt(sub 3)In(sub 7)/n-GaAs.
DOE
Stability; Thermodynamics; Interfaces; Nickel; Schottky Diodes

19980211300 Sandia National Labs., Albuquerque, NM USA
GaAs Photonic Integrated Circuit (PIC) development for high performance communications
Sullivan, C. T., Sandia National Labs., USA; Mar. 1998; 60p; In English
Contract(s)/Grant(s): DE-AC04-94AL-85000
Report No.(s): SAND-98-0566; DE98-004482; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Sandia has established a foundational technology in photonic integrated circuits (PICs) based on the (Al,Ga,In)As material system for optical communication, radar control and testing, and network switching applications at the important 1.3(mu)m/1.55(mu)m wavelengths. We investigated the optical, electrooptical, and microwave performance characteristics of the fundamental building-block PIC elements designed to be as simple and process-tolerant as possible, with particular emphasis placed on reducing optical insertion loss. Relatively conventional device array and circuit designs were built using these PIC elements: (1) to establish a baseline performance standard; (2) to assess the impact of epitaxial growth accuracy and uniformity, and of fabrication uniformity and yield; (3) to validate our theoretical and numerical models; and (4) to resolve the optical and microwave packaging issues associated with building fully packaged prototypes. Novel and more complex PIC designs and fabrication processes, viewed as higher payoff but higher risk, were explored in a parallel effort with the intention of meshing those advances into our baseline higher-yield capability as they mature. The application focus targeted the design and fabrication of packaged solitary modulators meeting the requirements of future wideband and high-speed analog and digital data links. Successfully prototyped devices are expected to feed into more complex PICs solving specific problems in high-performance communications, such as optical beamforming networks for phased array antennas.
DOE
Photonics; Gallium Arsenides; Communication; Design Analysis; Electro-Optics; Integrated Circuits; Optical Properties

19980211301 Sandia National Labs., Albuquerque, NM USA
PV batteries and charge controllers: Technical issues, costs, and market trends
Hammond, R. L., Arizona State Univ., USA; Turpin, J.F., Arizona State Univ., USA; Corey, G. P., Sandia National Labs., USA; Hund, T. D., Sandia National Labs., USA; Harrington, S. R., Harrington (S. R.), USA; [1997]; 6p; In English; 26th; Photovoltaic Specialists, 29 Sep. - 3 Oct. 1997, Anaheim, CA, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA
Contract(s)/Grant(s): DE-AC04-94AL-85000
Report No.(s): SAND-97-2457C; CONF-970953-; DE98-001186; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A survey of US system integrators, charge controller manufacturers, and battery manufacturers was conducted in 1996 to determine market and application trends. This survey was sponsored by the USDOE. Results from 21 system integrators show a 1995 PV battery sales of $4.76 million. Using the survey results, a top down market analysis was conducted with a total predicted US battery market of $34.7 million and a world wide market of US $302 million. The survey also indicated that 71% (of dollars)

were spent on VRLA and 29% on flooded lead-acid batteries. Eighty percent of charge controllers were ON-OFF, vs. PWM or constant voltage.
DOE
Electric Batteries; Photovoltaic Cells; Electric Power Supplies; Control Equipment; Electric Charge

19980211332 Sandia National Labs., Albuquerque, NM USA
Dynamic effects of linkage joints in electrostatic microengines
Allen, J. J., Sandia National Labs., USA; Miller, S. L., Sandia National Labs., USA; LaVigne, G. F., Sandia National Labs., USA; 1998; 6p; In English; Modeling and Simulation of Microsystems, Semiconductors, Sensors and Actuators, 6-8 Apr. 1998, Santa Clara, CA, USA
Contract(s)/Grant(s): DE-AC04-94AL-85000
Report No.(s): SAND-97-2821C; CONF-980430; DE98-004906; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The electrostatic micro-engine is one of the major actuators used in MEMS applications. to ensure this MEMS actuator is operated in a fashion that will produce peak performance and long life, the system dynamics must be fully understood. One of the major trade-offs in the micro-engine design is the use of either pin or flexure joints. This paper will develop the equations of motion for flexure-jointed and pin-jointed surface micromachined microengines. An analytical mechanics approach will be used to derive the equations of motion and the appropriate equations of constraint. The effect of the flexure joints on the drive signals of the micro engine is experimentally shown to be significant during static tests.
DOE
Actuators; Electrostatic Engines; Electrostatics; Engine Design; Equations of Motion; Micromachining

19980211336 MultiLythics, Inc., Allison Park, PA USA
Pad printer for electronics *Final Report*
[1998]; 38p; In English
Contract(s)/Grant(s): DE-FC04-95AL-87486
Report No.(s): DOE/AL/87486-T1; DE98-005008; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This is the Final report on DARPA-sponsored development Program Pad Printer for Electronics DE-FC04-95AL87486 which was initiated in February, 1995 and intended to run 24 months to February 1997. The Program has significant value to the Thick Film processing industry, an electronic manufacturing alternative for producing functional modules integrated at the multi-chip level. The result is highly reliable, high volumetric efficiency, subassemblies for military applications and for commercial applications in severe environments, such as automotive, portable communications, and bio-implantable devices. The program progressed quite satisfactorily through 19 months, when it encountered severe, non-technical, difficulties. Resolving these difficulties resulted in several months of delay in completing the Program, but resulted in only a trivial increase in total program cost and no increase in cost to the sponsor. The principle Objective of the Program was the development of a printing system - machine and appropriate inks - compatible with existing thick-film processing but offering a 5x improvement in line density. This objective has been met. The Pad Printer is capable of printing suitable inks in traces 25 g wide on 50g centers to a fired thickness of 3 (mu); each of these parameters is roughly 1/5 the value of the current alternative, silk-screen printing. The available inks represent an assortment of conductor, dielectric, and insulator formulations and the knowledge developed permits extending this family of inks to new and diverse functional materials. An important secondary objective was maximum compatibility with existing Thick Film processing; the printer and ink systems may be substituted directly for the silk screen printers in existing processes. The Program reached or exceeded its other Technical Objectives in almost every case and, in those few instances where the objective was only partially met, work continues under private funding.
DOE
Thick Films; Manufacturing; Screening; Printing; Electronic Equipment; Output

19980211361 New Energy and Industrial Technology Development Organization, Tokyo, Japan
Feasibility study on the introduction of hybrid buses *Hybrid bus donyu kanosei chosa*
Mar. 1997; 176p; In Japanese
Report No.(s): NEDO-P-9604; DE98-745376; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The purpose of this research is to design pilot projects for introducing hybrid buses into the public transportation sector. This research also covers contents regarding hybrid buses with a trolley-collector motor and a diesel engine, to identify technical and

economical problems and to analyze cost beneficiation using hybrid buses. The trolley parallel hybrid system has been employed for the feasibility study. This system has abundant operation results in Europe and the USA. Its battery is small or is not necessary, and the maintenance cost is also low. As a result of the feasibility study, reduction effects of CO2 emission were found out. When the CO2 generation at the power plant is not counted, the reduction effect was estimated to be 32% compared with the CO2 emission from diesel buses. When the CO2 generation at the power plant is considered, it was estimated to be 18%. The cost beneficiation was investigated for the cases of the transportation using trolley system surrounding a medium-scale terminal among large-scale housing development, tourist resort, and stations. The annual income is estimated to be larger than the annual payment in each case. It was found that the hybrid bus is economically established.
DOE
Urban Transportation; Electric Automobiles; Automated Transit Vehicles

19980211380 Argonne National Lab., IL USA
Testing and Evaluation of Batteries for a Fuel Cell Powered Hybrid Bus
Miller, J. F., Argonne National Lab., USA; Webster, C. E., Argonne National Lab., USA; Tummillo, A. F., Argonne National Lab., USA; DeLuca, W. H., Argonne National Lab., USA; May 1997; 6p; In English; 32nd; Intersociety Energy Conversion Engineering Conference, 27 Jul. - 2 Aug. 1997, Honolulu, HI, USA
Contract(s)/Grant(s): W-31-109-ENG-38
Report No.(s): ANL/CMT/CP-93413; CONF-970701-; DE97-053460; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Argonne National Laboratory conducted performance characterization and life-cycle tests on various batteries to qualify them for use in a fuel cell/battery hybrid bus. On this bus, methanol-fueled, phosphoric acid fuel cells provide routine power needs, while batteries are used to store energy recovered during bus braking and to produce short-duration power during acceleration. Argonne carried out evaluation and endurance testing on several lead-acid and nickel/cadmium batteries selected by the bus developer as potential candidates for the bus application. Argonne conducted over 10,000 hours of testing, simulating more than 80,000 miles of fuel cell bus operation, for the nickel/cadmium battery, which was ultimately selected for use in the three hybrid buses built under the direction of H-Power Corp.
DOE
Phosphoric Acid Fuel Cells; Nickel Cadmium Batteries; Evaluation; Lead Acid Batteries; Tests

19980211421 Naval Facilities Engineering Service Center, Port Hueneme, CA USA
Cleaning of Livefront Electrical Switchgear Using Carbon Dioxide Pellets at Navy Installations
Durlak, Edward R., Naval Facilities Engineering Service Center, USA; May 1998; 120p; In English
Report No.(s): AD-A347057; NFESC-TR-2091-ENV; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The Objective of this project is to evaluate a promising technique that uses carbon dioxide (CO2) pellet media blasting to clean energized power distribution equipment. This process has been in use in industry for some time to clean various kinds of equipment, but its use in high voltage applications has had limited evaluation. The objective is to demonstrate the process on energized (approx. 15 kV) Load Interrupter (L.I.) electrical switches located on the base at Naval Station San Diego. Demonstration testing is required to enable Navy-wide implementation of the process. Objectives of the test program are verification of cleaning effectiveness, development of safe work practices, and evaluation of potential impacts on electrical switchgear. The project was conducted jointly with PWC San Diego Code 620 and leveraged about $125K of PWC funds to procure a CO2 cleaning system.
DTIC
Evaluation; Cleaning; Switches; Electromechanical Devices; Carbon Dioxide

19980211476 Oak Ridge National Lab., TN USA
Microwave processing of Tantalum capacitors: CRADA *Final Report*
McMillan, A. D., Oak Ridge National Lab., USA; Lauf, R. J., Oak Ridge National Lab., USA; Vierow, W. F., Oak Ridge National Lab., USA; [1998]; 8p; In English
Contract(s)/Grant(s): DE-AC05-96OR-22464
Report No.(s): ORNL-98051731; DE98-051731; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A Cooperative Research and Development Agreement (CRADA) between Lockheed Martin Energy Systems, Inc. (LMES) and AVX Tantalum Corporation (AVX) of Biddeford, Maine, was initiated in October 1991. [Lockheed Martin Energy Research Corp. (LMER) has replaced LMES]. The completion date for the Agreement was March 1996. The purpose of this work is to explore the feasibility of an advanced microwave processing concept to develop higher capacitance tantalum anodes. Tantalum

capacitors are used where high reliability is needed (e.g., pacemakers, hearing aids, and military devices). Two types of tantalum powder are used: sodium-reduced powder and electron beam-refined powder. Sodium-reduced powder has higher surface area, but lower purity; electron beam-refined powder has higher purity for working voltages, but somewhat lower surface area. The powder is pressed into pellets using traditional methods and then placed in the microwave furnace for processing. It is of interest to determine if variable-frequency microwave sintering can increase quality while decreasing processing time and decreasing or eliminating surface contamination; these issues must be addressed while retaining the maximum surface area of the anode. Meeting each of these needs will result in a higher quality anodic film, which will thereby increase the dielectric strength. Additionally, microwave sintering might enable the authors to develop a strong sintered anode without excessive grain growth. The variable-frequency microwave furnace (VFMF), located at the Y-12 Plant, allows the authors to study the effects of sintering over a wide frequency range. This novel design uses a high-power traveling wave tube (TWT), originally developed for electronic warfare. by using this microwave source, one can not only select individual microwave frequencies for particular experiments, but also achieve uniform power densities over a large area by the superposition of many different frequencies.
DOE
Microwaves; Tantalum; Capacitors; Capacitance

19980211480 Karlsruhe Univ., Germany
Development of integrated superconducting devices for signal preprocessing *Final Report Entwicklung supraleitender Bausteine der Signalvorverarbeitung. Abschlussbericht*
Biehl, M., Karlsruhe Univ., Germany; Koch, R., Karlsruhe Univ., Germany; Neuhaus, M., Karlsruhe Univ., Germany; Scherer, T., Karlsruhe Univ., Germany; Jutzi, W., Karlsruhe Univ., Germany; Feb. 1998; 118p; In German
Contract(s)/Grant(s): BMBF 13N632
Report No.(s): ETDE-DE-671; DE98-761308; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

SPICE and CADENCE based tools for designing, simulating and optimizing SFQ and RSFQ circuits have been developed as well as a standard cell library corresponding to the fabrication technology established at the IEGI. A 12 bit flux shuttle shift register using Nb/Al Josephson junctions with a new write and readout gate has been fabricated and tested successfully; the power dissipation is 9 nW/bit/GHz. A pseudo random pulse generator was developed correspondingly. Simulations of RSFQ toggle flip-flops during a large number of clock cycles demonstrated that the digital performance of counters is limited to clock frequencies below 100 GHz by dynamic effects, especially of parasitic inductances. Therefore dc measurements based on the voltage-frequency Josephson relationship must be followed by real time measurements of single SFQ word pulses. A four stage Nb based RSFQ counter in a coplanar waveguide test jig was tested up to a frequency of 2 GHz, limited by the available 32 bit pattern generator and the bandwidth of the sampling oscilloscope, yielding bit error rates of about 10(sup -12). Using YBCO technology, a 4 bit SFQ shift register (T=40 K) as well as miniaturized coplanar microwave devices for satellite and communication applications at 10 GHz (T=77 K) have been designed and fabricated. A 4 bit instantaneous real time frequency meter (IFM) and a microwave filter with a 3-dB bandwidth of only 1.8% have been mounted on the cold head of a split-cycle Stirling cooler (AEG, 1.5 W rate at 80 K) and tested successfully. Hybrid devices, e.g. amplifiers and oscillators, combining active semiconductor components and low loss coplanar YBCO transmission lines operated at 77 K seem very promising.
DOE
Josephson Junctions; Semiconductors (Materials); YBCO Superconductors; Superconducting Devices; Miniaturization; Microwave Equipment

19980211509 Energia Nucleare e Delle Energie Alternative, Dipt. Energia Divisione Tecnologie Energetiche Avanzate, Rome, Italy
Containment system and thermal conduction in lithium electric batteries energy modules 2 kWh with polymeric electrolytes *Sviluppo del sistema di contenimento e del condizionamento termico di moduli da 2 kWh di batterie al litio ad elettrolita polimerico*
Ciancia, A., Energia Nucleare e Delle Energie Alternative, Italy; Alessandrini, F., Energia Nucleare e Delle Energie Alternative, Italy; Jun. 1997; 25p; In Italian
Report No.(s): ENEA-RT-ERG-TEA-97-02; DE98-759666; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

In this work are presented some technical specifications regarding lithium electric batteries with polymeric electrolytes, in particular the design of electrodes container efficient and reliable and thermal management system oriented to safety, performances and battery life.
DOE
Containment; Lithium; Electric Batteries; Modules; Electrolytes; Electrodes; Safety Factors; Polymers

19980211554 Brookhaven National Lab., Upton, NY USA
An XAS investigation of corrosion characteristics in AB5 type metal hydride electrodes
Mukerjee, S., Brookhaven National Lab., USA; McBreen, J., Brookhaven National Lab., USA; Reilly, J. J., Brookhaven National Lab., USA; Johnson, J. R., Brookhaven National Lab., USA; Adzic, G. D., Brookhaven National Lab., USA; Marrero, M. R., Texas A&M Univ., USA; Aug. 1997; 15p; In English; 192nd; 48th; Electrochemical Society, 31 Aug. - 5 Sep. 1997, Paris, Paris, France, France
Contract(s)/Grant(s): DE-AC02-76CH-00016
Report No.(s): BNL-64564; CONF-970805; DE97-008949; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Apart from the stress cracking due to lattice expansion and contraction during cycling, several substituents such as Ce and Co, and additions to the electrolyte such as ZnO have the ability to significantly improve the cycle life and corrosion characteristics in AB5 type metal hydride alloys. In situ XANES and SVET studies reveal that Ce substitution causes a protective passivation layer comprising of Ce oxides. This significantly reduces the extent of corrosion of substituents such as Ni despite greater percent volume expansion and contraction cycle compared with non Ce substituted samples. The Co substitution reduces the extent of percent volume expansion in the lattice cycle and hence the extent of stress cracking. It also segregates to the surface as Co(OH)2 which due to its higher conductivity counters the resistive effects due to build up of surface Ni(OH)2. Addition of ZnO to the electrolyte suppresses corrosion of substituents such as Ni in non Ce substituted alloys resulting in improved cycle life. The effects on Ce substituted alloys is negligible.
DOE
Corrosion; Metal Hydrides; Electrodes

19980211563 Microwave Sciences, Inc., Lafayette, CA USA
Extension of HPM Pulse Duration by Cesium Iodide Cathodes in Crossed Field Devices ***Final Report, May 1997 - May 1998***
Benford, James N., Microwave Sciences, Inc., USA; Price, David, Microwave Sciences, Inc., USA; DeHope, William, Microwave Sciences, Inc., USA; May 1998; 26p; In English
Contract(s)/Grant(s): F29601-97-C-0076; AF Proj. 5797
Report No.(s): AD-A347299; AFRL-DE-PS-TR-1998-1019; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

When explosive emission cathodes are used in higher power greater than 100 MW devices, microwave pulse shortening occurs because of motion of the cathode plasma at speeds 1 to 5 x 10(exp 6) cm/sec. This limited duration in turn can limit present-day high power microwave (HPM) sources to a few hundred joules. The introduction of cathodes made from Cesium Iodide-coated (CsI) carbon fiber has shown plasma speeds reduced by factors of a few from uncoated carbon fiber, but previous work was at low diode fields of a few 10's of kV/cm. We have demonstrated reduced CsI plasma speed for macroscopic electric fields of 265 kV/cm, sufficient for the diodes of GW microwave sources. Carbon fiber coated with CsI in saturated solution gives plasma speeds at these high electric fields of -0.6 x 10(exp 6) cm/sec, about three times less than the bare carbon fiber. The apparatus had oil-free high vacuum conditions and the cathode was baked both before assembly at atmospheric pressure and in vacuum after assembly, to temperatures of greater than 600 deg. C. A residual gas analyzer showed burnout of the water; base pressure was approx. 10 to the minus 6th power Torr. The diode current and voltage traces are substantially more reproducible than with bare carbon fiber. This may be because CsI emits copious UV, lighting up the surface much more uniformly. With this reduced plasma velocity, CsI cathodes should produce an extension of the HPM pulse length and an increase in pulse energy in sources now limited by low-Z contaminant, cathode plasma motion.
DTIC
Pulse Duration Modulation; Electron Beams; Cathodes; Plasmas (Physics); Pulse Duration; Crossed Field Amplifiers; Crossed Field Guns; Crossed Fields; Diodes

19980211586 New Mexico Univ., Center for High Technology Materials, Albuquerque, NM USA
High Speed Switches for Reconfigurable Optical Logic Arrays and Optical Interconnections ***Final Report, 1 Jun. 1993 - 30 Nov. 1997***
Cheng, Julian, New Mexico Univ., USA; Jun. 08, 1998; 52p; In English

Report No.(s): AD-A349099; 329181FTR; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This program began with the objective of developing a novel optical interconnect technology that would provide parallel optical interconnections between electronic processing in a dynamically reconfigurable manner. The goal was to develop a switching fabric consisting of integrated optoelectronic switch arrays that offer a very compact, very-high-information-throughout optical interconnect architecture. The technology we had chosen was based on the monolithic integration of VCSELs with other photonic and electronic technologies, including heterojunction HPTs and photothyristors, PIN and MSM photodiodes, and heterojunction bipolar HBTs. We have played a leading role in the development of monolithic OEIC technology based on VCSELs, as well as advancing the state-of-the-art in VCSEL technology itself. We have developed an optical interconnect architecture and a high-speed OEIC switching technology that can provide reconfigurable interconnections between electronic processors, allowing then to communicate through a network of integrated optoelectronic transceivers and compact, monolithic space-division-multiplexed switches that provide an optical link to other nodes and electrical access to each processor These reconfigurable binary HPT/VCSEL switches can detect, regenerate and spatially reroute optical data, and can be programmed by simple voltages to perform different optical routing, fanout and logic functions. Arrays of switches with high optical gain were optically cascaded to form a multistage optical switching network that provide multipoint interconnections between nodes, through which multiple data channels can be routed in parallel without intermediate OE signal conversion. The functional capabilities of the reconfigurable optical switching fabric have been demonstrated at a data rate of >500 Mb/s.

DTIC

Laser Applications; Optical Switching; High Speed; Optical Interconnects

19980211599 West Virginia Univ., Dept. of Mechanical and Aerospace Engineering, Morgantown, WV USA

Development of Doppler Global Velocimeter (DGV) ***Final Report, 15 Aug. 1994 - 14 Nov. 1997***

Kuhlman, John, West Virginia Univ., USA; May 1998; 38p; In English

Contract(s)/Grant(s): F49620-94-1-0434

Report No.(s): AD-A346449; AFRL-SR-BL-TR-98-0496; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A two component Doppler Global Velocimeter (DGV) and a two component Point Doppler Velocimeter (PDV) are described. Velocity measurements for both systems to quantify accuracy are presented. Results are presented for velocity distribution over the surface of a rotating wheel and fully developed turbulent pipe flow. Accuracy of PDV wheel velocity data is +1% of full scale, while linearity of a single channel is on the order of +0.5%. Overall accuracy of wheel data matches cell calibration repeatability. PD pipe flow data show consistent turbulence intensities, and mean velocities agree with pitot probe data. However, a mean velocity offset error is observed. DGV system accuracy has also been investigated; this system uses four 8 bit Hitachi CCD cameras, and a Matrox Genesis frame grabber board for image acquisition. For rotating wheel results, RMS noise levels are on the order of +/- 1 m/sec, while total velocity range errors are between +/- 1-2 m/sec. RMS noise is dominated by camera resolution. Pipe flow mean velocity measurements show reasonable agreement with centerline pitot probe data. The observed zero velocity offset has been corrected through use of a reference tab, to record zero velocity signals.

DTIC

Velocity Measurement; Measuring Instruments; Turbulent Flow; Pipe Flow; Flow Velocity; Flow Visualization

19980211616 Optical Society of America, Washington, DC USA

OSA Trends in Optics and Photonics Series, Volume 14, Spatial Light Modulators ***Final Report, 1 Mar. 1997 - 28 Feb. 1998***

Fantone, Stephen D., Optical Society of America, USA; Optics and Photonics News; May 26, 1998; Volume 8, No. 3, pp. 16-21; In English

Contract(s)/Grant(s): F49620-97-1-0166

Report No.(s): AD-A346520; AFRL-SR-BL-TR-98-0494; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

The OSA topical meetings that received support under this grant provided a forum for researchers in various specialty areas to meet and share ideas and technology in their fields. Following are the meetings that were supported by this grant: (1) Optics in Computing; optical interconnections within electronic computers, system demonstrations of digital optical computing optical neural networks, optical signal processing and novel optical processing architectures, etc. (2) Spatial Light Modulators; material and device research and development, novel system applications and their requirements on SLMs, and future directions. (3) Ultrafast Electronics and Optoelectronics; high speed phenomena in the areas of optics, optoelectronics, and electronics. Other meetings were in the areas of glass fibers and biomedical optics.

DTIC

Electro-Optics; Photonics; Light Modulators; Optical Data Processing

19980211620 Optical Society of America, Washington, DC USA

Bragg Gratings, Photosensitivity, and Poling in Glass Fibers and Waveguides: Applications and Fundamentals. Technical Digest Series, Volume 17 ***Final Report, 1 Mar. 1997 - 28 Feb. 1998***

Fantone, Stephen D., Optical Society of America, USA; May 26, 1998; 369p; In English; 12th; Optical Fiber Sensors Glass and Optical Materials Division (GOMD), 26-28 Oct. 1997, Williamsburg, VA, USA; Sponsored by Optical Society of America, USA
Contract(s)/Grant(s): F49620-97-1-0166
Report No.(s): AD-A346498; AFRL-SR-BL-TR-98-0494; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

The OSA topical meetings that received support under this grant provided a forum for researchers in various specialty areas to meet and share ideas and technology in their fields. Following are the meetings that were supported by this grant: (1) Optics in Computing; (2) topics for discussion included optical interconnections within electronic computers, system demonstrations of digital optical computing optical neural networks, optical signal processing and novel optical processing architectures, etc. Spatial Light Modulators; (3) this meeting concentrated on material and device research and development, novel system applications and their requirements on SLMs, and on future directions. Ultrafast Electronics and Optoelectronics; and (4) this meeting explored the advance in high speed phenomean in the area; of optics, optoelectronics, and electronics. Other meetings were in the areas of glass fibers and biomedical optics.

DTIC

Glass Fibers; Photosensitivity; Waveguides; Signal Processing; Bragg Gratings; Electro-Optics; Optical Data Processing

19980211626 Central Research Inst. of Electric Power Industry, Tokyo, Japan

Study of two step constant current charging method with EV's valve-regulated lead acid batteries for nighttime load leveling ***Yakan denryoku wo yuko katsuyo dekiru denki jidoshayo namari denchi no nidantei denryu judenho no kaihatsu***

Ikeya, T., Central Research Inst. of Electric Power Industry, Japan; Mita, Y., Central Research Inst. of Electric Power Industry, Japan; Iwahori, T., Central Research Inst. of Electric Power Industry, Japan; Iwasaki, M., Central Research Inst. of Electric Power Industry, Japan; Takagi, S., Central Research Inst. of Electric Power Industry, Japan; Sugii, Y., Central Research Inst. of Electric Power Industry, Japan; Yada, M., Central Research Inst. of Electric Power Industry, Japan; Sakabe, T., Central Research Inst. of Electric Power Industry, Japan; Kosaka, E., Central Research Inst. of Electric Power Industry, Japan; Tsuchiya, H., Central Research Inst. of Electric Power Industry, Japan; Kanetsuki, M., Central Research Inst. of Electric Power Industry, Japan; Nasu, H., Central Research Inst. of Electric Power Industry, Japan; Ono, M., Central Research Inst. of Electric Power Industry, Japan; Adachi, K., Central Research Inst. of Electric Power Industry, Japan; Narisoko, H., Central Research Inst. of Electric Power Industry, Japan; Nishiyama, K., Central Research Inst. of Electric Power Industry, Japan; Feb. 1997; 48p; In Japanese
Report No.(s): CRIE-T-96013; DE98-745987; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

In the constant-current/constant-voltage charging method that has been in application for EV (electric vehicle) lead-acid batteries, power load is generated only at the initial part of the charging process, and therefore the method cannot be said to be sufficiently contributory to the levelling of power loads. In this report, a proposed 2-step constant-current charging method is assessed for applicability, and another charging method is introduced, which extends battery life and utilizes low-cost night-time power more effectively. It is found that the proposed 2-step constant-current charging method (1st step: 12A, 2nd step: 3A) completes the charging process in eight hours, that it assumes a charging pattern more suitable for contributing to the effective use of night-time power than the conventional method, and that it extends the battery life of approximately 170 cycles to approximately 300 cycles. In a study seeking for a charging method capable of utilizing night-time power more efficiently, the 1st-step current of 12A is increased to 30A for shortening the charging time, and then it is found that this change extends the battery cycle life and improves on charging efficiency. The conclusion is that possibilities are high that an increase in the 1st-step current prolongs the battery life cycle and shortens the charting time.

DOE

Electric Motor Vehicles; Lead Acid Batteries; Electric Charge; Battery Chargers

19980211697 Optical Society of America, Washington, DC USA

1997 Technical Digest Series, Volume 9, Quantum Optoelectronics

Mar. 1997; 165p; In English; Quantum Optoelectronics, 19-21 Mar. 1997, Incline Village, NV, USA; Sponsored by Optical Society of America, USA
Report No.(s): AD-A346560; AFRL-SR-BL-TR-98-0494-Vol-9; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The report documents the information presented at the conference on Quantum Optoelectronics held 19-21 Mar 97 in Hyatt Regency Lake Tahoe, Incline Village, Nevada. The symposium was sponsored and managed by Optical Society of America. The purpose of the conference was to bring together scientists and engineers in quantum theory in order to report the most recent results

and to simulate new disciplinary activity. One of the highlights of the symposium this year was a series of excellent physics talks on such topics as microcavity lasers, quantum coherence, photonic bandgaps, quantum electrodynamics, quantum optoelectronic physics.
DTIC
Electro-Optics; Conferences; Quantum Theory; Quantum Mechanics

19980211700 Aerospace Corp., Technology Operations, El Segundo, CA USA
Observation of Single Event Upsets in Analog Microcircuits
Koga, R., Aerospace Corp., USA; Pinkerton, S. D., Aerospace Corp., USA; Moss, S. C., Aerospace Corp., USA; Mayer, D. C., Aerospace Corp., USA; LaLumondiere, S., Aerospace Corp., USA; Hansel, S. J., Aerospace Corp., USA; Jan. 15, 1998; 11p; In English
Contract(s)/Grant(s): F04701-93-C-0094
Report No.(s): AD-A348978; TR-93(3940)-5; SMC-TR-98-21; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Selected analog devices were tested for heavy ion induced single event upset (SEU). The results of these tests are presented, likely upset mechanisms are discussed, and standards for the characterization of analog upsets are suggested. The OP-15 operational amplifier, which was found to be susceptible to SEU in the laboratory, has also experienced upset in space. Possible strategies for mitigating the occurrence of analog SEUs in space are discussed.
DTIC
Failure; Microelectronics; Operational Amplifiers; Analog Circuits

19980211703 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA
Development and Packaging of Microsystems Using Foundry Services
Butler, Jeffrey T., Air Force Inst. of Tech., USA; Jun. 1998; 322p; In English
Report No.(s): AD-A347631; AFIT/DS/ENG/98-08; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche
Micro-electro-mechanical systems (MEMS) are a new and rapidly growing field of research. Several advances to the MEMS state of the art were achieved through design and characterization of novel devices. Empirical and theoretical model of polysilicon thermal actuators were developed to understand their behavior. The most extensive investigation of the Multi-User MEMS Processes (MUMPs) polysilicon resistivity was also performed. The first published value for the thermal coefficient of resistivity (TCR) of the MUMPs Poly 1 layer was determined as 1.25 x 10(exp -3)/K. The sheet resistance of the MUMPs polysilicon layers was found to be dependent on linewidth due to presence or absence of lateral phosphorus diffusion. The functional integration of MEMS with CMOS was demonstrated through the design of automated positioning and assembly systems, and a new power averaging scheme was devised. Packaging of MEMS using foundry multichip modules (MCMs) was shown to be a feasible approach to physical integration of MEMS with microelectronics. MEMS test die were packaged using Micro Module Systems MCM-D and General Electric High Density Interconnect and Chip-on-Flex MCM foundries. Xenon difluoride (XeF2) was found to be an excellent post-packaging etchant for bulk micromachined MEMS. For surface micromachining, hydrofluoric acid (HF) can be used.
DTIC
Integrated Circuits; Microelectronics; Thermodynamic Properties; Foundries; Micromachining; Electronic Packaging

19980213228 Department of the Navy, Washington, DC USA
Battery System and a Method for Generating Electrical Power
Tucker, Steven P., Inventor, Department of the Navy, USA; Roberts, Raymond W., Inventor, Department of the Navy, USA; Dow, Eric G., Inventor, Department of the Navy, USA; Moden, James R., Inventor, Department of the Navy, USA; Mar. 31, 1998; 17p; In English; Supersedes US-Patent-Appl-SN-797765, AD-D018414
Patent Info.: Filed 8 Jan. 1997; US-Patent-Appl-SN-797765; US-Patent-5,733,679
Report No.(s): AD-D018964; No Copyright; Avail: US Patent and Trademark Office, Microfiche
The present invention relates to a dry composition of materials to be used in a battery system. The dry composition comprises a mixture consisting of sodium hydroxide and sodium oxide. In a first reservoir in the battery system, the mixture is present in an amount sufficient to form with water a heated sodium hydroxide electrolyte solution having a 15% by weight concentration of sodium hydroxide. In a second reservoir in the battery system, the mixture is present in an amount sufficient to form with water a heated sodium hydroxide electrolyte solution having to up to about 75% by weight concentration of sodium hydroxide. The

present invention also relates to a battery system and a method for generating electrical power which utilize the aforementioned dry composition of materials.
DTIC
Electric Batteries; Electrolytes

19980213255 California Univ., Dept. of Mechanical Aerospace and Nuclear Engineering, Los Angeles, CA USA
Conformable M3 Microsystems for Aerodynamic Control ***Final Report, 15 Oct. 1993 - 31 Dec. 1997***
Chih–Ming, Ho, California Univ., USA; Yu–Chong, Tai, California Univ., USA; May 29, 1998; 30p; In English
Contract(s)/Grant(s): F49620-94-1-0008
Report No.(s): AD-A346213; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The recently emerging microelectromechanical technology has created a new frontier for the control of aerodynamic, structural and propulsion systems. The micromachining process provides two unique features for transducer technology: large in quantity and minute in size. A large number of sensors and actuators are essential for distributed system control while miniature transducers are necessary to satisfy high spatial resolution requirements. In this project, we suggest a microsystem concept which will make quantum advances to the still emerging microelectromechanical technology. The purpose is to develop a new conformable Mhat3 technology for use in active flow control on a delta wing. The Mhat3 technology will integrate microelectronics, microsensors, and microactuators on a planar silicon chip. The conformable Mhat3 technology has made another advancement to finish the integrated transducers and electronics on a flexible skin, hence called the smart skin here. to our knowledge, there is no existing technology and no ongoing research to provide conformable Mhat3 systems. In addition, potential applications of the smart skin in defense, aerospace and medical fields are obviously whenever 3-D surfaces are encountered. The smart skin is wrapped around the 3-D leading edge of a delta wing and control all the six components of the aerodynamic forces and moments of a delta wing such that radical changes of aircraft design concept will take place.
DTIC
Electromechanical Devices; Microelectronics; Transducers; Delta Wings; Control Surfaces; Actuators; Active Control

19980213266 Department of the Navy, Washington, DC USA
Non-Aqueous Lithium Cells
Zajac, William V., Inventor, Department of the Navy, USA; Bis, Frank F., Inventor, Department of the Navy, USA; DeBold, Frank C., Inventor, Department of the Navy, USA; Kowalchik, Leonard A., Inventor, Department of the Navy, USA; Barnes, James A., Inventor, Department of the Navy, USA; Feb. 03, 1998; 8p; In English; Supersedes US-Patent-Appl-SN-427219
Patent Info.: US-Patent-Appl-SN-427219; US-Patent-5,714,279
Report No.(s): AD-D018994; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The high discharge rate performance of a non-aqueous lithium electrochemical cell is improved by dispersing a portion of the lithium conducting salt of the electrolyte uniformly throughout the carbon current collector of the cathode in the form of microcrystals. Upon contact, the electrolyte solubilizes the lithium salt from the carbon current collector, increasing the surface area and thus the efficiency of the carbon current collector.
DTIC
Nonaqueous Electrolytes; Electrochemistry; Electrochemical Cells; Lithium

19980213267 Department of the Navy, Washington, DC USA
Switch Assembly for Withstanding Shock and Vibration
Machado, Peter W., Inventor, Department of the Navy, USA; Apr. 13, 1998; 12p; In English
Patent Info.: Filed 13 Apr. 1998; US-Patent-Appl-SN-064360
Report No.(s): AD-D018997; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A switch assembly and method of making same are provided. First and second seals are mounted in spaced apart relation about the elongate body of a delicate switch such as a reed switch. The resulting switch/seal assembly is inserted into a rigid housing that encases the switch and seals. The housing is in circumferential contact with each seal. The seals are spaced apart from one another to reside on either side of a port in the side of the housing so that an annular chamber is defined between the elongate body and the housing between the seals. A damping material is injected through the port to fill the annular chamber. The housing can extend past the elongate body at either end to define first and second open-ended chambers through which electrical leads extending from the elongate body pass through. The damping material can also be used to fill the first and second open-ended chambers once electrical connection to the leads is made.
DTIC
Electric Switches; Electric Connectors; Electric Conductors

19980213274 Department of the Navy, Washington, DC USA

Complementary Vertical Bipolar Junction Transistors Formed in Silicon-On-Saphire

Cartagena, Eric N., Inventor, Department of the Navy, USA; Walker, Howard W., Inventor, Department of the Navy, USA; Feb. 03, 1998; 11p; In English; Supersedes US-Patent-Appl-SN-700894

Patent Info.: Filed 21 Aug. 1996; US-Patent-Appl-SN-700894; US-Patent-5,714,793

Report No.(s): AD-D018974; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A method is described for fabricating a complementary, vertical bipolar semiconducting structure. An N(+) silicon island and a P(+) silicon island separated by a first oxide layer are formed on a sapphire substrate. An NPN junction device is formed on the N(+) silicon island by epitaxially growing an N-type silicon layer on the N(+) silicon island. Then, a P region is created in the N-type silicon layer. An N(+) region created in the P region completes the NPN junction device. Similarly, a PNP junction device is formed by epitaxially growing a P-type silicon layer on the P(+) silicon island. Then, an N region is created in the P-type silicon layer. A P(+) region created in the N region completes the PNP junction device.

DTIC

Bipolar Transistors; Junction Transistors; Bipolarity; Fabrication

19980213282 Department of the Navy, Washington, DC USA

High Power Factor Shielded Superconducting Transformer

Johnson, Leopold J., Inventor, Department of the Navy, USA; Feb. 17, 1998; 7p; In English; Supersedes US-Patent-Appl-SN-787001

Patent Info.: Filed 12 Oct. 1994; US-Patent-Appl-SN-323942; US-Patent-5,719,545

Report No.(s): AD-D018967; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A superconducting transformer comprises a superconducting primary layer arranged to conduct an externally supplied primary electric current around a primary core to establish a magnetic flux through the primary core. The superconducting primary layer is formed on a primary substrate of electrically insulating, non-magnetic material. A superconducting secondary layer is arranged to conduct a secondary electric current around a secondary core. The superconducting secondary layer is formed on a secondary substrate of electrically insulating, non-magnetic material. The primary and secondary cores are made of a non-saturating material. The secondary electric current is generated by stacking the layers to couple the magnetic flux from the primary core to the secondary core. Superconducting vias are formed through the primary, isolation, and secondary layers for making external connections to the transformer. The superconducting transformer may be enclosed within a capacitor shield comprising an insulating layer, an inner superconducting layer, a dielectric layer, and an outer superconducting layer. The inner and outer superconducting layers form a capacitor which may be connected in parallel with the primary layer by the superconducting vias. The capacitor shield isolates external components from the electromagnetic field of the superconducting transformer, and provides a capacitive reactance substantially equal to the inductive reactance of the primary layer for correcting the power factor of the superconducting transformer. Electrical connections are formed through the capacitor shield for making external connections to the superconducting transformer.

DTIC

Transformers; Superconductivity

19980213284 Department of the Navy, Washington, DC USA

Preamplifier with Adjustable Input Resistance

Straw, Timothy B., Inventor, Department of the Navy, USA; Eno, Patricia M., Inventor, Department of the Navy, USA; Mar. 17, 1998; 7p; In English; Supersedes US-Patent-Appl-SN-891119, AD-D015377

Patent Info.: Filed 1 Jun. 1992; US-Patent-Appl-SN-891119; US-Patent-5,729,171

Report No.(s): AD-D018969; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A monolithic CMOSFET integrated circuit which includes a first MOSFEF integrant transistor having a gate area chosen to provide a desired range of resistance when operated in its triode region which constitutes: (1) a preamplifier, (2) a voltage controlled resistance (VCR) device, and (3) a high-pass filter when capacitive with a transducer. Preferred operating characteristics are achieved by including an active CMOSFET linearization network including a pan of second and third integrant MOSFET transistors having only one-hundredth (1/100th) to one-tenth (1/10th) the gate area of the first transistor. The present invention operates with a reduction in distortion resulting from the filtering effect of the combined capacitive reactance of the sensor and the resistance of the resistor. This reduction in distortion occurs at frequencies greater than the corner frequency (the frequency which is equal to the inverse product of the capacitance in farads times the resistance in ohms) and is due to the high-pass filter formed by the sensor and the resistor. Stated in terms of well known capacitor-resistor pole theory, the high-pass filter effect is based upon the ”transducer capacitance-preamplifier input resistance pole” (i.e.. such ”pole” with reference to the capacitance characteristic

of the capacitive transducer and the preamplifier input resistance provided by a CMOSFET I.C. device or devices as aforesaid). This distortion is less than that which would have been expected as a consequence of the non-linearity of prior art MOSFET VCRS. Due to this high pass filter effect, the distortion rolls off at approximately 20 db/decade of frequency.
DTIC
Preamplifiers; Field Effect Transistors; Electrical Resistance; Adjusting; Integrated Circuits

19980213285 Department of the Navy, Washington, DC USA
Intersubband Electro-Optical Modulators Based on Intervalley Transfer in Asymmetric Double Quantum Wells
Meyer, Jerry R., Inventor, Department of the Navy, USA; Hoffman, Craig A., Inventor, Department of the Navy, USA; Bartoli, Filbert, Inventor, Department of the Navy, USA; Mar. 03, 1998; 12p; In English; Supersedes US-Patent-Appl-SN-586476
Patent Info.: Filed 11 Jan. 1996; US-Patent-Appl-SN-586476; US-Patent-5,724,174
Report No.(s): AD-D018971; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The present invention is an electro-optical modulator having: (a) a first semiconductor layer and a second semiconductor layer; (b) a first quantum well layer having a conduction band minimum at an optically active point (typically the L point or the X point), disposed between the first and second semiconductor layers; (c) a second quantum well layer having a conduction band minimum at the optically inactive (at normal incidence) GAMMA point, disposed between the first and second semiconductor layers; (d) a spacer layer disposed between the first and second quantum well layers, where the spacer layer has a conduction band minimum that is large enough for establishing quantum confinement in the first quantum well layer at the optically active point and in the second quantum well layer at the GAMMA point, but small enough to allow tunnelling between the two layers on a time scale consistent with the desired switching response time. The invention also has some controllable means for applying an electric field. The invention can produce both intensity and phase changes, and may be used in a Fabry-Perot device to achieve greater modulation for a given active region thickness.
DTIC
Quantum Wells; Phase Modulation; Asymmetry; Electro-Optics; Modulation; Modulators

19980213295 Department of the Navy, Washington, DC USA
Outdoor Scene Simulating Apparatus for Testing an Infrared Imaging Device
Spindler, Jeffrey W., Inventor, Department of the Navy, USA; Jan. 20, 1998; 6p; In English
Patent Info.: Filed 5 Sep. 1996; US-Patent-Appl-SN-706588; US-Patent-5,710,431
Report No.(s): AD-D018990; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An outdoor scene simulating apparatus for testing an infrared imaging device comprising an infrared source, which emits infrared energy along a first optical path. Positioned downstream from the infrared source along the first optical path is a metallic substrate which has on its front surface a simulated outdoor scene. The simulated outdoor scene is formed by coating a portion of the metallic substrate with a black ink which absorbs infrared radiation. A thermal mass abuts the substrate to provide a cooling path between the thermal mass and the substrate. The thermal mass cools the metallic substrate and black ink of the simulated outdoor scene to temperatures below ambient temperature reducing infrared emissions from the metallic substrate and black ink of the simulated outdoor scene. Infrared energy reflected from the metallic substrate is directed along a second optical pam to a collimator. The collimator collects the infrared radiation reflected from on metallic substrate and then redirects the infrared radiation as a collimated beam of infrared radiation along a third optical path to the lens of the infrared imager being tested.
DTIC
Scene Generation; Infrared Imagery

19980214890 Department of the Navy, Washington, DC USA
Optical Correlator Using Spatial Light Modulator
Garcia, Joseph P., Inventor, Department of the Navy, USA; Koenigsberg, Lisa, Inventor, Department of the Navy, USA; Mar. 03, 1998; 11p; In English; Supersedes US-Patent-Appl-SN-562919, AD-D017921
Patent Info.: Filed 27 Nov. 1995; US-Patent-Appl-SN-562919; US-Patent-5,724,162
Report No.(s): AD-D018938; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An optical correlator is disclosed that compares signals of interest against selected reference signals stored in holograms both of which are imaged onto a spatial light modulator comprising electron trapping material. The cooperative action of the light from the hologram and the light from a delayed line causes the spatial light modulator to produce signals that are proportional to the correspondence between the signals of interest and the reference signals.
DTIC
Optical Correlators; Light Modulators; Spatial Distribution

19980214904 Department of the Navy, Washington, DC USA

Hysteretic Coupling System

Garcia, Joseph P., Inventor, Department of the Navy, USA; Feb. 03, 1998; 15p; In English; Supersedes US-Patent-Appl-SN-504342

Patent Info.: Filed 19 Jul. 1995; US-Patent-Appl-SN-504342; US-Patent-5,714,901

Report No.(s): AD-D018919; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An interconnecting network comprising operational amplifiers, summing amplifiers, and hysteretic coupling circuits is disclosed. The interconnecting network responds to signals of interest that may be substantially simultaneously present, but only to the highest initial intensity thereof so as to provide priority decoding of signals of interest. The hysteretic coupling circuit has a selectable coupling rate and a selectable coupling constant that allows the hysteretic circuit to respond in a stable so called winner take all manner, or conversely in a non-stable chaotic manner.

DTIC

Coupling Circuits; Operational Amplifiers; Hysteresis

19980214906 Department of the Navy, Washington, DC USA

Selectively Controlled Electrical Power Switching System

Duong, Tuan A., Inventor, Department of the Navy, USA; Feb. 10, 1998; 6p; In English; Supersedes US-Patent-Appl-SN-613744, AD-D018562

Patent Info.: Filed 22 Feb. 1996; US-Patent-Appl-SN-613744; US-Patent-5,717,582

Report No.(s): AD-D018924; No Copyright; Avail: US Patent and Trademark Office, Microfiche

Electrical energy from a DC voltage source is supplied through a power switching converter under operational control, to an electrical load in accordance with a soft-switching mode implemented by an auxiliary resonant commutated pole inverter. A mode control section having snubber switches connected to the switching converter selectively changes switching operation to a hard-switching mode so as to accommodate supply of load current at higher levels to the electrical load.

DTIC

Switching Circuits; Electric Potential; Switching; Electricity

19980214907 Department of the Navy, Washington, DC USA

Antiphase Switching in Arrays of Globally Coupled Oscillators

Schwarts, Ira B., Inventor, Department of the Navy, USA; Tsang, Kwok Yeung, Inventor, Department of the Navy, USA; Jan. 06, 1998; 13p; In English; Supersedes US-Patent-Appl-SN-558430

Patent Info.: Filed 16 Nov. 1995; US-Patent-Appl-SN-558430; US-Patent-5,706,192

Report No.(s): AD-D018928; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A method and apparatus for accessing anti-phase states in a nonlinear system by globally coupling an array of oscillators. For N number of oscillators in the system, there are (N-1)! anti-phase (AP) states in phase space. AP states exist where each waveform is staggered out of phase with every other wave form. The system is controlled between AP states by means of a linear parameter and a hyperswitch. In an out of phase (OP) state the orbit remains on a basin boundary between or among AP states. As the linear parameter is decreased to a specific value, the orbit leaves the basin boundary and enters a canonical invariant region (CIR) towards an attractor. Each CIR contains one AP state and one attractor. Once the orbit has reached an attractor within the CIR it shall remain there until the linear parameter is increased and system again becomes unstable. Accordingly, by controlling the bias current in the system, the orbit may remain on the basin boundary until such time as the bias current is altered and forces the orbit into an invariant region thereby attaining an AP state. Furthermore, if the orbit is in a CIR, the bias current may be adjusted so that the system becomes unstable and returns to the basin boundary. This method of accessing different AP states in a system of globally coupled oscillators uses a hyperswitch together with control and release techniques for switching between or among AP states by pulsing a linear parameter.

DTIC

Nonlinear Systems; Phase Control; Switching; Oscillators

34
FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling. For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.

19980210924 Naval Postgraduate School, Monterey, CA USA
Pressure-Sensitive Paint Measurement Technique Development for Turbomachinery Application
Quinn, Kevin J., Naval Postgraduate School, USA; Dec. 1997; 96p; In English
Report No.(s): AD-A346041; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Pressure-sensitive paint measurement on a transonic compressor rotor required the prior development of phase-locked cumulative imaging using a disk-rotor driven by a high-speed Hamilton-Standard turbine as a developmental test-bed. The turbine was installed in a protective housing in the Gas Dynamics Laboratory and connected to an 8000 cu ft, 300 psi air supply. An hydraulic pump provided bearing lubrication. A once per revolution trigger signal was produced from a light-emitting diode and PIN photodiode pair. The imaging system consisted of an intensified CCD video camera externally triggered by the 1/rev signal via a waveform shaping circuit designed for the present application. Images were captured at camera gate speeds calculated to eliminate pixel blur and image integration times were varied to optimize image intensity and spatial resolution. Structural and modal analyses of the disk-rotor were conducted and a simplified numerical model of the flow was computed. Ratioed, colored images were produced for wheel speeds to 20,000 RPM. The effect of the radially varying stagnation temperature was evident, underscoring the importance of quantifying and accounting for the PSP temperature sensitivity so that quantitative pressure data may be obtained. Recommendations for a follow-on program are reported.
DTIC
Pressure Measurement; Sensitivity; Paints; Compressor Rotors; Phase Locked Systems; Turbines

19980210929 Sandia National Labs., Albuquerque, NM USA
Spatial and temporal resolution of fluid flows *Final Report*
Tieszen, S. R., Sandia National Labs., USA; OHern, T. J., Sandia National Labs., USA; Schefer, R. W., Sandia National Labs., USA; Perea, L. D., Sandia National Labs., USA; Feb. 1998; 100p; In English
Contract(s)/Grant(s): DE-AC04-94AL-85000
Report No.(s): SAND-98-0338; DE98-004153; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This report describes a Laboratory Directed Research and Development (LDRD) activity to develop a diagnostic technique for simultaneous temporal and spatial resolution of fluid flows. The goal is to obtain two orders of magnitude resolution in two spatial dimensions and time simultaneously. The approach used in this study is to scale up Particle Image Velocimetry (PIV) and Planar Laser Induced Fluorescence (PLIF) to acquire meter-size images at up to 200 frames/sec. Experiments were conducted in buoyant, fully turbulent, non-reacting and reacting plumes with a base diameter of one meter. The PIV results were successful in the ambient gas for all flows, and in the plume for non-reacting helium and reacting methane, but not reacting hydrogen. No PIV was obtained in the hot combustion product region as the seed particles chosen vaporized. Weak signals prevented PLIF in the helium. However, in reacting methane flows, PLIF images speculated to be from Poly-Aromatic-Hydrocarbons were obtained which mark the flame sheets. The results were unexpected and very insightful. A natural fluorescence from the seed particle vapor was also noted in the hydrogen tests.
DOE
Fluid Flow; Spatial Resolution; Temporal Resolution; Particle Image Velocimetry; Reacting Flow; Images; Plumes; Hydrocarbons

19980210935 Korean Atomic Energy Research Inst., Korea Nuclear Safety Center, Daeduk, Korea, Republic of
Analysis of pressure propagation in the sodium-hydrogen two-phase flow
Park Hung Mok, Sogang Univ., Korea, Republic of; Oh, Woo Sock, Sogang Univ., Korea, Republic of; Lee, Min Woo, Sogang Univ., Korea, Republic of; Kim, Oh Young, Sogang Univ., Korea, Republic of; Jeong, Ok Yul, Sogang Univ., Korea, Republic of; Jul. 1997; 141p; In Korean
Report No.(s): KAERI-CM-113/96; DE98-725022; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

An analysis of pressure propagation in the sodium-hydrogen two-phase flow has been performed ; The governing equations of sodium-hydrogen two phase flow are based on drift flux model. Drift flux model takes care of relative velocity while assuming the temperature between two phase is the same. We include the compressibility of hydrogen in order to treat the pressure wave

propagation according to the amount of hydrogen generated form sodium-water reaction. In addition, governing equations are discretized using an upwind scheme, which is efficient for treating convection terms and the numerical code is constructed by employing SIMPLE algorithm of Patankar. We applied the present code to straight pipe system, pipe link system and pipe loop system. Moreover, we consider a simplified model of KALIMER and predict the pressure wave propagation resulting from sodium-water reaction, and the variation of other variables of this more realistic system. The results of the present research may contribute to the safety of LMR design by analyzing the quasi steady state pressure propagation in vapor evaporator and sodium secondary loop and predicting the pressure and velocity propagation resulting from the water leakage in sodium loop LMR.
DOE
Pressure Distribution; Sodium; Hydrogen; Two Phase Flow

19980210950 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA
Numerical Methods for Accurate Computation of Design Sensitivities
Stewart, Dawn L., Virginia Polytechnic Inst. and State Univ., USA; Jun. 10, 1998; 133p; In English
Report No.(s): AD-A348625; Rept-98-007D; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This work is concerned with the development of computational methods for approximating sensitivities of solutions to boundary value problems. We focus on the continuous sensitivity equation method and investigate the application of adaptive meshing and smoothing projection techniques to enhance the basic scheme. The fundamental ideas are first developed for a one dimensional problem and then extended to 2-D flow problems governed by the incompressible Navier-Stokes equations. Numerical experiments are conducted to test the algorithms and to investigate the benefits of adaptivity and smoothing.
DTIC
Incompressible Flow; Navier-Stokes Equation; Numerical Analysis

19980211040 Lawrence Livermore National Lab., Livermore, CA USA
One-dimensional, steady compressible flow with friction factor and uniform heat flux at the wall specified
Landram, C. S., Lawrence Livermore National Lab., USA; Oct. 27, 1997; 16p; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-ID-128670; DE98-051155; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The purpose of this work is to present generalized graphical results to readily permit passage design for monatomic gases, the results including accommodation of any independently specified friction factor, heat transfer coefficient, and wall heat flux. Only constant area passages are considered, and the specified wall heat flux is taken to be uniform.
DOE
Steady Flow; Compressible Flow; Friction Factor; Heat Flux

19980211078 Technische Univ., Inst. fuer Thermische Verfahrenstechnik, Clausthal-Zellerfeld, Germany
Drop generation at a binary mixture nozzle ***Final Report Tropfenerzeugung an einer Zweistoffduese. Abschlussbericht***
Eckstein, A., Technische Univ., Germany; Jun. 1997; 66p; In German
Contract(s)/Grant(s): DFG Vo 203/39-1
Report No.(s): ETDE-DE-592; DE98-715017; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

Within the framework of this project, extensive investigations were carried out concerning drop formation at a binary mixture nozzle. It was demonstrated that the drops are generated with a constant mean diameter over a wide throughput range. On varying the operating parameters, the following was established: drop diameter decreases as the inner diameter of the needle decreases. Particularly in the single drop domain, drop diameter can be influenced via the throughputs of the disperse and continuous phases. In the single drop domain, it is not the annular gap diameter but the wall thickness of the needle that has great influence on drop diameter. The influence of a large wall thickness can be minimized if the needle is made to jut out considerably. The results for a system with a high boundary surface tension are transferable to a system with a low boundary surface tension.
DOE
Binary Mixtures; Drops (Liquids); Annular Nozzles; Interfacial Tension

19980211080 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. fuer Antriebstechnik, Cologne, Germany
Experimental analysis of secondary flow in turbines (with cooling air ejection) ***Final Report Experimentelle Analyse der Sekundaerstroemungen in Turbinen (mit Kuehlluftausblasung). Abschlussbericht***
Langowsky, C., Editor, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Weyer, H. B., Deutsche Forschungsans-

talt fuer Luft- und Raumfahrt, Germany; Sep. 1997; 124p; In German
Contract(s)/Grant(s): BMBF 032680
Report No.(s): ETDE-DE-593; DE98-715512; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

Film cooling is an effective method of blade surface cooling. to satisfy not only the thermal but also the aerodynamic demand of minimum loss production the detailed knowledge of the interaction between the cooling air and the main flow is necessary. In this work the effect of cooling air ejection on the aerodynamics of the cascade flow and its loss production is studied experimentally with varied Blowing ratios and locations. Furthermore the mixing process of the cooling air jets among the influence of the secondary flow is investigated. to be able to analyse the different superimposed effects (radial pressure gradient, secondary flow) various measurement techniques are used. By means of additional numerical flow simulations origins of the experimental indicated effects could be figured out.
DOE
Film Cooling; Cascade Flow; Gas Turbines; Secondary Flow; Surface Cooling; Air Jets

19980211125 California Univ., Lawrence Berkeley Lab., Berkeley, CA USA
Non-convex profile evolution in two dimensions using volume of fluids
Helmsen, J., California Univ., Lawrence Berkeley Lab., USA; Colella, P., California Univ., Lawrence Berkeley Lab., USA; Puckett, E. G., California Univ., USA; Jun. 1997; 35p; In English
Contract(s)/Grant(s): DE-AC03-76SF-00098
Report No.(s): LBNL-40693; DE98-000157; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A new Volume of Fluid (VoF) method is applied to the problem of surface evolution in two dimensions (2D). The VoF technique is applied to problems that are representative of those that arise in semiconductor manufacturing, specifically photolithography and ion-milling. The types of surface motion considered are those whose etch rates vary as a function of both surface position and orientation. Functionality is demonstrated for etch rates that are non-convex in regard to surface orientation. A new method of computing surface curvature using divided differences of the volume fractions is also introduced, and applied to the advancement of surfaces as a vanishing diffusive term.
DOE
Procedures; Two Dimensional Models; Surface Finishing; Semiconductors (Materials); Models; Computation

19980211290 Manchester Univ., Inst. of Science and Technology, UK
EF Conference in Turbulent Heat Transfer
Jan. 1998; 35p; In English; 2nd, 31 May - Jun. 1998, Manchester, UK; Sponsored by Manchester Univ., UK
Contract(s)/Grant(s): F61775-98-WE001
Report No.(s): AD-A346764; EOARD-CSP-98-1012; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This is an interdisciplinary conference. Topics include: (1) Momentum and Heat Transfer in Simple Shear with or without Velocity Extrema; (2) Low Reynolds Number Phenomena; (3) Effects of Curvature, Rotation, Buoyancy on Heat Transfer; (4) Impingement and Separated Flows; (5) Effects of Streamwise Vortices on Heat Transfer; (6) Control of Turbulent Flow; (7) Transport across Fluid Fluid Interfaces; (8) Progress in Instrumentation; and (9) Review of CFD Test Cases and Inquests.
DTIC
Conferences; Computational Fluid Dynamics; Fluid Mechanics; Turbulent Flow; Turbulent Heat Transfer; Low Reynolds Number; Buoyancy

19980211325 Manchester Univ., Inst. of Science and Technology, UK
EF Conference in Turbulent Heat Transfer
Jun. 1998; 307p; In English; 2nd, 31 May - 4 Jun. 1998, Manchester, UK; Prepared in collaboration with the Engineering Foundation, ASME Heat Transfer Division
Report No.(s): AD-A346540; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

This report on turbulent heat transfer contains the following sessions: (1)measurement and modeling of 3D separated flows, (2) large eddy simulation for industrial flows, and (3) poster papers.
DTIC
Conferences; Turbulent Heat Transfer; Large Eddy Simulation; Convection

19980211326 Manchester Univ., Institute of Science and Technology, UK

EF Conference in Turbulent Heat Transfer, Volume 1, ***May 31 - 4 Jun. 1998***

Jun. 1998; 339p; In English; 2nd, 1998, Manchester, UK; Prepared in collaboration with the Engineering Foundation, ASME Heat Transfer Division

Report No.(s): AD-A346539; JPRS-WER-87-062; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

This report on turbulent heat transfer contains the following sessions: (1) heat transfer under simple shearing, (2) vertical mixed and natural convection, (3) flows with interfaces, (4) separating, impinging, and recovering flows, (5) horizontal, stratified flows, and (6) engineering turbulence models.

DTIC

Conferences; Turbulent Flow; Turbulent Heat Transfer; Turbulence Models; Free Convection

19980211328 Electricite de France, Clamart, France

Numerical modelling 2D and 3D of circulating fluidized bed: Application to the realization of regime diagrams ***Modelisation numerique 2D et 3D de lit fluidise circulant: application a la realisation du diagramme des regimes***

Begis, J., Electricite de France, France; Balzer, G., Electricite de France, France; Feb. 1997; 85p; In French; In English

Report No.(s): EDF-97-NB-00057; DE98-732058; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The numerical modelling of internal CFB boilers flows faced with complex phenomenons due to the flows un-stationariness, the heterogeneousness of the particle size distribution, and interactions between the two phases and the walls. Our study consisted in applying numerical models to the experimental configuration of cold circulating fluidized bed studied at the Cerchar. Special attention was given to the analysis of particles-wall interactions models, stemming from Jenkins (1992) and Louge's (1994) theories, as well as the influence of the particles on fluid turbulence. In order to realize numerical simulations, we have used Eulerian two-phases flow codes developed at NHL medolif(2D), ESTET-ASTRID(3D). From different tests we have deducted that the most appropriate model for the realization of CFB's prediction is the model taking in account the influence of particles on fluid turbulence. Then, to evaluate the validity limits of this model, we have built the regime diagram, and we have compared it with the experimental diagram. We have concluded that the simulation allows to describe the different CFB's working regimes, and especially transitions. We have also noticed the importance of the choice of the mean diameter of the simulated particles. In this way, making a correction of the simulated particles' diameter in comparison with Sauter mean particle diameter, we obtained numerical results in good agreement with experimental data.

DOE

Mathematical Models; Two Phase Flow; Two Dimensional Models; Turbulence; Three Dimensional Models; Fluidized Bed Processors; Boilers; Flow Visualization; Internal Flow; Applications Programs (Computers)

19980211356 Forschungszentrum Rossendorf G.m.b.H., Inst. fuer Sicherheitsforschung, Rossendorf, Germany

Contactless detection of the structure and selected parameters of a two-phase-flow by pattern recognition based ultrasonic techniques ***Final Report Beruehrungslose Detektion der Struktur und Messung ausgewaehlter Parameter von Zweiphasenstroemungen durch Mustererkennungsverfahren unter Verwendung von Ultraschall als Messsonde. Abschlussbericht***

Prasser, H. M., Forschungszentrum Rossendorf G.m.b.H., Germany; Schuetz, P., Forschungszentrum Rossendorf G.m.b.H., Germany; Kossok, N., Forschungszentrum Rossendorf G.m.b.H., Germany; Nov. 1997; 113p; In German

Contract(s)/Grant(s): BMBF 150096

Report No.(s): FZR-203; DE98-741600; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

An ultrasonic measuring method is presented, which allows to measure the volume flow densities of the gas and the liquid phases in a pipeline. A prototype was developed in co-operation with the Technical University of Nishny Novgorod, Russia. It operates in pulse-echo and in pulse-transmission models with wave guide sensors, which can be clamped also on hot pipelines up to 350 C. The basis of the measuring method is a pattern recognition technique. In certain regions of flow rates, it determines the volume flow densities with an error of less than 10%, provided the thermodynamic parameters are almost constant. An extension of the training matrices by adding a thermodynamic parameter (temperature, pressure) allows to apply the classification method for fluids with variable physical properties, too. The pattern recognition and the ultrasonic hardware were experimentally optimised and tested. The ultrasonic signals were also classified by an unsupervised learning procedure. The found clusters show a significant similarity to flow maps known from the literature. It was shown that the method of unsupervised learning can be used

for the automatic setup of flow maps. A special chapter is dedicated to the water level measurement in a segment of the main circulation line of nuclear pressurised water reactors.
DOE
Two Phase Flow; Ultrasonic Tests; Flow Visualization; Pipelines; Pattern Recognition; Density Measurement; Ultrasonic Densimeters; Vapor Phases; Liquid Phases

19980211375 Institutt for Energiteknikk, Kjeller, Norway
Numerical aspects of modelling of coupled chemical reactions and fluid flow in sedimentary basins
Holstad, Astrid, Institutt for Energiteknikk, Norway; Jan. 1998; 16p; In English
Report No.(s): IFE/KR/E-98/002; DE98-748645; ISBN 82-7017-174-3; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Simulation of coupled chemical reactions and fluid flow in porous sedimentary basins, through long time periods, is a numerical challenge. In most models available today the equations representing such a physical problem are solved as PDEs (Partial Differential Equation) where efficient time-stepping with controlled error is very difficult. The DAE (Differential Algebraic Equation) system approach is used where robust adaptive time-stepping algorithms are available in solvers. In this report mathematical and numerical models are derived for coupled chemical reactions and fluid flow. The models have several interesting properties which are discussed. The performance of code is tested.
DOE
Chemical Reactions; Differential Equations; Errors

19980211398 Helsinki Univ. of Technology, Lab. of Applied Thermodynamics, Otaniemi, Finland
An application of the multigrid technique to solve the pressure correction equation of incompressible flow
Miettinen, A., Helsinki Univ. of Technology, Finland; Siikonen, T., Helsinki Univ. of Technology, Finland; 1997; 35p; In English
Report No.(s): TKK-ET/STD-97; DE98-735469; ISBN 951-22-3415-7; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

An implementation of a multigrid technique to solve the pressure correction equation of incompressible flow is described. Two methods, full approximation storage (FAS) and multigrid (MG), were investigated and compared with a single level (SL) iteration technique. Only simple V-cycles were used. The solutions of the equations were always iterated by using the Gauss-Seidel method (GS). The grid of the test problem was 64 x 64, and the problem itself was a pressure correction problem of Driven Cavity Flow at Re=400. The CPU time needed to achieve the machine accuracy of the computer (Indigo 2 Workstation) was measured. The best achieved ratio between MG-GS and SL-GS was 1/145. When using a combination of the FAS technique and fixed V-cycles it was impossible to attain the machine accuracy. to reach the machine accuracy the FAS technique needs sensitive solution cycles, which makes the solver vulnerable. Thus it is recommended to use the MG technique, which can be easily developed after FAS implementation.
DOE
Incompressible Flow; Iteration; Cavity Flow; Cycles

19980211447 NASA Lewis Research Center, Cleveland, OH USA
Mach Number Effects on Turbine Blade Transition Length Prediction
Boyle, R. J., NASA Lewis Research Center, USA; Simon, F. F., NASA Lewis Research Center, USA; Jun. 1998; 15p; In English
Contract(s)/Grant(s): RTOP 523-26-13
Report No.(s): NASA/TM-1998-208404; NAS 1.15:208404; E-11237; Rept-98-GT-367; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The effect of a Mach number correction on a model for predicting the length of transition was investigated. The transition length decreases as the turbulent spot production rate increases. Much of the data for predicting the spot production rate comes from low speed flow experiments. Recent data and analysis showed that the spot production rate is affected by Mach number. The degree of agreement between analysis and data for turbine blade heat transfer without film cooling is strongly dependent of accurately predicting the length of transition. Consequently, turbine blade heat transfer data sets were used to validate a transition length turbulence model. A method for modifying models for the length of transition to account for Mach number effects is presented. The modification was made to two transition length models. The modified models were incorporated into the two-dimensional Navier-Stokes code, RVCQ3D. Comparisons were made between predicted and measured midspan surface heat transfer

for stator and rotor turbine blades. The results showed that accounting for Mach number effects significantly improved the agreement with the experimental data.
Author
Mach Number; Turbine Blades; Mathematical Models; Turbulence Models; Navier-Stokes Equation; Boundary Layer Transition

19980211515 Technical Univ. of Denmark, Inst. for Energiteknik, Lyngby, Denmark
General curvilinear transformation of the Navier-Stokes equations in a 3D polar rotating frame
Michelsen, J. A., Technical Univ. of Denmark, Denmark; Jan. 1998; 24p; In English
Report No.(s): DTU-ET-AFM-98-01; DE98-759836; ISBN 87-7475-197-2; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

In the present study, the polar form of the governing equations for mass and momentum transfer in strong conservation form are discretized in finite volume form on a general curvilinear mesh. The (kappa) - (epsilon) model equations are treated as well, and the treatment of a generic scalar advection equation may easily be inferred. Rotation about the polar axis is included. The study points out the differences between discretization in Cartesian and polar coordinates. Hence, with this study at hand, a Cartesian implementation may be upgraded to treat both Cartesian and polar systems.
DOE
Navier-Stokes Equation; Momentum Transfer; Finite Volume Method; Mass Transfer

19980211619 Stanford Univ., Environmental Fluid Mechanics Lab., Stanford, CA USA
The Structure of Turbulence and Other Motions Beneath an Air-Water Interface ***Final Report, 1 Nov. 1993 - 31 May 1997***
Monismith, Stephen G., Stanford Univ., USA; Street, Robert L., Stanford Univ., USA; Aug. 31, 1997; 10p; In English
Contract(s)/Grant(s): N00014-94-1-0190
Report No.(s): AD-A346510; EFML-97-1; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Both physical experiments and numerical simulation experiments were used to study three-dimensional, unsteady, real-fluid flows beneath the alr-water interface. The focus of the numerical work was the kinematics of the interaction between surface waves and a turbulent current. The numerical method produces a time-accurate, large-eddy simulations of an unsteady turbulent free-surface flow in three space-dimensions. The simulations show that the turbulence in the near-surface region is enhanced by the interactions between non-breaking waves and a turbulent shear current. A novel measurement technique, digital particle tracking velocimetry (DFTV), was developed and used to make near-surface measurements of the velocity field in wavy and non-wavy open channel flows. This approach is based on cross-correlation digital particle image velocimetry (DPIV) and results in significantly improved resolution and accuracy. In particular, this approach allows for the direct measurement of mean squared fluctuating gradients, and thus several important components of the turbulent dissipation.
DTIC
Surface Waves; Air Water Interactions; Fluid Flow; Water Waves; Particle Image Velocimetry; Three Dimensional Flow; Turbulent Flow; Unsteady Flow; Velocity Measurement; Channel Flow

19980213240 Iowa State Univ. of Science and Technology, Dept. of Mechanical Engineering, Ames, IA USA
Large Eddy and Unstructured Grid Methods for Heat Transfer Applications in Propulsion Systems ***Final Report, 15 Feb. 1994 - 14 Feb 1998***
Pletcher, Richard H., Iowa State Univ. of Science and Technology, USA; May 20, 1998; 34p; In English
Contract(s)/Grant(s): F49620-94-1-0168
Report No.(s): AD-A346237; ISU-ERI-AMES-98405; AFRL-SR-BL-TR-98; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Large eddy simulation methods have been developed to compute compressible turbulent flows with heat transfer. The formulation employs preconditioning to permit efficient use in the low Mach number regime. Efficient algorithms have been developed for both vector and parallel processing computer systems. Simulation results have been obtained using a dynamic subgrid-scale model for a channel heated and cooled at temperature ratios as high as 3. Results were also obtained for a channel with uniform wall heat flux heating and cooling with wall to bulk temperature ratios as high as 1.5 for heating and 0.56 for cooling. Density rms fluctuations as high as 9% have been observed for very low Mach number flows with heat transfer. Mean and rms velocity and temperature data were observed to collapse toward incompressible results when plotted in semi-local coordinates. Preliminary results have also been obtained for flow in a rib-roughened channel. The large eddy simulation algorithms were

extended to include the use of unstructured and zonal embedded grids. Particularly, the use of zonal embedded grids show much promise for extending the Reynolds number range for which large eddy simulation can be employed with existing computers.
DTIC
Heat Transfer; Large Eddy Simulation; Unstructured Grids (Mathematics); Propulsion; Turbulent Flow; Compressible Flow; Vector Processing (Computers)

19980213269 Department of the Navy, Washington, DC USA
Flow Control System Having Actuated Elastomeric Membrane
Kirschner, Ivan N., Inventor, Department of the Navy, USA; Apr. 20, 1998; 20p; In English
Patent Info.: Filed 20 Apr. 1998; US-Patent-Appl-SN-062567
Report No.(s): AD-D018999; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A flow control system is used to control fluid flow at the boundary layer of an object or body about or within which the fluid flows relative to the body. The flow control system includes an actuated membrane that is displaced in a direction substantially tangential to the actuated membrane, thereby causing a disturbance or modified shear stress distribution in the boundary layer fluid flow. One or more sensor elements are disposed proximate a top region of the actuated membrane for sensing fluid conditions at the boundary layer flow. A membrane actuator provides the displacement, for example, by extending or contracting the actuated membrane in a direction substantially tangential to the actuated membrane. A feedback device is responsive to a system of sensor elements and is coupled to a system of membrane actuators to cause the displacement in one or more regions of the actuated membrane in response to the sensed fluid conditions. The flow control system controls the fluid flow by providing turbulence modification and reducing drag, radiated noise, and other undesirable effects caused by fluid flow relative to an object.
DTIC
Actuators; Boundary Layers; Elastomers; Membranes; Turbulent Flow

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INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography. For aerial photography see 43 Earth Resources and Remote Sensing. For related information see also 06 Aircraft Instrumentation, and 19 Space Instrumentation.

19980210990 Lawrence Livermore National Lab., Livermore, CA USA
High current pulsed positron microprobe
Howell, R. H., Lawrence Livermore National Lab., USA; Stoeffl, W., Lawrence Livermore National Lab., USA; Kumar, A., Lawrence Livermore National Lab., USA; Sterne, P. A., Lawrence Livermore National Lab., USA; Cowan, T. E., Lawrence Livermore National Lab., USA; Hartley, J., Lawrence Livermore National Lab., USA; May 01, 1997; 6p; In English; 11th; Positron Annihilation, 25-30 May 1997, Kansas City, MO, USA
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-126767; CONF-9705156; DE98-052017; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We are developing a low energy, microscopically focused, pulsed positron beam for defect analysis by positron lifetime spectroscopy to provide a new defect analysis capability at the 10(exp 10) e(+)s(sup -l) beam at the Lawrence Livermore National Laboratory electron linac. When completed, the pulsed positron microprobe will enable defect specific, 3-dimensional maps of defect concentrations with sub-micron resolution of defect location. by coupling these data with first principles calculations of defect specific positron lifetimes and positron implantation profiles we will both map the identity and concentration of defect distributions.
DOE
Linear Accelerators; Microanalysis; Defects; Positrons; Measuring Instruments

19980211002 Department of the Navy, Washington, DC USA
Computer Controlled Optical Tracking System
Houlberg, Christian L., Inventor, Department of the Navy, USA; Hochstetler, James S., Inventor, Department of the Navy, USA; Mar. 17, 1998; 306p; In English; Supersedes US-Patent-Appl-SN-673889
Patent Info.: Filed 1 Jul. 1996; US-Patent-Appl-SN-673889; US-Patent-5,729,338
Report No.(s): AD-D018912; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A system for tracking a target comprising an acquisition sight used by a pilot of an aircraft to acquire and begin tracking the target. Once the pilot acquires the target an operator can use a track handle to track the target. The operator monitors the target utilizing narrow and wide field of view monitors. A computer receives azimuth and elevation data from the tracking device which may be the acquisition sight, track handle, a video tracking system or a tracking radar coupled to an infrared display system. The computer then processes the azimuth and elevation data and provides azimuth and elevation angle signals to a gimbal mirror interface which steers the gimballed mirror to the target. The gimballed mirror receives image forming light from the target and then directs the image forming light to a wide field of view camera and a zoom telescope. The wide field of view camera is connected to the wide field of view monitor to display the target on the wide field of view monitor. The zoom telescope provides a narrow field of view image which is directed to a narrow field of view camera which is connected to the narrow field of view monitor allowing the narrow field of view image of the target to be displayed. The airborne video tracking system also provides for the automatic calibration of the gimballed mirror the acquisition sight and the infrared display system.
DTIC
Target Acquisition; Radar Tracking; Optical Tracking; Display Devices; Infrared Instruments; Tracking Radar

19980211133 NASA Lewis Research Center, Cleveland, OH USA
Application of a Modified Gas Chromatograph to Analyze Space Experiment Combustion Gases on Space Shuttle Mission STS-94
Coho, William K., NASA Lewis Research Center, USA; Weiland, Karen J., NASA Lewis Research Center, USA; VanZandt, David M., Aerospace Design and Fabrication, Inc., USA; May 1998; 29p; In English, 1-6 Mar. 1998, New Orleans, LA, USA; Sponsored by The Pittsburgh Conference, USA
Contract(s)/Grant(s): RTOP 963-10-0B
Report No.(s): NASA/TM-1998-206965; E-11094; NAS 1.15:206965; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A space experiment designed to study the behavior of combustion without the gravitational effects of buoyancy was launched aboard the Space Shuttle Columbia on July 1, 1997. The space experiment, designated as Combustion Module-1 (CM-1), was one of several manifested on the Microgravity Sciences Laboratory - 1 (MSL-1) mission. The launch, designated STS-94, had the Spacelab Module as the payload, in which the MSL-1 experiments were conducted by the Shuttle crewmembers. CM-1 was designed to accommodate two different combustion experiments during MSL-1. One experiment, the Structure of Flame Balls at Low Lewis-number experiment (SOFBALL), required gas chromatography analysis to verify the composition of the known, premixed gases prior to combustion, and to determine the remaining reactant and the products resulting from the combustion process in microgravity. A commercial, off-the-shelf, dual-channel micro gas chromatograph was procured and modified to interface with the CM-1 Fluids Supply Package and the CM-1 Combustion Chamber, to accommodate two different carrier gases, each flowing through its own independent column module, to withstand the launch environment of the Space Shuttle, to accept Spacelab electrical power, and to meet the Spacelab flight requirements for electromagnetic interference (EMI) and offgassing. The GC data was down linked to the Marshall Space Flight Center for near-real time analysis, and stored on-orbit for post-flight analysis. The gas chromatograph operated successfully during the entire SOFBALL experiment and collected 309 runs. Because of the constraints imposed upon the gas chromatograph by the CM-1 hardware, system and operations, it was unable to measure the gases to the required accuracy. Future improvements to the system for a re-flight of the SOFBALL experiment are expected to enable the gas chromatograph to meet all the requirements.
Author
Gas Chromatography; Spaceborne Experiments; Electromagnetic Interference; Combustion Chambers; Combustion Products; Gas Mixtures; Gravitational Effects; Microgravity

19980211351 Florida Inst. of Tech., Environmental Optics and Remote Sensing Lab., Melbourne, FL USA
Shallow Water Optical Water Quality Buoy *Final Report*
Bostater, Charles, Florida Inst. of Tech., USA; Mar. 1998; 27p; In English
Contract(s)/Grant(s): NAG10-151
Report No.(s): NASA/CR-1998-208210; NAS 1.26:208210; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This NASA grant was funded as a result of an unsolicited proposal submission to Kennedy Space Center. The proposal proposed the development and testing of a shallow water optical water quality buoy. The buoy is meant to work in shallow aquatic systems (ponds, rivers, lagoons, and semi-enclosed water areas where strong wind wave action is not a major environmental During the project period of three years, a demonstration of the buoy was conducted. The last demonstration during the project period was held in November, 1996 when the buoy was demonstrated as being totally operational with no tethered communications line. During the last year of the project the buoy was made to be solar operated by large gel cell batteries. Fund limitations did not permit

the batteries in metal enclosures as hoped for higher wind conditions, however the system used to date has worked continuously for in- situ operation of over 18 months continuous deployment. The system needs to have maintenance and somewhat continuous operational attention since various components have limited lifetime ages. For example, within the last six months the onboard computer has had to be repaired as it did approximately 6 months after deployment. The spectrograph had to be repaired and costs for repairs was covered by KB Science since no ftmds were available for this purpose after the grant expired. Most recently the computer web page server failed and it is currently being repaired by KB Science. In addition, the cell phone operation is currently being ftmded by Dr. Bostater in order to maintain the system's operation. The above points need to be made to allow NASA to understand that like any sophisticated measuring system in a lab or in the field, necessary funding and maintenance is needed to insure the system's operational state and to obtain quality factor. The proposal stated that the project was based upon the integration of a proprietary and confidential sensor and probe design that was developed by KB Science and Engineering and is currently patented by KB Science. The buoy's purpose was to collected hyperspectral optical signatures for analysis and resulting estimation of water quality parameters such as chlorophyll-a, seston and dissolved organic matter (DOC). The ultimate goal of the project was to develop a buoy that would integrate a probe to measure upwelling light from a source and thus relate this backscattered light to water quality parameters.
Derived from text
Air Water Interactions; Shallow Water; Water Quality; Buoys

19980211420 Army Research Inst. for the Behavioral and Social Sciences, Fort Benning, GA USA
Night Vision Goggle Research and Training Issues for Ground Forces: A Literature Review ***Final Report, Dec. 1994 - Mar. 1998***
Dyer, Jean L., Army Research Inst. for the Behavioral and Social Sciences, USA; Young, Keith M., Army Research Inst. for the Behavioral and Social Sciences, USA; May 1998; 74p; In English
Report No.(s): AD-A347071; ARI-TR-1082; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
A review of the night vision goggle (NVG) literature published over a 30-year period was conducted to identify NVG training issues that should be addressed to enhance the performance of ground forces. First-, second-, and third-generation image intensification devices are covered. Although the focus is on ground forces, research that addressed aviation issues is also included. The review documents bow soldier performance has improved from advancements in image intensification technology as well as from concerted efforts to address some long-standing training problems. Training research and development issues identified are: determining techniques to train soldiers on NVG technology and its application to night tasks, how to train soldiers to integrate NVGs with other equipment, training to enhance distance estimation abilities of soldiers when using NVGs, and training to improve mounted and dismounted navigation skills with NVGs. Attention must also be paid to developing training techniques that will enable soldiers to overcome the learning plateaus and human factors problems with NVGs so they become truly skilled at night with NVGs.
DTIC
Goggles; Education; Human Factors Engineering; Military Operations; Night Vision

19980213289 Department of the Navy, Washington, DC USA
Photoelastic Stress Sensor
Nadolink, Richard H., Inventor, Department of the Navy, USA; Mar. 17, 1998; 5p; In English; Supersedes US-Patent-Appl-SN-605291, AD-D017957
Patent Info.: Filed 17 Jan. 1996; US-Patent-Appl-SN-605291; US-Patent-5,728,944
Report No.(s): AD-D018984; No Copyright; Avail: US Patent and Trademark Office, Microfiche
A stress detection apparatus is provided. A piece of semiconductor grade, single crystal silicon mounted on the material is illuminated by an infrared source with radiation having a wavelength in the range of 800-1100 nanometers. An infrared detector monitors the photoelastic effects of illuminating the single crystal silicon with the radiation.
DTIC
Stress Analysis; Infrared Detectors

19980213332 Department of the Navy, Washington, DC USA
Optical RF Spectrum Analyzer
Oh, Tae K., Inventor, Department of the Navy, USA; Mar. 31, 1998; 10p; In English; Supersedes US-Patent-Appl-SN-605251, AD-D018194
Patent Info.: Filed 13 Feb. 1996; US-Patent-Appl-SN-605251; US-Patent-5,734,578
Report No.(s): AD-D018962; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An optical RF spectrum analyzer which is suitable for determining the real-time spectral frequency content of radar return signals. The optical RF spectrum analyzer includes a demodulator for demodulating an input RF signal to produce a time-varying voltage signal at its output, and a sample and hold circuit for sampling the time-varying voltage signal to obtain and hold a prescribed number of sample of the time-varying voltage signal during each of successive prescribed frame intervals. At the conclusion of each frame interval, the samples obtained and held during that frame interval are applied to respective inputs of a laser array to drive respective ones of the lasers in the array, whereby the laser array produces a spatial pattern of infrared radiation having a spatial intensity distribution which is indicative of the amplitude distribution of the envelope of the input RF signal over a given frame interval. A first optical subsystem directs the spatial pattern of infrared radiation to strike an exposed surface of the electron trapping (ET) material of a spatial light modulator (SLM). A second optical subsystem directs coherent blue light generated by an argon laser to illuminate the exposed surface of the ET material. The incident infrared radiation releases trapped electronics in the ET material at the exposed locations, resulting in the emissions of incoherent visible light. The incident coherent blue light is selectively absorbed at these exposed locations as it acts to excite ground state electrons back into energy traps. The incoherent visible light which is emitted by the ET-SLM is filtered out by a blue flight filter. The coherent blue light which passes through the ET-SLM is Fourier transformed by a Fourier lens, and then detected by a CCD detector.
DTIC
Spectrum Analysis; Demodulators; Signal Processing

19980214929 OPTRA, Inc., Topsfield, MA USA
High Speed, High Accuracy Stage for Advanced Lithography, Phase 1 ***Final Report, 20 Oct. 1997 - 15 Jun. 1998***
Hercher, Michael, OPTRA, Inc., USA; Jun. 17, 1998; 37p; In English
Contract(s)/Grant(s): DAAH01-98-C-R015
Report No.(s): AD-A347314; Rept-294; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The overall program goal is to develop an integrated stage and metrology system for microlithography, based on the use of an XY encoder grid, meeting the following specifications: (a) 12 x 12 inches coverage, (b) accuracy of +/- 2.5nm or better, (c) operable at a speed of 1 meter/sec, and (d) active control of all 6 degrees of freedom. to this end, the Phase I program had goals of (1) finding one or more suppliers of high-accuracy grids; (2) grid-based measurement repeatability of +/- 2.5nm or better, (3) ability to work at speeds of up to 1 meter/sec, and (4) development of a short-range optical sensor for servo control of the nominally fixed degrees of freedom (Z, theta(x), and theta(y)). With the exception of the velocity specification, these Phase I goals were all met. We were able to work at velocities of up to 790mm/sec, and can readily get to 1 meter/sec by upgrading the speed of the A/D's in our phase processor. Measurement repeatability of +/- 2.5nm was achieved in an environment where the turbulence-limited repeatability of a laser interferometer was on the order of 10nm to 20nm. We found the Etec ALTA laser-writer to be the best machine for making accurate grids.
DTIC
Photolithography; Optical Measuring Instruments; Metrology; High Speed

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LASERS AND MASERS

Includes parametric amplifiers. For related information see also 76 Solid-State Physics.

19980210947 Army Research Lab., Aberdeen Proving Ground, MD USA
Laser Ignition of Propellants and Explosives ***Final Report, Dec. 1993 - Jun. 1994***
Strakovskiy, Leonid, Army Research Lab., USA; Cohen, Arthur, Army Research Lab., USA; Fifer, Robert, Army Research Lab., USA; Beyer, Richard, Army Research Lab., USA; Forch, Brad, Army Research Lab., USA; Jun. 1998; 81p; In English
Contract(s)/Grant(s): DA Proj. 1L1-61102-AH-43
Report No.(s): AD-A348616; ARL-TR-1699; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Laser and radiative ignition of 24 solid propellants and explosives was analyzed. The effect of ignition criterion used to calculate ignition delays from models was evaluated. Values for the optical parameters reflection, R(lambda) and absorption, k(lambda) coefficients at wavelengths 0.36-1, 1.06 and 10.6 microns were summarized. Effects of in-depth absorption and vaporization were considered. Methods for determining the relation of ignition delays for conductive heating (R(lambda) = 1, k(lambda) = infinity) and radiative heating at various wavelengths were developed. Methods for deriving kinetic parameters for the ignition and vaporization mechanisms were developed. Changes in the ignition mechanism at high radiative power/flux are discussed. A summary

of the minimum flux levels needed for ignition and the Arrhenius kinetic parameters determined from ignition delay measurements with several energetic materials is presented.
DTIC
Absorptivity; Lasers; Optical Reflection; Propellants; Solid Propellant Ignition

19980211069 Academy of Sciences (USSR), General Physics Inst., Moscow, USSR
Optical Parametric Oscillator on GaSe Crystal Pumped by a 3 Micron Erbium Laser ***Final Report***
Kulevsky, Lev, Academy of Sciences (USSR), USSR; May 12, 1998; 19p; In English
Contract(s)/Grant(s): F61708-97-W-0128
Report No.(s): AD-A347684; EOARD-SPC-97-4038; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report results from a contract tasking General Physics Institute as follows: The contractor will investigate and develop an optical parametric oscillator based upon a GaSe crystal pumped by a Q-switched and mode-locked Erbium laser as detailed in the attached proposal.
DTIC
Nonlinear Optics; Gallium Selenides; Product Development; Parametric Amplifiers

19980211292 Academy of Sciences (USSR), Inst. of General Physics, Moscow, USSR
Sixth International Workshop on Laser Physics (LPHYS 1997)
Prokhorov, Alexander M., Editor, Academy of Sciences (USSR), USSR; Jan. 1998; 379p; In English; 6th; Laser Physics, 4-8 Aug. 1997, Prague, Czech Republic, USA
Contract(s)/Grant(s): F61708-97-W-0181
Report No.(s): AD-A346696; EOARD-SPC-97-1054; No Copyright; Avail: CASI; A17, Hardcopy; A03, Microfiche
The Final Proceedings for International Workshop on Laser Physics, 4 August 1997 - 8 August 1997. The Topics covered include: (1) New laser sources, (2) measurement and diagnostics, (3) lasers in R&D, (4) communications and informatics, and (5) lasers in medicine.
DTIC
Conferences; Solid State Lasers; Laser Applications; Quantum Electronics

19980211293 Physics and Electronics Lab. TNO, The Hague, Netherlands
Laser Jamming in the 3 to 5 microns Wavelength Band ***Final Report***
vandenHeuvel, J. C., Physics and Electronics Lab. TNO, Netherlands; vanPutten, F. J., Physics and Electronics Lab. TNO, Netherlands; Apr. 1998; 38p; In Dutch; In English
Contract(s)/Grant(s): A95/D/714
Report No.(s): AD-A346689; FEL-97-A382; TDCK-TD98-0151; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The generation of 3 to 5 microns laser radiation and the required powers to jam IR-seekers were investigated in relation to a laser-jamming system. Sufficient powers were reached with two generation methods. The first method used difference frequency generation (DFG) to obtain 4.04 microns radiation using the mixing in LiNbO3 of 1.064 microns and 1.444 microns radiation, which were obtained from two Nd:YAG lasers. The second method used an OPO of BBO to generate tunable radiation around 1.4 microns that was used in the DFG setup to generate tunable 3 to 5 microns radiation. Measurements of the damage threshold of photodiodes confirmed the theoretical considerations that state that the order of magnitude of the damage threshold is 1 J/sq cm.
DTIC
Jamming; Laser Beams; YAG Lasers; Infrared Detectors; Homing Devices

19980211323 Los Alamos National Lab., NM USA
The feed-out process: Rayleigh-Taylor and Richtmyer-Meshkov instabilities in thin, laser-driven foils
Smitherman, D. P., Los Alamos National Lab., USA; Apr. 1998; 194p; In English
Contract(s)/Grant(s): W-7405-ENG-36
Report No.(s): LA-13430-T; DE98-005694; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche
Eight beams carrying a shaped pulse from the NOVA laser were focused into a hohlraum with a total energy of about 25 kJ. A planar foil was placed on the side of the hohlraum with perturbations facing away from the hohlraum. All perturbations were 4 micrometer in amplitude and 50 micrometer in wavelength. Three foils of pure aluminum were shot with thicknesses and pulse lengths respectively of 86 micrometer and 2. 2 ns, 50 micrometer and 4.5 ns, and 35 micrometer with both 2.2 ns and 4. 5 ns pulses.

Two composite foils constructed respectively of 32 and 84 micrometer aluminum on the ablative side and 10 micrometer beryllium on the cold surface were also shot using the 2.2 ns pulse. X-ray framing cameras recorded perturbation growth using both face- and side-on radiography. The LASNEX code was used to model the experiments. A shock wave interacted with the perturbation on the cold surface generating growth from a Richtmyer-Meshkov instability and a strong acoustic mode. The cold surface perturbation fed-out to the Rayleigh-Taylor unstable ablation surface, both by differential acceleration and interface coupling, where it grew. A density jump did not appear to have a large effect on feed-out from interface coupling. The Rayleigh-Taylor instability's vortex pairs overtook and reversed the direction of flow of the Richtmyer-Meshkov vortices, resulting in the foil moving from a sinuous to a bubble and spike configuration. The Rayleigh-Taylor instability may have acted as an ablative instability on the hot surface, and as a classical instability on the cold surface, on which grew second and third order harmonics.
DOE
Taylor Instability; Foils (Materials); Hohlraums; Perturbation; Metal Surfaces; Hydrodynamics; Pulsed Lasers; Combustion Stability

19980211329 New Energy and Industrial Technology Development Organization, Tokyo, Japan
Research cooperation of the development of laser radar for environmental measurements ***Kankyo keisokuyo laser radar no kaihatsu ni kansuru kenkyu kyoryoku***
Mar. 1997; 137p; In Japanese
Report No.(s): NEDO-KKS-LR4-1; DE98-745369; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Research and development of the laser radar for measuring the air pollution in urban areas and the environmental information network have been conducted through the cooperation with Indonesian researchers. A measurement system suitable to actual situation of Indonesia has been constructed. In FY 1996, some works have been conducted as in the final fiscal year. to set the laser radar for environmental measurements and to make a plan of measurement research, conditions of air pollution in Indonesia and setting places of systems have been investigated. Opinions for the cooperation research have been exchanged with Indonesian researchers. Actual trends of the environmental measurements technology using laser radar have been surveyed. Indonesian researchers have been invited to learn operation and data processing of the system. One unit of MIE diffusion laser radar system has been designed and fabricated, and an additional data processing program has been made. The system has been delivered to Jakarta and installed. After the adjustment, performance tests have been conducted to complete the construction of the system.
DOE
Air Pollution; Indonesia; Optical Radar; Environmental Monitoring; Measuring Instruments

19980211427 Illinois Univ., Beckman Inst. for Advanced Sciences and Technology, Urbana-Champaign, IL USA
Electronic Transport in Semiconductor Heterostructures and in Mesoscopic Systems ***Final Report***
Hess, K., Illinois Univ., USA; Jan. 1998; 5p; In English
Contract(s)/Grant(s): N00014-89-J-1470
Report No.(s): AD-A347808; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Much of the work in the past three years has concentrated on creating a predictive simulation tool for edge emitting semiconductor quantum well laser diodes. This simulator (MINILASE 2) has been completed and has been compared to modulation response experiments from the Santa Barbara group. Modulation response has been chosen because it is the most difficult characteristic to predict since nonlinearities enter in a crucial way. The close agreement between experimental and simulation results that is described in publication 15 has necessitated a careful treatment of the device physics. We have included an 8 band k.p bandstructure including the effects of strain. The effects of bandstructure are twofold. It had already been known that bandstructure determines the optical matrix element and therefore is crucial to obtain correct values for optical absorption, spontaneous emission and stimulated emission. Our self-consistent simulator has shown however, that of equal importance is the non-parabolicity which effects the location of the quasi-Fermi levels and therefore the gain. Only a complete simulator such as MINILASE 2 can show this with all its quantitative aspects.
DTIC
Semiconductors (Materials); Electron Energy; Simulators; Semiconductor Lasers

19980211428 Lebedev Physical Inst., Moscow, Russia
Development of Diode-Pumped Color Center Laser with Methane Absorption Cell for Optical Frequency Standard (3.3 Micron Wavelength Range) ***Final Report***
Gubin, Mikhail, Lebedev Physical Inst., Russia; Jan. 1998; 15p; In English
Contract(s)/Grant(s): F61708-97-W-0135

Report No.(s): AD-A347807; EOARD-SPC97-4037; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Lebedev Physics Institute as follows: The contractor will investigate and develop a diode-pumped color-center laser and methane cell for use in developing an optical frequency standard at 3.3 microns. Tasks to be include under this project are: (1) development and investigation of a cw, tunable, color-center laser operating in the 3.0 to 3.3 micron that is pumped by a laser diode (array), (2) establishment of stable operation of two mode operation of the color-center laser, and (3) investigation of the saturated-dispersion resonances on different methane line of the R-branch using the beat frequency between the two modes.

DTIC

Laser Pumping; Optical Properties; Methane; Color Centers; Frequency Standards; Product Development; Absorption Spectra

19980211461 Academy of Sciences (USSR), General Physics Inst., Moscow, USSR

Solid-State Raman Converters for High-Average Power Chemical Oxygen Iodine Laser ***Final Report***

Basiev, Tasoltan T., Academy of Sciences (USSR), USSR; Jan. 1998; 41p; In English

Contract(s)/Grant(s): F61708-97-W-0212

Report No.(s): AD-A346748; EOARD-SPC97-4065; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Laser Materials and Technology Research Center of the General Physics Institute as follows: The contractor will investigate materials for high average power Raman conversion of 1.3 micron laser radiation.

DTIC

Chemical Oxygen-Iodine Lasers; Laser Beams; Laser Materials

19980211521 Dayton Univ., Research Inst., OH USA

Communication Applications for Deformable Mirror Devices ***Final Report, 19 Jan. 1993 - 30 Jun. 1997***

Gustafson, Steven C., Dayton Univ., USA; Little, Gordon R., Dayton Univ., USA; Rhoadarmer, Troy A., Dayton Univ., USA; Tuthill, Theresa A., Dayton Univ., USA; Jun. 1997; 139p; In English

Contract(s)/Grant(s): F33615-92-C-1120; AF Proj. 7662

Report No.(s): AD-A347124; UDR-TR-97-105; WL-TR-97-1153; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This report reviews a technical effort that accomplished computer simulations and experimental demonstrations of piston-type micro-mirror arrays for laser beam steering, shaping, and aberration correction. especially simulations and demonstrations with possible relevance for communication applications. The effort successfully investigated the use of micro-mirror arrays for laser beam manipulations and illustrated both their potential advantages in terms of small size, high ruggedness and low cost and their potential limitations in terms of small beam steering range and, in particular low optical efficiency due to inactive inter-micro-mirror space, lack of tilt control, and diffraction into undesired orders. The report concludes that micro-mirror arrays could be useful in applications where high optical efficiency is not a priority; otherwise continuous mirrors with micromechanical actuation are likely to provide the best fine beam steering and beam shaping or aberration correction performance while retaining the potential advantages of small size, high ruggedness. and low cost.

DTIC

Computerized Simulation; Deformable Mirrors; Micromechanics; Laser Beams

19980211522 KJT, Inc., Rochester, NY USA

Mode Locked Fiber Lasers and Their Applications ***Final Report, Mar. 1996 - Mar 1997***

Teegarden, Kenneth J., KJT, Inc., USA; Jun. 1998; 25p; In English

Contract(s)/Grant(s): F30602-96-C-0069; AF Proj. 4600

Report No.(s): AD-A347098; AFRL-SN-RS-TR-1998-97; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A modelocked fiber laser design was fabricated and tested at Rome Laboratory. Significant features are a fully integrated portable assembly and complete freedom from polarization sensitivity. A remarkable low threshold power of 50 mw enables use of single element laser diode pumping. Extensive optimization of the Multiple Quantum Well Saturable Absorber has resulted in stable 10 pico second pedestal free modelocked pulses in a passive self-starting configuration. Active model-locking was also investigated but was found to generate longer pulses. Synchronization with a second fiber laser was demonstrated to increase the repetition rate by more than order of magnitude. Soliton pulse shaping in the cavity is indicated but requires further work to establish. The signal pulses are transform limited and can support data rates exceeding the limitations of present state of the art diode based laser sources.

DTIC

Semiconductor Lasers; Laser Mode Locking; Diodes; Quantum Wells

19980211696 Optical Society of America, Washington, DC USA
1997 Technical Digest Series, Volume 7, Applications of High Field and Short Wavelength Sources VII
Mar. 1997; 289p; In English; Applications of High Field and Short Wavelength Sources VII, 19-22 Mar. 1997, Santa Fe, NM, USA; Sponsored by Optical Society of America, USA
Report No.(s): AD-A346561; AFRL-SR-BL-TR-98-0494-Vol-7; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

This report documents the information presented at the conference on Applications of High field and Short wavelength sources 7. The conference was held at Eldorado Hotel in Santa Fe, New Mexico from 19th to 22nd of March 97. The conference was sponsored and managed by Optical Society of America. The purpose of the symposia was to bring together scientists and engineers in lasers and atomic physics in order to report the most recent results and to simulate new disciplinary activity. One of highlights of the symposium this year was a series of excellent physics talks on such topics as laser produced plasmas, Harmonics, and high field laser electron interactions.
DTIC
Conferences; Lasers; Plasma Generators; Atomic Physics

37
MECHANICAL ENGINEERING

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

19980210989 Lawrence Livermore National Lab., Livermore, CA USA
Beam profile analysis for the C&MS B231 electron beam welding machines
Elmer, J. W., Lawrence Livermore National Lab., USA; Teruya, A. T., Lawrence Livermore National Lab., USA; Gauthier, M., Lawrence Livermore National Lab., USA; Jun. 12, 1997; 19p; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-ID-127549; DE98-050678; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The electron beams produced by two different welders were examined using computer assisted tomographic (CT) analysis. The machines used are Hamilton Standard welders with 150 kV/50mA maximum. One machine uses a ribbon filament while the other uses a hairpin filament. The objective of this study was to characterize the beam power distribution on each machine to see if weld parameters could easily be transferred between machines. Beam focus, voltage, and current settings were pre-selected to duplicate the welding conditions used in LLNL program applications. The results show that the actual beam currents measured by Faraday cup are 5 to 10% higher for the first machine and 30% lower for the second. The CT analysis of the beam shapes shows that the hairpin filament welder produces an elliptical beam shape in the sharp focus condition that defocuses to a diamond shape. The ribbon filament welder produced less of an elliptical beam shape in the sharp focus condition, but when defocused, acquires an elliptical shape. CT analysis of the effects of defocus on the peak power density shows that the hairpin filament drops in peak power density much more quickly than the ribbon filament for a given amount of defocus. Furthermore, it was more difficult to find and repeat the sharp focus condition for the hairpin filament, particularly at higher beam currents.
DOE
Electron Beam Welding; Electron Beams; Welding Machines; Welding

19980211020 Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht, Germany
Laser and electron beam welding of Ti-alloys: Literature review
Cam, G., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Santos, J. F. dos, Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Kocak, M., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; 1997; ISSN 0344-9629; 34p; In English
Report No.(s): GKSS-97/E/35; DE98-742194; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The welding of titanium alloys must be conducted in completely inert or vacuum environments due to the strong affinity of titanium to oxygen. Residual stresses in titanium welds can greatly influence the performance of a fabricated aerospace component by degrading fatigue properties. Moreover, distortion can cause difficulties in the final assembly and operation of high-tolerance aerospace systems. Power beam welding processes, namely laser and electron beam welding, offer remarkable advantages over conventional fusion welding processes and have a great potential to produce full-penetration, single-pass autogenous welds with minimal component distortion due to low heat input and high reproducibility of joint quality. Moreover, electron beam welding process, which is conducted in a vacuum chamber, inherently provides better atmospheric protection. Although considerable

progress has been made in welding of titanium alloys by power beam processes, there is still a lack of a complete set of mechanical properties data of these joints. Furthermore, the problem of solid-state cracking in fusion welding of (gamma)-TiAl intermetallic alloys due to their low ductility is still to be overcome. The purpose of this literature review is to outline the progress made in this area and to provide basic information for the Brite-Euram project entitled assessment of quality of power beam weld joints 'ASPOW'.
DOE
Aerospace Systems; Electron Beam Welding; Fusion Welding; Laser Welding; Mechanical Properties; Welded Joints

19980211036 Alvar Engine A.B., Lund, Sweden
Alvar variable compression engine development ***Final Report***
Mar. 30, 1998; 4p; In English
Contract(s)/Grant(s): DE-FG01-95EE-15618
Report No.(s): DOE/EE/15618-T1; DE98-005069; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The Alvar engine is an invention by Mr. Alvar Gustafsson of Skarblacka, Sweden. It is a four stroke spark ignition internal combustion engine, having variable compression ratio and variable displacements. The compression ratio can be varied by means of small secondary cylinders and pistons which are communicating with the main combustion chambers. The secondary pistons can be phase shifted with respect to the main pistons. The engine is suitable for multi-fuel operation. Invention rights are held by Alvar Engine AB of Sweden, a company created to handle the development of the Alvar Engine. A project was conceived wherein an optimised experimental engine would be built and tested to verify the advantages claimed for the Alvar engine and also to reveal possible drawbacks, if any. Alvar Engine AB appointed Gunnar Lundholm, professor of Combustion Engines at Lund University, Lund, Sweden as principal investigator. The project could be seen as having three parts: (1) Optimisation of the engine combustion chamber geometry; (2) Design and manufacturing of the necessary engine parts; and (3) Testing of the engine in an engine laboratory NUTEK, The Swedish Board for Industrial and Technical Development granted Gunnar Lundholm, SEK 50000 (about $6700) to travel to the US to evaluate potential research and development facilities which seemed able to perform the different project tasks.
DOE
Compression Ratio; Engine Design; Engine Parts; Combustion; Internal Combustion Engines

19980211070 Southampton Univ., Systems Engineering Faculty, UK
Intelligent Tool Condition Monitoring in Milling Operation
Fu, Pan, Southampton Univ., UK; Hope, A. D., Southampton Univ., UK; King, G. A., Southampton Univ., UK; Jan. 1998; 10p; In English
Report No.(s): AD-A347671; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

One of the most important features of the modern machining system in an "unmanned" factory is to change tools that have been subjected to wear and damage. An integrated system composed of multi-sensors, signal processing device and intelligent decision making plans is a necessary requirement for automatic manufacturing process. An intelligent tool wear monitoring system for milling operation will be introduced in this report. The system is equipped with four kinds of sensors, signal transforming and collecting apparatus and microcomputer. A unique ANN (Artificial Neural Network) driven fuzzy pattern recognition algorithm has been developed from this research. It can fuse the information from multiple sensors and has strong learning and noise suppression ability. This lead to successful tool wear classification under a range of machining conditions.
DTIC
Computer Aided Manufacturing; Monitors; Milling (Machining); Manufacturing; Industrial Plants

19980211298 Auburn Univ., AL USA
Repair welding of fusion reactor components ***Final Report***
Chin, B. A., Auburn Univ., USA; Wang, C. A., Auburn Univ., USA; Sep. 30, 1997; 233p; In English
Contract(s)/Grant(s): DE-FG05-91ER-54134
Report No.(s): DOE/ER/54134-T1; DE98-005122; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The exposure of metallic materials, such as structural components of the first wall and blanket of a fusion reactor, to neutron irradiation will induce changes in both the material composition and microstructure. Along with these changes can come a corresponding deterioration in mechanical properties resulting in premature failure. It is, therefore, essential to expect that the repair and replacement of the degraded components will be necessary. Such repairs may require the joining of irradiated materials

through the use of fusion welding processes. The present ITER (International Thermonuclear Experimental Reactor) conceptual design is anticipated to have about 5 km of longitudinal welds and ten thousand pipe butt welds in the blanket structure. A recent study by Buende et al. predict that a failure is most likely to occur in a weld. The study is based on data from other large structures, particularly nuclear reactors. The data used also appear to be consistent with the operating experience of the Fast Flux Test Facility (FFTF). This reactor has a fuel pin area comparable with the area of the ITER first wall and has experienced one unanticipated fuel pin failure after two years of operation. The repair of irradiated structures using fusion welding will be difficult due to the entrapped helium. Due to its extremely low solubility in metals, helium will diffuse and agglomerate to form helium bubbles after being trapped at point defects, dislocations, and grain boundaries. Welding of neutron-irradiated type 304 stainless steels has been reported with varying degree of heat-affected zone cracking (HAZ). The objectives of this study were to determine the threshold helium concentrations required to cause HAZ cracking and to investigate techniques that might be used to eliminate the HAZ cracking in welding of helium-containing materials.
DOE
Welding; Maintenance; Fusion Welding; Reliability; Reactor Materials; Welded Joints; Experiment Design

19980211357 Technische Univ., Berlin, Germany
Blades and disks in gas turbines. Material and component behaviour: Project department D *Final Report Schaufeln und Scheiben in Gasturbinen. Werkstoff- und Bauteilverhalten: Projektbereich D. Abschlussbericht*
Apr. 1997; 461p; In German
Report No.(s): ETDE-DE-655; DE98-743145; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The Special Research Department No. 339, ”Disks and Blades in Gas Turbines - Material and Component Characteristics” received financial support from 1988 through 1996. This final report discusses activities of the years 1994, 1995, and 1996. Project group D, ”Production and Quality Assurance”, investigated rotors and blades. Grinding techniques were developed and optimized for nickel base materials, and the effects of grinding on the marginal zones was investigated, including an analysis of intrinsic stresses induced by machining. In the field of ceramics, separation and production of reinforced ceramics was investigated, and techniques for vacuum soldering of ceramic/ceramic and ceramic/metal compounds for high-temperature applications were developed. In the framework of a part-project carried out at HMI, neutron diffraction was used for nondestructive analysis of volume intrinsic stresses near the joint both on model geometries and on the joint between metal shaft and ceramic rotor. The development and application of computerized tomography for testing of ceramic rotors and joints was an important contribution to quality assurance.
DOE
Ceramics; Gas Turbines; Quality Control; Disks (Shapes); Composite Materials; Rotors; Heat Resistant Alloys; Manufacturing; Turbine Blades

19980211407 Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht, Germany
Status of the Engineering Treatment Model for Mis-Matched Welds (ETM-MM) Handbook
Schwalbe, K. H., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Hao, S., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Cornec, A., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Kocak, M., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Second International Symposium on Mis-Matching of Interfaces and Welds: Performance of Strength Mis-Matched Welded or Bonded Joints; 1997; ISSN 0344-9629, pp. 675-690; In English; 2nd; Mis-Matching of Interfaces and Welds: Performance of Strength Mis-Matched Welded or Bonded Joints, 24-26 Apr. 1996, Reinstorf-Lueneburg, Germany
Report No.(s): GKSS-97/E/43; CONF-9604243; DE98-746532; ISBN 3-00-001951-0; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The Engineering Treatment Model (ETM) has been extended to heterogeneous structures such as yield strength mismatched welded joints. The document ETM-MM describes four levels with increasing complexity. On the first level mismatch can be ignored if specific conditions are satisfied. The second level refers to the ETM for homogeneous structures, and mismatch is accounted for by using the lowest yield strength and hardening exponent of the weld metal and base plate, respectively. Within a specified window the third level can be used which is based on all weld metal configurations. If the mismatch yield load solution is available the fourth level can be applied which represents a solution of general validity. Some examples for validation are presented.
DOE
Heterogeneity; Yield Strength; Welded Joints; Handbooks

19980211463 NASA Marshall Space Flight Center, Huntsville, AL USA

A Case Study for Probabilistic Methods Validation (MSFC Center Director's Discretionary Fund, Project No. 94-26) ***Final Report***

Price J. M., NASA Marshall Space Flight Center, USA; Ortega, R., NASA Marshall Space Flight Center, USA; Jul. 1998; 24p; In English

Report No.(s): NASA/TM-1998-208529; NAS 1.15:208529; M-878; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Probabilistic method is not a universally accepted approach for the design and analysis of aerospace structures. The validity of this approach must be demonstrated to encourage its acceptance as it viable design and analysis tool to estimate structural reliability. The objective of this Study is to develop a well characterized finite population of similar aerospace structures that can be used to (1) validate probabilistic codes, (2) demonstrate the basic principles behind probabilistic methods, (3) formulate general guidelines for characterization of material drivers (such as elastic modulus) when limited data is available, and (4) investigate how the drivers affect the results of sensitivity analysis at the component/failure mode level.

Author

Probability Distribution Functions; Aircraft Structures; Component Reliability; Failure Modes

19980211579 University of Western Ontario, Dept. of Mechanical and Materials Engineering, London, Ontario Canada

Automatic machinery fault detection and diagnosis using fuzzy logic

Mechefske, Chris K., University of Western Ontario, Canada; 1998; 10p; In English

Report No.(s): AD-A347295; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Vibration based machine condition monitoring (MCM) incorporates a number of machinery fault detection and diagnostic techniques. Many of the machinery fault diagnostic techniques involve automatic signal classification in order to increase accuracy and reduce errors caused by subjective human judgment. In this paper Fuzzy logic techniques have been applied to classify frequency spectra representing various rolling element bearing faults. The frequency spectra have been processed using a variety of Fuzzy set shapes. The application of basic Fuzzy logic techniques has allowed Fuzzy numbers to be generated which represent the similarity between two frequency spectra. Correct classification of different bearing fault spectra was observed when the correct combination of Fuzzy set shapes and degree of membership criterion were used. The problem of membership overlapping found in previous studies, where classifying individual spectrum with respect to spectra that represent true fault classes was not conclusive, has been overcome. Further work is described which will extend this technique for application with other classes of machinery using generic software.

DTIC

Fault Detection; Machinery; Fault Tolerance

19980211693 Technische Univ., Sonderforschungsbereich 339 - Schaufeln und Scheiben in Gasturbinen - Werkstoff- und Bauteilverhalten, Berlin, Germany

Blades and discs in gas turbines. Behaviour of material and components: Project department A-C ***Final Report Schaufeln und Scheiben in Gasturbinen. Werkstoff- und Bauteilverhalten: Projektbereiche A bis C. Abschlussbericht***

Apr. 1997; 461p; In German

Report No.(s): ETDE-DE-659; DE98-746217; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The special research area 339 'Blades and discs in gas turbines, behaviour of material and components' was carried on from 1988 to the end of 1196. This final report deals with the work in the years 1994, 1995 and 1996. In the project area A 'Development of material' manufacturing processes both for metallic and ceramic high temperature materials were developed, tested and optimised. In the area of optimising casting structure, it was shown that the making grains finer up to the medium temperature range can be a suitable means for significantly raising the resistance to LCF loading with nearly unchanged heat and creep strength properties. Another main point was the characterisation and optimisation of sprayed ceramic layers on metallic substrates (heat insulating layers) and compound ceramic materials. In project area B 'Material behaviour' the mechanisms were studied, which, particularly in metallic high temperature materials such as nickel-based superalloys, lead to failure of the material under thermo-mechanical stresses. In project area C 'Component design', on the one hand models for estimating service life for metallic high temperature materials under different thermo-mechanical stresses were developed.

DOE

Heat Resistant Alloys; Turbine Blades; Refractory Materials; Ceramics; Sprayed Coatings; Gas Turbines; Mechanical Properties; Composite Materials

19980213268 Department of the Navy, Washington, DC USA

Roller Excitation Device

Gray, Charles E., Inventor, Department of the Navy, USA; Wiedenheft, John H., III, Inventor, Department of the Navy, USA; Sep. 29, 1997; 17p; In English

Patent Info.: Filed 29 Sep. 1997; US-Patent-Appl-SN-976132

Report No.(s): AD-D018998; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

The invention is directed to a roller excitation device for frictionally engaging and turning rollers of a roller box assembly. The roller box assembly is of the type that includes a generally U-shaped housing having a partial tube which covers the open end of the housing, and a plurality of rollers captured by the housing. The rollers and partial tube define a space through which a cable is received. The arrangement being such that the rollers are adapted to roll upon engaging the cable located in the space defined by the tube and rollers. The roller excitation device includes a body portion fabricated from resilient material and sized for occupying the space defined by the tube and roller and for frictionally engaging the rollers, and means for moving the body portion over the rollers. Preferably, the body portion has an outer surface with a plurality of ribs extending outwardly along the circumference of the body portion. The ribs engage the rollers for causing them to turn upon moving the body portion thereover.

DTIC

Rollers; Excitation

19980213281 Department of the Navy, Washington, DC USA

Roller Shaft Extractor

Strong, David N., Inventor, Department of the Navy, USA; Mar. 17, 1998; 6p; In English; Supersedes US-Patent-Appl-SN-716700, AD-D018203

Patent Info.: Filed 19 Sep. 1996; US-Patent-Appl-SN-716700; US-Patent-5,727,298

Report No.(s): AD-D018982; No Copyright; Avail: US Patent and Trademark Office, Microfiche

All extractor for use in removing a solid. smooth. press fit shaft from a housing where access to the shaft is restricted The extractor has a jacket and a collet. The collet fits around the shaft and the collet in turn fits within the jacket. The exterior of the collet end within which the shaft is placed is tapered and this tapered portion of the collet fits within a similarly tapered bore in the jacket. The collet has a threaded end opposite the tapered portion and the threaded end protrudes from the jacket when the tapered portion is fully seated within the tapered bore of the jacket. A nut is placed onto the threaded end and tightened such that the collet is pulled further into the jacket. The movement of the tapered portion within the tapered bore creates a wedging action which forces the collet against the shaft As the nut is further tightened. the collet grips the shaft tighter. when the collet is sufficiently tightened about the shaft. jacking screws are inserted through a flange on the jacket and brought to bear against the shaft housing. Turning the jacking screws pulls the jacket. collet and attached shaft free of the housing.

DTIC

Rollers; Shafts (Machine Elements)

19980214888 Department of the Navy, Washington, DC USA

Method and Apparatus for Controlling Backlash in Motor Drive Systems

Rothstein, Barry R., Inventor, Department of the Navy, USA; Paden, Bradley E., Inventor, Department of the Navy, USA; Mar. 17, 1998; 12p; In English

Patent Info.: Filed 3 Feb. 1997; US-Patent-Appl-SN-790884; US-Patent-5,729,100

Report No.(s): AD-D018935; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An anti-backlash gearing system which includes first and second drive gears which mesh with a driven gear to provide torque and rotational motion to the driven gear. The drive gears are each driven by a motor, while the driven gear drives a load. The anti-backlash gearing system uses a microprocessor to control the command voltage R to each of the drive motors. The command voltage R provided to each drive motor also includes an offset delta which may be positive for one motor and negative for the other motor. The torque provided by one motor and its associated drive gear to the driven gear may be in the positive direction (clockwise direction), while the torque provided by the other motor and its associated drive gear to the driven gear is in the negative direction (counterclockwise direction). The motors are driven In opposite directions to control the backlash on the gears. As a sign change in torque is about to occur for one of the motors, there is a correction made to the torque curves for each motor so that the commanded torque for each individual motor and its associated drive gear adds up to the total commanded torque for the two motors. This substantially reduces backlash and the resultant impact loading on the gear teeth of the drive gears and the driven gear of the gear train.

DTIC

Gears; Equipment

19980214908 Department of the Navy, Washington, DC USA

High Speed Magnetostrictive Linear Motor

Teter, Joseph P., Inventor, Department of the Navy, USA; Jan. 06, 1998; 9p; In English; Supersedes US-Patent-Appl-SN-433857
Patent Info.: Filed 2 May 1995; US-Patent-Appl-SN-433857; US-Patent-5,705,863
Report No.(s): AD-D018929; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A linear actuator having a magnetostrictive rod is magnetically energized under analog logic control in operative relation to a pair of electrically disengaged one way locking devices one of which is interconnected with the actuator through a stroke multiplier for high force, high speed motor drive. Two stage operation of the stroke multiplier is effected through levers angularly displaced by angular deformation of the magnetostrictive rod about a pivotal axis offset from the rod axis by means of a flexible support for such levers to avoid wear and backlash.

DTIC

Electric Motors; High Speed; Magnetostriction; Actuators

19980214931 Pennsylvania State Univ., State College, PA USA

Wear Particle Analysis Results for Variably Loaded Single Reduction Helical Gearboxes

Merdes, Terri A., Pennsylvania State Univ., USA; Lang, Derek C., Pennsylvania State Univ., USA; Kozlowski, James D., Pennsylvania State Univ., USA; Meister, Karen, Pennsylvania State Univ., USA; Jan. 1998; 7p; In English
Report No.(s): AD-A347308; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Mechanical Diagnostic Test Bed (MDTB) was constructed as a multisensor instrumented gear/transmission test stand by the Pennsylvania State University in the area of Condition-Based Maintenance (CBM). The MDTB data acquisition system is capable of recording (using PC-LabWindows) transitional run-to-failure data sets from a variety of commensurate and non-commensurate (vibration, oil, temperature, and acoustic emission) sensors. Off-line JOAP oil analysis results (ferrography) for samples collected from industrial grade (off-the-shelf) single-pair helical gearboxes subjected to sustained output loads of 2-3 times their rated maximum torque are presented. The off-line oil ferrography results indicated a much higher sliding and cutting wear particle content for the higher loaded (3X maximum torque) experiments. This agrees with intuition. One of the goals of this research is to fuse oil sensor information on lubricant condition in an on-line manner with vibration (accelerometer) data as well as with acoustic emission and thermographic sensor data in order to effectively detect developing or incipient faults, and to predict (with confidence bounds) the remaining useful life of the system (gearbox).

DTIC

Maintenance; Test Stands; Transmissions (Machine Elements); On-Line Systems; Gears; Acoustic Emission

19980214932 Pennsylvania State Univ., State College, PA USA

Model-Based Diagnostics of Gas Turbine Engine Lubrication Systems

Byington, Carl S., Pennsylvania State Univ., USA; Jan. 1998; 10p; In English
Contract(s)/Grant(s): N00014-96-1-0271
Report No.(s): AD-A347307; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The objective of the current research was to develop improved methodology for diagnosing anomalies and maintaining oil lubrication systems for gas turbine engines. The effort focused on the development of reasoning modules that utilize the existing, inexpensive sensors and are applicable to on-line monitoring within the full-authority digital engine controller (FADEC) of the engine. The target application is the Enhanced TF-40B gas turbine engine that powers the Landing Craft Air Cushion (LCAC) platform. to accomplish the development of the requisite data fusion algorithms and automated reasoning for the diagnostic modules, Penn State ARL produced a generic Turbine Engine Lubrication System Simulator (TELSS) and Data Fusion Workbench (DFW). TELSS is a portable simulator code that calculates lubrication system parameters based upon one-dimensional fluid flow resistance network equations. Validation of the TF-40B modules was performed using engineering and limited test data. The simulation model was used to analyze operational data from the LCAC fleet. The TELSS, as an integral portion of the DFW, provides the capability to experiment with combinations of variables and feature vectors that characterize normal and abnormal operation of the engine lubrication system. The model-based diagnostics approach is applicable to all gas turbine engines and mechanical transmissions with similar pressure-fed lubrication systems.

DTIC

Gas Turbine Engines; Lubrication Systems; Diagnosis; On-Line Systems; Electronic Control; Fluid Flow

19980214933 Lund Univ., Sweden

On the Relation Between Operating Conditions and Changes in Vibration Signature: A Case Study in Paper Mill

Al–Najjar, Basim, Lund Univ., Sweden; Jan. 1998; 11p; In English

Report No.(s): AD-A347306; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To achieve effective diagnosis and prognosis, relevant and reliable data from the surroundings are required in addition to the vibration measurements. The paper classifies stoppage times and highlights the reasons behind them. Also, it discusses the consequential economic losses incurred by unplanned stoppages. Further, it presents a new approach to envelope alarming, which is called dynamic alarm. It is applicable to identical bearings and those of approximately identical vibration signatures. One of the important conclusions from this study is that it is not only the variation in the machine loading which affects the amplitudes of the bearing defect frequencies, but also the machine speed does. Therefore, changes in the machine speed and load should be considered when interpreting vibration spectra. This will improve the effectiveness of vibration diagnosis and prediction of the time to replacement. During the period covered by this study, which is fifty eight days, it was found that the total stoppage time due to unknown reasons was very large and caused appreciable economic losses of about 2,3 millions SEK. The dynamic alarm is shown theoretically to offer later renewal with fewer failures, and therefore lower cost and higher productivity.
DTIC
Vibration; Diagnosis; Vibration Measurement; Industrial Plants

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QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

19980210886 Sandia National Labs., Albuquerque, NM USA
Nondestructive inspection assessment of eddy current and electrochemical analysis to separate inconel and stainless steel alloys
Moore, D. G., Sandia National Labs., USA; Sorensen, N. R., Sandia National Labs., USA; Feb. 1998; 72p; In English
Contract(s)/Grant(s): DE-AC04-94AL-85000
Report No.(s): SAND-98-0319; DE98-004154; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This report presents a nondestructive inspection assessment of eddy current and electrochemical analysis to separate inconel alloys from stainless steel alloys as well as an evaluation of cleaning techniques to remove a thermal oxide layer on aircraft exhaust components. The results of this assessment are presented in terms of how effective each technique classifies a known exhaust material. Results indicate that either inspection technique can separate inconel and stainless steel alloys. Based on the experiments conducted, the electrochemical spot test is the optimum for use by airframe and powerplant mechanics. A spot test procedure is proposed for incorporation into the Federal Aviation Administration Advisory Circular 65-9A Airframe & Powerplant Mechanic - General Handbook.
DOE
Inspection; Eddy Currents; Electrochemistry; Analytical Chemistry; Inconel (Trademark); Stainless Steels; Oxides

19980211037 Lawrence Livermore National Lab., Livermore, CA USA
Nondestructive evaluation
Martz, H. E., Lawrence Livermore National Lab., USA; Feb. 01, 1997; 50p; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-ID-125476; DE98-050686; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Research reported in the thrust area of nondestructive evaluation includes: advanced 3-D imaging technologies; new techniques in laser ultrasonic testing; infrared computed tomography for thermal NDE of materials, structures, sources, and processes; automated defect detection for large laser optics; multistatic micropower impulse radar imaging for nondestructive evaluation; and multi-modal NDE for AVLIS pod shielding components.
DOE
Nondestructive Tests; Imaging Techniques; Lasers; Ultrasonic Tests; Detection; Multistatic Radar; Tomography

19980211566 Research Inst. for Informatics, Bucharest, Romania
Using Expert Systems for Fault Detection and Diagnosis in Industrial Applications
Alexandru, Adriana A., Research Inst. for Informatics, Romania; 1998; 9p; In English
Report No.(s): AD-A347351; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper intended to motivate the introduction of the expert Systems within the supervisory systems used in the automatic control of the industrial processes. Some concepts related to the problem of supervision and diagnosis, as well as the functions and principles associated are briefly presented. Emphases is given to the use of expert systems for diagnostic purposes. Some results obtained by the author in implementing an expert shell and using it in building real time expert systems for performance analysis and diagnosis are presented. The contribution shows how the fault detection and accommodation can be achieved through a proper integration of in process on-line monitoring and diagnosis expert system.
DTIC
Expert Systems; Fault Detection; Diagnosis; Fault Tolerance

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STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress. For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance.

19980210900 Cranfield Univ., Royal Military Coll. of Science, Bedford, UK
Stability of Arrays of Multiple-Edge Cracks *Final Report*
Parker, Anthony P., Cranfield Univ., UK; Jun. 1998; 26p; In English
Report No.(s): AD-A348587; ARCCB-CR-98009; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The creation and subsequent shedding of arrays of edge cracks is a natural phenomenon which occurs in heat-checked gun tubes, rapidly cooled pressure vessels, and rock, dried-out mud flats, paint, and concrete and in ceramic coatings and permafrost. The phenomenon covers five orders of magnitude in crack spacing. A simple model is developed which indicates that the shedding behavior is governed by energy release from individual cracks rather than global energy changes. The model predicts that all cracks will deepen until a crack-spacing/crack-depth ratio (2h/a) of 3.0 is achieved, at which stage crack-shedding will commence. Two out of every three cracks will be shed, leading to a new (higher) crack-spacing/crack-depth ratio at which stage growth of all currently active cracks will be dominant. An approach based upon rapid, approximate methods for determining stress intensity provides good indications of behavior provided near-surface stress gradients are not excessive. in cases where stress gradients are high, it is shown that it is necessary to employ numerical techniques in calculating stress intensity. Two specific examples are presented, the first at very small scale (heat-check cracking, typical crack spacing 1 mm) and the second very large scale (permafrost cracking, typical crack spacing 20m). The predicted ratios for the proportion of cracks shed and for crack-spacing/crack-depth are in agreement with experimental evidence for gun tubes, concrete, and permafrost. The ratios also appear to match experimental observations of 'island delamination' in ceramic coatings and paint films.
DTIC
Crack Propagation; Stress Intensity Factors; Stress Distribution; Edge Cracks; Delaminating; Cracks; Ceramic Coatings

19980211405 Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht, Germany
Fracture simulation of undermatched interleaf in bending using a cohesive zone model
Lin, G., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Kim, Y. J., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Cornec, A., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Schwalbe, K. H., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Second International Conference on Mis-Matching of Interfaces and Welds: Performance of Strength Mis-Matched Welded or Bonded Joints; 1997; ISSN 0344-9629, pp. 343-355; In English; 2nd; Mis-Matching of Interfaces and Welds: Performance of Strength Mis-Matched Welded or Bonded Joints, 24-26 Apr. 1996, Reinstorf-Lueneburg, Germany
Report No.(s): GKSS-97/E/41; CONF-9604243; DE98-746527; ISBN 3-00-001951-0; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

Simulation of crack growth in an interleaf bending specimen consisting of a metal interleaf bonded between two elastic substrates, with a crack located in the center of the metal, is conducted via a 2-D plane strain, finite element (FE) analysis. The fracture process is modeled using a cohesive zone model (CZM) where the fracture process is treated as a microscale strip (cohesive zone) and is represented by a continuum traction-separation law. Attention is focused on two issues. Firstly, the parameters affecting fracture resistance are studied systematically, emphasizing the roles of microstructural parameters and continuum properties of solids. Secondly, the effect of the interleaf thickness on failure (crack initiation and subsequent crack growth) is investigated. The results show that the interleaf thickness almost does not affect crack initiation. For all specimens considered, crack initiation takes place at the crack tip. However, after crack initiation, the interleaf thickness 'significantly' affects fracture resistance. Reducing

the interleaf thickness significantly increases the load-carrying capacity. More importantly, it is observed that ductile fracture in a thin interleaf is associated with an instability.
DOE
Crack Propagation; Finite Element Method; Load Carrying Capacity; Cohesion; Crack Tips; Fracture Strength; Initiation

19980211492 Pennsylvania State Univ., Graduate School College of Engineering, University Park, PA USA
Determination of Yield and Flow Surfaces for Inconel 718 Under Axial-Torsional Loading at Temperatures Up to 649 C ***Final Report***
Gil, Christopher M., Pennsylvania State Univ., USA; Jul. 1998; 162p; In English
Contract(s)/Grant(s): NCC3-597; RTOP 523-21-13
Report No.(s): NASA/CR-1998-207932; E-11201; NAS 1.26:207932; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

An experimental program to determine flow surfaces has been established and implemented for solution annealed and aged IN718. The procedure involved subjecting tubular specimens to various ratios of axial-torsional stress at temperatures between 23 and 649 C and measuring strain with a biaxial extensometer. Each stress probe corresponds to a different direction in stress space, and unloading occurs when a 30 microstrain (1 micro eplison = 10(exp -6) mm/mm) offset is detected. This technique was used to map out yield loci in axial-torsional stress space. Flow surfaces were determined by post-processing the experimental data to determine the inelastic strain rate components. Surfaces of constant inelastic strain rate (SCISRS) and surfaces of constant inelastic power (SCIPS) were mapped out in the axial-shear stress plane. The von Mises yield criterion appeared to closely fit the initial loci for solutioned IN718 at 23 C. However, the initial loci for solutioned IN718 at 371 and 454 C, and all of the initial loci for aged IN718 were offset in the compression direction. Subsequent loci showed translation, distortion, and for the case of solutioned IN718, a slight cross effect. Aged IN718 showed significantly more hardening behavior than solutioned IN718.
Author
Plastic Deformation; Plastic Flow; Torsional Stress; Shear Stress; Inconel (Trademark); Yield Strength

19980211584 Pittsburgh Univ., Dept. of Chemistry, Pittsburgh, PA USA
Effect of Finite Thickness on Elasticity Determination Using Atomic Force Microscope
Akhremitchev, B. B., Pittsburgh Univ., USA; Walker, G. C., Pittsburgh Univ., USA; Jul. 1998; 22p; In English
Contract(s)/Grant(s): N00014-96-1-0735; Proj-96PRO5335-00
Report No.(s): AD-A349087; TR-98-3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The effect of finite sample thickness on material elasticity measurements made using an Atomic Force Microscope (AFM) has been calculated. The model includes an elastic layer on an elastic foundation and simulates sample indentation under an applied load, for rigid axisymmetric tips with conical, paraboloidal, and hyperboloidal profiles. The results show that a common approach to estimating elastic modulus from force-displacement curves can lead to significant error that depends on the units of measurement. A method to estimate this error unambiguously and correct it is proposed. In addition, it is shown that elasticity estimates for monolayer thick samples using the force-modulation technique have substantial, sample thickness-dependent error. Local thickness variation can result in misleading contrast in force modulation images for samples that are several nanometers thick.
DTIC
Thickness; Elastic Properties; Thin Films; Atomic Structure; Modulus of Elasticity; Displacement

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EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see 35 Instrumentation and Photography.

19980211408 Naval Research Lab., Marine Geosciences Div., Stennis Space Center, MS USA
Compressed Aeronautical Chart Processing Operator's Manual ***Final Report***
Myrick, Stephanie A., Naval Research Lab., USA; Lohrenz, Maura C., Naval Research Lab., USA; Mehaffey, J. Michelle, Naval Research Lab., USA; Wischow, Perry B., Naval Research Lab., USA; Gendron, Marlin L., Naval Research Lab., USA; May 06, 1998; 136p; In English; Original contains color plates
Report No.(s): AD-A347237; NRL/FR/7441--95-9633; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The Naval Research Laboratory (NRL) Map Data Formatting Facility (MDFF) has developed an efficient data processing system that compresses National Imagery and Mapping Agency (NIMA) Equal Arc Second Digitized Raster Graphics (ADRG) data into the Navy specified Compressed Aeronautical Chart (CAC) database. In September 1995, the NRL MDFF team transitioned the CAC processing system (CPS) to NIMA. Documentation that was distributed with the system included MDFF HELP (both on-line and hard copy versions), the MDFF HELP Library Design Document, and the CAC Processing Operator's Manual (this document). This manual is intended for users of the CPS. It contains all the information required to create a CAC Optical Disk Image, including descriptions of all CAC processing phases, intermediate processing steps (within these phases), and operations and maintenance functions (e.g., utility software, significant directories, and files).
DTIC
User Manuals (Computer Programs); Maps; Navigation Aids; Data Processing Equipment; On-Line Systems; Data Bases

19980211434 Wisconsin Univ., Environmental Remote Sensing Center, Madison, WI USA
Upper Midwest Gap Analysis Program Image Processing Protocol. A Geographic Approach to Planning for Biological Diversity
Lillesand, T., Wisconsin Univ., USA; Chipman, J., Wisconsin Univ., USA; Nagel, D., Wisconsin Univ., USA; Reese, H., Wisconsin Univ., USA; Bobo, M., Wisconsin Univ., USA; Jun. 1998; 54p; In English
Report No.(s): PB98-154560; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This document presents a series of technical guidelines by which land cover information is being extracted from LANDSAT Thematic Mapper data as part of the Upper Midwest Gap Analysis Program (UMGAP). The UMGAP represents a regionally coordinated implementation of the national Gap Analysis Program in the states of Michigan, Minnesota, and Wisconsin. The protocol describes both the underlying philosophy and the operational details of the land cover classification activities being performed as part of UMGAP. Topics discussed include the hierarchical classification scheme, ground reference data acquisition, image stratification, and classification techniques. This discussion is primary aimed at the image processing analysts involved in the UMGAP land cover mapping activities as well as others involved in similar projects.
NTIS
Image Processing; Mapping; Ground Tests; Land Management; Image Classification; Data Acquisition; Biological Diversity

19980211623 Army Construction Engineering Research Lab., Champaign, IL USA
Modeling Training Site Vegetation Coverage Probability with a Random Optimizing Procedure: An Artificial Neural Network Approach ***Final Report***
Guan, Biing T., Army Construction Engineering Research Lab., USA; Gertner, George Z., Army Construction Engineering Research Lab., USA; Anderson, Alan B., Army Construction Engineering Research Lab., USA; May 1998; 19p; In English
Report No.(s): AD-A346040; CERL-TR-98/83; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The objective of this project was to examine the feasibility of applying feed-forward neural networks to estimate training site vegetation coverage probability based on past disturbance pattern and vegetation coverage history. The rationale behind this project was the excellent approximation and generalization ability of feed-forward neural networks. Data used to train the networks were collected from Fort Sill, Oklahoma, using the U.S. Army's Land Condition Trend Analysis (LCTA) standard data collection methodology. Two types of vegetation covers were modeled in this project: ground cover and canopy cover. For both types of vegetation cover, the input vector of a transect point consisted of several variables; namely, the past disturbance, past vegetation cover, plant community type, and vegetation life form. The output from the model was the estimated conditional probability of a transect point having vegetation cover. Results from this project suggest that artificial neural networks are a suitable tool for predicting training site vegetation coverage probability.
DTIC
Neural Nets; Data Acquisition; Canopies (Vegetation)

19980213251 Massachusetts Univ., Dept. of Computer Science, Amherst, MA USA
The UMASS RADIUS Project ***Annual Report, Oct. 1994 - Sep. 1995***
Collins, Robert T., Massachusetts Univ., USA; Hanson, Allen R., Massachusetts Univ., USA; Riseman, Edward M., Massachusetts Univ., USA; Mar. 1998; 27p; In English
Contract(s)/Grant(s): DACA76-92-C-0041
Report No.(s): AD-A346163; TEC-0105; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Automated Site Construction, Extension, Detection, and Refinement system (ASCENDER) has been developed to automatically populate a site model with buildings extracted from multiple overlapping views. Version 1.0 of the system has been delivered for evaluation on classified imagery. Evaluation results on an unclassified Fort Hood, TX data set are presented here.

Extensions to the system that allow it to detect a wide range of building classes, including peaked roof and multilevel flat roofed structures are described. Recent work on symbolic extraction of surface structures, such as windows, greatly enhances the visual realism of graphical site model displays.
DTIC
Aerial Photography; Imagery; Pattern Recognition; Scene Generation; Image Reconstruction

44
ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 28 Propellants and Fuels.

19980210934 Department of Energy, Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC USA
Role of research in the changing world of energy supply: Proceedings geothermal program review 15
1997; 347p; In English; 15th; Geothermal Program Review, 24-26 Mar. 1997, San Francisco, CA, USA; Sponsored by Department of Energy, USA
Report No.(s): DOE/EE-0139; CONF-970376; DE98-001891; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The U.S. Department of Energy's Office of Geothermal Technologies conducted its annual Program Review 15 in Berkeley, March 24-26, 1997. The geothermal community came together for an in-depth review of the federally-sponsored geothermal research and development program. This year's theme focussed on "The Role of Research in the Changing World of Energy Supply." This annual conference is designed to promote technology transfer by bringing together DOE-sponsored researchers; utility representatives; geothermal developers; equipment and service suppliers; representatives from local, state, and federal agencies; and others with an interest in geothermal energy. Separate abstracts have been indexed to the database for contributions to this conference.
DOE
Geothermal Technology; Conferences; Energy Technology; Geothermal Resources

19980210988 International Energy Agency, Paris, France
IEA joint action: Aerodynamics of wind turbines
Maribo Pedersen, B., Editor; 1997; 232p; In English; 10th; Aerodynamics of Wind Turbines, 16-17 Dec. 1996, Edinburgh, UK
Report No.(s): NEI-DK-2671; CONF-961287; DE97-763238; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The advances to be made in aerodynamic prediction requires a deeper understanding of the physical processes occurring at the blades, and in the wake, of a wind turbine. This can only come from a continuing process of experimental observation and theoretical analysis. The present symposium presents the opportunity to do this by exchange of data from experiments and simulations, and by discussion of new or modified wake theories. The symposium will consists of a number of presentations by invited speakers and conclude with a summary of the talks and a round-the-table technical discussion. The talks offer the change to present behaviour from full-scale and laboratory experiments that are not explained by existing prediction codes. In addition, presentations are welcome on new modelling techniques or formulations that could make existing codes more accurate, less computationally intensive and easier to use. This symposium is intended to provide a starting point for the formulation of advanced rotor performance methods, which will improve the accuracy of load and performance prediction codes useful to the wind turbine industry.
DOE
Conferences; Aerodynamics; Vortices; Wind Turbines; Wakes; Turbine Blades; Rotors

19980210991 Fraunhofer-Inst. fuer Solare Energiesysteme, Freiburg, Germany
Continuous casting of silicon for solar cells *Final Report Kontinuierliches Giessen von Silicium fuer Solarzellen. Abschlussbericht*
Eyer, A., Fraunhofer-Inst. fuer Solare Energiesysteme, Germany; Raeuber, A., Fraunhofer-Inst. fuer Solare Energiesysteme, Germany; Riemann, H., Fraunhofer-Inst. fuer Solare Energiesysteme, Germany; Schilling, H., Fraunhofer-Inst. fuer Solare Energiesysteme, Germany; Haas, F., Fraunhofer-Inst. fuer Solare Energiesysteme, Germany; Aug. 1997; 41p; In German
Contract(s)/Grant(s): BMBF 032955
Report No.(s): ETDE-DE-598; DE98-715439; No Copyright; Avail: Issuing Activity (Natl Technical Information Service

(NTIS)); US Sales Only, Microfiche

This feasibility study demonstrated that continuous melting of silicon granulate and crystallization of a multi-crystalline silicium rod with a technically relevant cross-section of 100 millimetres and a predominatly columnar orientation of the individual crystals is possible. The project carried out at the Fraunhofer Institute of Solar Energy showed that optical heating is in principle suited for this purpose. It is a heating method that requires a moulding element from foreign material. Adequate heating of the centre of the melted mass was achieved only upon introduction of a focussing heating system and by charging with molten silicium. At the IKZ it was demonstrated that a modified float-zone arrangement with inductive heating is also suited. Round rods were fabricated; in this process, feeding of the granulate was by free-fall or by a quartz rod being immersed in the melted mass.- by harnessing the electromagnetic supporting forces it was also possible to obtain approximately square rod diameters of 75 x 75 square millimetres. The smoothing off of the edges can be considerably reduced if additional pins are immersed in the four corners.

DOE

Silicon; Solar Cells; Casting; Granular Materials; Crystal Growth; Fabrication

19980211034 National Renewable Energy Lab., Golden, CO USA

Control strategy for variable-speed, stall-regulated wind turbines

Muljadi, E., National Renewable Energy Lab., USA; Pierce, K., National Renewable Energy Lab., USA; Migliore, P., National Renewable Energy Lab., USA; Apr. 1998; 6p; In English; Controls, 24-26 Jun. 1998, Philadelphia, PA, USA

Contract(s)/Grant(s): DE-AC36-83CH-10093

Report No.(s): NREL/CP-500-24311; CONF-980623; DE98-004908; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A variable-speed, constant-pitch wind turbine was investigated to evaluate the feasibility of constraining its rotor speed and power output without the benefit of active aerodynamic control devices. A strategy was postulated to control rotational speed by specifying the demanded generator torque. by controlling rotor speed in relation to wind speed, the aerodynamic power extracted by the blades from the wind was manipulated. Specifically, the blades were caused to stall in high winds. In low and moderate winds, the demanded generator torque and the resulting rotor speed were controlled to cause the wind turbine to operate near maximum efficiency. A computational model was developed, and simulations were conducted of operation in high turbulent winds. Results indicated that rotor speed and power output were well regulated.

DOE

Control Surfaces; Wind Turbines; Active Control; Aerodynamics; Turbulence; Speed Regulators

19980211088 New Energy and Industrial Technology Development Organization, Tokyo, Japan

Survey for making a data book related to the development of new energy technology (the photovoltaic power generation)

Shin energy gijutsu kaihatsu kankei data shu sakusei chosa (taiyoko hatsuden)

Mar. 1997; 248p; In Japanese

Report No.(s): NEDO-P-9614; DE98-735412; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A data book related to the photovoltaic power generation was made as a part of the systematical preparation of new energy related data. The paper arranged the importance of introducing the photovoltaic power system and the CO2 reduction effect at levels such as the government, local government, industries and individuals which are users. Described were the production quantity by region/type/company, shipment by usage, production amount and prices of solar cells. Arranged was the situation of policies on the photovoltaic power generation in Japan and developed countries. Examples of the introduction in countries including Japan were examined to know the introduction quantity and target. The paper introduced the subsidy system, preferential tax system and loan system for the introduction of the photovoltaic power system in Japan. The flow was summed up from the planning of the system introduction to the installation. The status of handling with the system introduction of government related organs and local governments was stated. The paper showed a list of the companies related to the photovoltaic power system and the references of solar cell makers and solar system installation makers. The development is so quickly made that the renewal every year of the system and the quality enhancement are required.

DOE

Photovoltaic Conversion; Solar Generators; Carbon Dioxide; Solar System; Solar Cells

19980211093 Helsinki Univ. of Technology, Automation Technology Lab., Otaniemi, Finland

Effect of size and structure of a bacteria fuel cell on the electricity production and energy conversion rate

Zhang Xiachang, Helsinki Univ. of Technology, Finland; Halme, A., Helsinki Univ. of Technology, Finland; 1997; 13p; In English

Report No.(s): TKK-T/AT-A17; DE98-737097; ISBN 951-22-3504-8; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The direct conversion of chemical energy to electrical energy can be realized by using microorganisms as catalyst in a microbial fuel cell. A relative big size bacteria fuel cell is investigated and compared to a smaller one constructed and tested previously. The big cell consists of a anode chamber and two cathode chambers. A packed bed of graphite particles was used as the anode and an oxygen gas diffusion electrode was used as the cathode in both devices. The cation permeable ion-exchange membrane from DuPont was used to separate anodic and cathodic chambers. Batch and self-circulation operation modes were applied in both devices. The apparent anode volume of the bigger device is 145.3 ml which is 2.7 times of the smaller cell volume (53.3 ml). The purpose of this study is to know what size of a bacteria fuel cell is suitable for the fuel cell to obtain maximum power output per volume.

DOE

Bacteria; Fuel Cells; Diffusion Electrodes; Microorganisms; Oxygen; Chemical Energy; Gaseous Diffusion

19980211100 Helsinki Univ. of Technology, Advanced Energy Systems and Technologies, Otaniemi, Finland

Development study 3. Kvaerner Turbin AB ***Final Report***

Goeransson, Bengt, Kvaerner Turbin A.B., Sweden; Nov. 1997; 35p; In English

Contract(s)/Grant(s): NUTEK-P504021-4

Report No.(s): NUTEK-VIND-97-4; DE98-739041; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The overall objective with DS 3 was to further develop the 3 MW concept from Naesudden 2 and in that way to find out if the large MW concept is commercially competitive with smaller turbines. The study should look deeply into both economical and technical design criteria. A third generation of large turbines should be developed to the extent that the manufacturer could present a binding offer for the next 1-2 machines together with a long term cost level at serial production. At the start of phase 3 the former German partner MBB introduced a new generator design. to make a further Swedish-German turbine project reachable, this interesting alternative was incorporated into DS 3 and was developed in parallel with the geared concept. The alternative is a design with a multi-pole, permanent magnet generator directly on the turbine, whereas the nacelle itself is the load carrying structure. Common designs for both alternatives are pitch regulation with hydraulics, including an emergency stopping system, a soft yaw system and a steel tower. The reduction of the weight is 30% from Naesudden 2. Two blade alternatives have been studied: Wood-epoxy blades from Taywood Aerolaminates and a development of the Naesudden 2-blades with a simplified design by MBB. The cost analysis carried out shows that the two concepts differ very little from each other. The cost for a serial of 5 units is estimated to SEK 3.80/kWh/year. The subsystems with the largest deviation from the cost goal are electrical system and assembly. Turbines following the 5-series are believed to be at a level of SEK 3.50/kWh/year. From the simplified market analysis carried out in DS 3, it can be concluded that a market for very large turbines is under development. Lack of good sites together with a spreading demand to decrease the number of units in a wind farm are important factors for this market growth. The location of large turbines offshore has long been discussed and larger and larger projects are now being planned or realised.

DOE

Windpowered Generators; Windpower Utilization; Turbines

19980211118 General Electric Co., Philadelphia, PA USA

Life testing of conductively coupled thermoelectric cells., Task 11 ***Final Report***

Kelley, E., General Electric Co., USA; Klee, P., General Electric Co., USA; Hanson, J., General Electric Co., USA; Nakahara, J., General Electric Co., USA; Sep. 26, 1997; 53p; In English

Contract(s)/Grant(s): DE-AC03-89SF-17787

Report No.(s): DOE/SF/17787-T21; DE98-000305; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Four conductively coupled thermoelectric cells, developed under the SP100 program, have been life tested. These cells, referred to as TOC (Task Order Contract) cells, were fourth generation cells, and incorporated design improvements to extend operating life. GS526 glass had been added to suppress the loss of Ge from the MoGe bond between the SiGe and the barrier graphite. The previous generation was life limited by the degradation of this electrical bond at the SiGe to graphite hot side interface due to the Ge loss. This led to abnormal internal resistance trends. The TOC cell test data and post test diagnostic have confirmed the effectiveness of the perimeter glass. Three of the four cells demonstrated normal electrical performance trends. The fourth cell (No. 139) tested at JPL showed an abnormal increase in internal resistance and a shift in temperature levels at 12,400 hours following a facility shutdown and restart. When the cell was removed from the test fixture, separation occurred between the hot side compliant pad facesheet and the niobium filament bundles. No degradation of the bond between the SiGe and the barrier

graphite was found and the change in slope of the internal resistance was attributed to changes in the rate of dopant precipitation caused by the shift in temperature levels.
DOE
Data Acquisition; Semiconductor Devices; Photovoltaic Cells; Service Life; Performance Tests

19980211119 Ford Motor Co., Dearborn, MI USA
Direct-hydrogen-fueled proton-exchange-membrane fuel cell system for transportation applications. Hydrogen vehicle safety report
Thomas, C. E., Directed Technologies, Inc., USA; May 1997; 160p; In English
Contract(s)/Grant(s): DE-AC02-94CE-50389
Report No.(s): DOE/CE/50389-502; DE98-000309; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This report reviews the safety characteristics of hydrogen as an energy carrier for a Fuel Cell Vehicle (FCV), with emphasis on high pressure gaseous hydrogen onboard storage. The authors consider normal operation of the vehicle in addition to refueling, collisions, operation in tunnels, and storage in garages. They identify the most likely risks and failure modes leading to hazardous conditions, and provide potential countermeasures in the vehicle design to prevent or substantially reduce the consequences of each plausible failure mode. They then compare the risks of hydrogen with those of more common motor vehicle fuels including gasoline, propane, and natural gas.
DOE
Hydrogen Fuels; Fuel Cells; Substitutes; Safety Factors

19980211120 Sandia National Labs., Albuquerque, NM USA
GaAs series connected photovoltaic converters for high voltage capacitor charging applications
Rose, B. H., Sandia National Labs., USA; Sep. 1997; 47p; In English
Contract(s)/Grant(s): DE-AC04-94AL-85000
Report No.(s): SAND-97-2306; DE98-000421; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This report describes the design features of series connected photovoltaic arrays which will be required to charge capacitors to relatively high (400V) voltages in time periods on the order of 1 microsecond. The factors which determine the array voltage and the capacitor charge time are given. Individual element junction designs, along with an interconnect scheme, and a semiconductor process to realize them are presented. Finally, the input laser optical required to meet the requirements is determined.
DOE
Design Analysis; Photovoltaic Cells; Solar Arrays; Solar Cells

19980211121 Sandia National Labs., Albuquerque, NM USA
Predicting aerodynamic characteristic of typical wind turbine airfoils using CFD
Wolfe, W. P., Sandia National Labs., USA; Ochs, S. S., Iowa State Univ. of Science and Technology, USA; Sep. 1997; 41p; In English
Contract(s)/Grant(s): DE-AC04-94AL-85000
Report No.(s): SAND-96-2345; DE98-000422; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

An investigation was conducted into the capabilities and accuracy of a representative computational fluid dynamics code to predict the flow field and aerodynamic characteristics of typical wind-turbine airfoils. Comparisons of the computed pressure and aerodynamic coefficients were made with wind tunnel data. This work highlights two areas in CFD that require further investigation and development in order to enable accurate numerical simulations of flow about current generation wind-turbine airfoils: transition prediction and turbulence modeling. The results show that the laminar-to turbulent transition point must be modeled correctly to get accurate simulations for attached flow. Calculations also show that the standard turbulence model used in most commercial CFD codes, the k-e model, is not appropriate at angles of attack with flow separation.
DOE
Aerodynamic Characteristics; Performance Prediction; Wind Tunnel Tests; Airfoils; Computational Fluid Dynamics; Flow Distribution

19980211123 Sandia National Labs., Albuquerque, NM USA

Smart packaging for photonics

Smith, J. H., Sandia National Labs., USA; Carson, R. F., Sandia National Labs., USA; Sullivan, C. T., Sandia National Labs., USA; McClellan, G., Sandia National Labs., USA; Palmer, D. W., Editor, Sandia National Labs., USA; Sep. 1997; 57p; In English

Contract(s)/Grant(s): DE-AC04-94AL-85000

Report No.(s): SAND-97-2337; DE98-000425; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Unlike silicon microelectronics, photonics packaging has proven to be low yield and expensive. One approach to make photonics packaging practical for low cost applications is the use of 'smart' packages. 'Smart' in this context means the ability of the package to actuate a mechanical change based on either a measurement taken by the package itself or by an input signal based on an external measurement. One avenue of smart photonics packaging, the use of polysilicon micromechanical devices integrated with photonic waveguides, was investigated in this research (LDRD 3505.340). The integration of optical components with polysilicon surface micromechanical actuation mechanisms shows significant promise for signal switching, fiber alignment, and optical sensing applications. The optical and stress properties of the oxides and nitrides considered for optical waveguides and how they are integrated with micromechanical devices were investigated.

DOE

Packaging; Optical Properties; Optical Waveguides; Semiconductors (Materials); Photonics

19980211358 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. fuer Technische Thermodynamik, Stuttgart, Germany

Development of a sodium heat pipe solar receiver with hybrid drive for dish/Stirling systems for decentralised electricity supply ***Final Report Entwicklung eines hybridbetriebenen Natrium-Heat Pipe Solarreceivers fuer Dish/Stirling-Systeme zur dezentralen Stromversorgung. Schlussbericht***

Laing, D., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Mar. 1997; 66p; In German

Contract(s)/Grant(s): BMBF 032956

Report No.(s): ETDE-DE-646; DE98-743318; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

After detailed concept studies, a hybrid heat pipe receiver was developed, in which the heat is transferred both on the gas and the solar side only via a heat pipe. The concentrated solar radiation is absorbed on the inner cylinder of a coaxial heat pipe. A diffusion gas blower burner (a modification of the SPS burner originally used for the gas operation of the V160 Stirling engine) is situated axially behind the heat pipe. The exhaust gases flow axially over the finned outer cylinder of the heat pipe, which is simultaneously the heat exchanger for the heat pipe. An impact plate divides the receiver hollow space from the combustion chamber. The receiver is designed for a transfer power of 35 KW(sub th) at an operating temperature of 700 to 850 C. The design of the capillary structure was done by the (German) Research Institute for Nuclear Technology and Energy Conversion (KE). The receiver was manufactured in collaboration with KE. The superimposition of the Stirling heater tube with the heat exchanger fins proved to be very difficult. The receiver was successfully tested in DISCOS for about 60 hours. The working behaviour of the receiver was very good. Neither the switching in the burner in solar operation nor the focussing or re-introduction of the solar radiation after passing clouds; during burner operation, represented a problem for the receiver. The heat pipe functioned without problems in every operating mode. Peak nett system efficiencies of 20% were obtained in purely gas operation and a combustion efficiency of 92% and a receiver efficiency of 83% were obtained.

DOE

Heat Pipes; Solar Collectors; Parabolic Reflectors; Receivers; Heat Exchangers; Capillary Flow; Sodium; Stirling Engines

19980211381 Lawrence Livermore National Lab., Livermore, CA USA

Geochemical analysis of fluid mineral relations in the Tiwi Geothermal Field, Philippines

Bruton, C. J., Lawrence Livermore National Lab., USA; Moore, J. N., Lawrence Livermore National Lab., USA; Powell, T. S., Lawrence Livermore National Lab., USA; Jan. 01, 1997; 10p; In English; 22nd; Stanford Workshop on Geothermal Reservoir Engineering, 27-29 Jan. 1997, Stanford, CA, USA

Contract(s)/Grant(s): W-7405-ENG-48

Report No.(s): UCRL-JC-127070; CONF-970114-; DE97-053927; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Geochemical modeling simulations are being used to examine the source of the reservoir fluids in the Tiwi geothermal field and to evaluate the chemical and physical processes responsible for producing observed vein parageneses. Such information can be used to trace the evolution of the Tiwi geothermal field through time. The React geochemical modeling code was used to simulate the effects of isothermal and isoenthalpic boiling, conductive cooling and heating, and incorporation of condensed steam, on

fluids from the Matalibong area. Predicted mineral stabilities were used to identify mineral indicators for each process. Calcite and anhydrite precipitation were favored by conductive heating, while illite precipitation was favored when condensed steam was added to the reservoir fluid. Reconstructed downhole fluids from borehole Mat-25 are acidic and are consistent with the presence of illite as the latest alteration mineral in veins. The processes of isothermal and isoenthalpic boiling could be differentiated from conductive cooling by the presence of epidote and/or calcite during boiling, and illite during cooling. Both boiling and cooling favored precipitation of quartz, K-feldspar, wairakite, and pyrite. Ratios of Na, Cl, and Br in waters from the Matalibong are relative to seawater indicate a significant component of seawater in reservoir fluids.
DOE
Geochemistry; Simulation; Feldspars; Illite

19980211400 Helsinki Univ. of Technology, Electron Physics Lab., Otaniemi, Finland
Improved analytical current voltage characteristics of a solar cell
Yli–Koski, M., Helsinki Univ. of Technology, Finland; Tuominen, E., Helsinki Univ. of Technology, Finland; Acerbis, M., Helsinki Univ. of Technology, Finland; Sinkkonen, J., Helsinki Univ. of Technology, Finland; 1997; 12p; In English
Report No.(s): TKK-S/EF-1997/14; DE98-735510; ISBN 951-22-3587-0; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Application of the Green's function method to the calculation of the current voltage characteristics of a pn-junction solar cell makes possible to extract more reliable and exact information about the behavior of the cell. With this method not only the minority carrier diffusion currents but also the drift currents in quasi- neutral regions of the solar cell can be taken into consideration. Furthermore, this approach is not limited to an exponentially decaying minority carrier generation function but is valid for any type of optical generation. In addition, the injection boundary condition is exploited with the result that not only the pn-diode current but also the current resulting from the optical generation depends on the voltage of the solar cell. Applying the method also gives the so called position dependent collection efficiency function which is defined as the probability that an electron-hole pair created at a certain point inside the solar cell will contribute to the current leaving the cell.
DOE
Solar Cells; Electric Potential; Extraction; Probability Theory; P-N Junctions; Diffusion

19980211513 Energia Nucleare e Delle Energie Alternative, Dipt. Innovazione, Bologna, Italy
A computer program for generating two-dimensional boundary-fitted orthogonal curvilinear coordinate systems
Barbaro, M., Energia Nucleare e Delle Energie Alternative, Italy; Nov. 1997; ISSN 0393-6317; 35p; In English
Report No.(s): ENEA-RT-INN-97-23; DE98-759692; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

A numerical method is described which generates an orthogonal curvilinear mesh, subject to the constraint that mesh lines are matched to all boundaries of a closed, simply connected two-dimensional region of arbitrary shape. The method is based on the solution, by an iterative finite-difference technique, of an elliptic differential system of equations for the Cartesian coordinates of the orthogonal grid nodes. The interior grid distribution is controlled by a technique which ensures that coordinate lines can be concentrated as desired. Examples of orthogonal meshes inscribed in various geometrical figures are included.
DOE
Cartesian Coordinates; Computational Grids; Computer Programs; Elliptic Differential Equations; Finite Difference Theory

19980211514 Technical Univ. of Denmark, Inst. for Energiteknik, Lyngby, Denmark
Basic rotor aerodynamics applied to wind turbines
Hansen, M. O. L., Technical Univ. of Denmark, Denmark; Jan. 1998; 62p; In English
Report No.(s): DTU-ET-NE-98-02; DE98-759835; ISBN 87-7475-192-1; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

It is the hope of the author that the notes will impart a basic understanding of the mechanisms behind the production of forces on a wind turbine. Even though aero-elastic codes, including a standard Blade Element Momentum method, can be bought, it is considered important that the theory behind this method and its limitations is understood. The aerodynamics of a wind turbine is important, but building a wind turbine is a multi disciplinary task since it requires knowledge of meteorology, atmospheric turbulence, fluid mechanics, structural dynamics, generators, electrical grid connections, gear boxes, hydraulics, foundations, economics and so on.
DOE
Rotor Aerodynamics; Fluid Mechanics; Atmospheric Turbulence; Dynamic Response; Aeroelasticity; Aerodynamics

19980211517 Petersen (H.) Consult, Broenshoe, Denmark

Comparison of wind turbines based on power curve analysis

Feb. 1998; 175p; In English

Contract(s)/Grant(s): ENS-51171-97.0004

Report No.(s): NEI-DK-3193; DE98-763004; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

In the study measured power curves for 46 wind turbines were analyzed with the purpose to establish the basis for a consistent comparison of the efficiency of the wind turbines. Emphasis is on wind turbines above 500 kW rated power, with power curves measured after 1994 according to international recommendations. The available power curves fulfilling these requirements were smoothened according to a procedure developed for the purpose in such a way that the smoothened power curves are equally representative as the measured curves. The resulting smoothened power curves are presented in a standardized format for the subsequent processing. Using wind turbine data from the power curve documentation the analysis results in curves for specific energy production (kWh/M(sup 2)/yr) versus specific rotor load (kW/M(sup 2)) for a range of mean wind speeds. On this basis generalized curves for specific annual energy production versus specific rotor load are established for a number of generalized wind turbine concepts. The 46 smoothened standardized power curves presented in the report, the procedure developed to establish them, and the results of the analysis based on them aim at providers of measured power curves as well as users of them including manufacturers, advisors and decision makers.

DOE

Rotors; Wind Turbines; Wind Velocity

19980211625 New Energy and Industrial Technology Development Organization, Tokyo, Japan

International Clean Energy System Using Hydrogen Conversion (WE-NET), 3, Study on the global network ***Suiso riyo kokusai clean energy system gijutsu (WE-NET), 3, Global network kenkyu***

Mar. 1997; 193p; In Japanese

Report No.(s): NEDO-WE-NET-9632; DE98-745405; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

As a part of the WE-NET project, the introduction condition of hydrogen as substituting energy and CO2 reduction effect were analyzed using a global energy model. The WE-NET project aims at global-wide introduction of clean energy by converting abundant renewable clean energy into hydrogen transportable to distant consumers all over the world. The study result in fiscal 1996 is as follows. Undeveloped hydroelectric resources in the world are estimated to be 12 trillion kWh/y equivalent to the existing developed one in the world. Since the cost of the hydroelectric power generation projects over 1000MW in the planning stage is estimated to be 0.02-0.05$/kWh lower than that of other renewable energies, such projects are expected as energy source in the initial stage of the practical WE-NET project. The GREEN model was modified by adding a hydrogen analysis function, and extending an analysis period. The modified model allowed evaluation of the long-term important role of hydrogen energy, in particular, the capability of CO2 gas reduction all over the world.

DOE

Clean Energy; Hydrogen; Energy Technology; Carbon Dioxide; Hydrogen Production

19980211682 New Energy and Industrial Technology Development Organization, Tokyo, Japan

International Clean Energy System Using Hydrogen Conversion (WE-NET), 3, Conceptual design of the total system ***Suiso riyo kokusai clean energy system gijutsu (WE-NET), 3, Zentai system gainen sekkei***

Mar. 1997; 176p; In Japanese

Report No.(s): NEDO-WE-NET-9631; DE98-745404; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This paper describes the research result on the conceptual design of the total system for the WE-NET project in 1996. Basic conditions are as follows: solid polymer water electrolysis, hydrogen combustion turbine power generation, hydrogen transport/storage through ammonia medium, power generation scale of 1000-4000MW (2-5 yen/kWh), and transport distance of 5000-20000km between supply and consumption places. The system efficiency was estimated to be 68% and 23% at an ammonia arrival time and power sending end, respectively, and it was dependent on a transport distance, while no power generation scale. The power cost was estimated to be 7 yen/Mcal and 33 yen/kWh, respectively. The system efficiency at a sending end was lower by 15% and 2% than that of the liquid hydrogen and methanol system, while the power cost was higher by 0 and 8 yen/kWh, respec-

tively. It was necessary for loss reduction of this ammonia system to develop a new high-efficiency ammonia synthesis process, and hydrogen separation (decomposition/refining) process.
DOE
Clean Energy; Energy Technology; Electrolysis; Hydrogen; Biopolymers; Solid Electrolytes; Combustion

19980211683 New Energy and Industrial Technology Development Organization, Tokyo, Japan
International Clean Energy System Using Hydrogen Conversion (WE-NET), 3, Conceptual design of the total system (safety measures and evaluation technology) ***Suiso riyo kokusai clean energy system gijutsu (WE-NET), 3, Zentai system gainen sekkei (anzen taisaku hyoka gijutsu)***
Mar. 1997; 274p; In Japanese
Report No.(s): NEDO-WE-NET-9634; DE98-745406; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Safety measures and assessment technology were studied for the WE-NET project. As the study result in fiscal 1996, the information on safety design, anomaly and accident was collected and arranged. The information on safety measures, ideology and criterion was also collected by visiting some domestic and overseas organizations experienced about handling of liquid hydrogen (LH). The initial survey was made for the safety design ideology, analytical technique and disaster preventive measures of LNG systems as the similar cold liquid system. Accidents and explosion accident of a hydrogen production plant (water electrolysis) in Germany were analyzed. Events on storage tanks and leakage around the tanks were studied as typical risk of LH considering temporary and LNG system design information. The model based on the LH spillage test result and 3-D dispersion of vapor cloud were prepared by modifying a simulation code. The model allowed evaluation of the effect of explosion and fire accidents of compressed hydrogen gas and flying fragments on structures and people, and visual display of distances from a tank and damage conditions.
DOE
Clean Energy; Liquid Hydrogen; Safety Management; Chemical Explosions; Energy Technology

19980211684 New Energy and Industrial Technology Development Organization, Tokyo, Japan
International Clean Energy System Using Hydrogen Conversion (WE-NET), 3, Conceptual design of the total system (assessment on an urban scale)
Mar. 1997; 70p; In English
Report No.(s): NEDO-WE-NET9635; DE98-745407; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

In order to study the best method for introducing relatively a small amount of hydrogen into urban fuel economics, the field test was carried out in London. The study result in fiscal 1996 is as follows. In the case where hythane (mixture of NG with a small amount of hydrogen) is targeted to transport applications (targeted hythane) or hydrogen is used as an additive to gasoline for engines (hydrogen gasoline), the reduction effect of external environmental costs was larger than hydrogen production costs. The cost benefit on environment improvement was dependent on estimation of environmental costs. In the case of lower external costs, the hythane scenario (hydrogen is supplied to all users as hythane) was best for environment, and in intermediate external costs, the targeted hythane was best, while in higher external costs, measures against exhaust gas by catalytic technology was best. The preferential selective criterion of the scenarios for environment improvement was thus dependent on both assumed costs for environmental impacts and different areas such as the central, inner and outer areas of London.
DOE
Clean Energy; Hydrogen Fuels; Energy Technology; Additives; Gasoline; Hydrogen Production; Costs; Environment Effects

19980211724 Los Alamos National Lab., NM USA
Modeling of polymer electrolyte fuel cell performance with reformate fuel feed streams
Springer, T. E., Los Alamos National Lab., USA; Zawodzinski, T. A., Los Alamos National Lab., USA; Gottesfeld, S., Los Alamos National Lab., USA; May 1997; 15p; In English; 191st; Meeting of the Electrochemical Society, Inc., 4-9 May 1997, Montreal, Canada
Contract(s)/Grant(s): W-7405-eng-36
Report No.(s): LA-UR-97-2196; CONF-970517; DE97-008569; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Carbon monoxide poisoning of polymer electrolyte fuel cell anodes is a key problem to be overcome when operating on reformed fuels. CO adsorbs on the precious metal surface leading to substantial performance losses. Much recent work has explored this problem, using various Pt alloys in attempts to overcome the performance loss. In their studies of hydrogen oxidation

on Pt and Pt alloy (Pt/Sn, Pt/Ru) electrodes exposed to H2/CO mixtures, Gasteiger et al. (1,2) showed that a small oxidation current is observed before the onset of CO oxidative stripping (ca. 0.4 V) on Pt/Ru. However, these workers concluded that the observed current was
DOE
Electrolytic Cells; Fuel Cells; Fuels; Streams; Polymers; Cell Anodes; Solid Electrolytes

19980213270 Department of the Navy, Washington, DC USA
Homopolar Transformer for Conversion of Electrical Energy
Smith, Robert C., Inventor, Department of the Navy, USA; Aug. 14, 1997; 10p; In English
Patent Info.: Filed 14 Aug. 1997; US-Patent-Appl-SN-911270
Report No.(s): AD-D019000; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche
The DC voltage of electrical energy applied to a homopolar machine, is converted by transformer windings in response to rotor rotation within the magnetic field of the homopolar machine, to a different voltage level for supply to a load.
DTIC
Transformers; Electric Potential; Electricity; Rotors; Rotation; Homopolar Generators

45
ENVIRONMENT POLLUTION

Includes atmospheric, noise, thermal, and water pollution.

19980210904 HydroGeoLogic, Inc., Herndon, VA USA
Scientific Advisory Board of the Strategic Environmental Research and Development Program ***Annual Report No. 5, Fiscal Year 1996***
Mar. 1997; 63p; In English
Contract(s)/Grant(s): DACA39-95-C-0023
Report No.(s): AD-A348611; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This is the fifth Annual Report of the Strategic Environmental Research and Development Program (SERDP) Scientific Advisory Board (SAB) and includes SAB activities and Program recommendations during FY96. Section 2904(h) of title 10, USA Code, requires that an annual report of the Strategic Environmental Research and Development Program (SERDP) Scientific Advisory Board (SAB) be submitted to Congress no later than March 15 of each year. The Annual Report is required to describe the actions of the SAB during the preceding year and to provide any recommendations, including recommendations related to projects, programs, information exchange, and additional legislation within the scope of SERDP.
DTIC
Research and Development; Law (Jurisprudence)

19980210906 Umweltbundesamt, Projekttraegerschaft Abfallwirthschaft und Altlastensanierung, Berlin, Germany
Pedological investigations regarding thermal, chemical and biological soil cleaning techniques ***Final Report, 1990-1994 Bodenkundliche Untersuchungen zu thermischen, chemischen und biologischen Bodenreinigungsverfahren. Schlussbericht fuer den Bearbeitungszeitraum 1990 bis 1994***
Goetz, D., Hamburg Univ., Germany; Bauske, B., Hamburg Univ., Germany; Claussen, A., Hamburg Univ., Germany; Glaeseker, W., Hamburg Univ., Germany; Holz, C., Hamburg Univ., Germany; [1997]; 292p; In German
Contract(s)/Grant(s): Foerderkennzeichen BMBF 147047
Report No.(s): ETDE-DE-603; DE98-722983; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche
The hazard potential of contaminated sites is evaluated by means of risk assessments. These can entail diverse measures being taken that may range from the mere observation of the site over protective and restricting measures, different encapsulations to ensure its safety as well as the shifting of contaminated matter, to the decontamination of the site (Council of Experts on Environmental Questions SRU, 1990). of these measures, soil cleaning demands the greatest effort and should lastingly repair the damage without new damage being caused in another place.
DOE
Cleaning; Procedures; Evaluation; Hazards; SOIl Pollution

19980210908 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. fuer Physik der Atmosphaere, Wessling, Germany

Observations and model calculations of B747 engine exhaust products at cruise altitude and inferred initial OH emissions

Tremmel, H. G., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Schlager, H., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Konopka, P., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Schulte, P., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Arnold, F., Max-Planck-Inst. fuer Kernphysik, Germany; Klemm, M., Max-Planck-Inst. fuer Kernphysik, Germany; Droste–Franke, B., Max-Planck-Inst. fuer Kernphysik, Germany; Jun. 1997; ISSN 0943-4771; 33p; In English

Report No.(s): ETDE-DE-612; DE98-722761; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

NO(y) (NO, HNO2 and HNO3) exhaust emissions in the near-field plume of two B747 jet airliners cruising in the upper troposphere were measured in situ using the DLR Falcon research aircraft. In addition CO2 was measured providing exhaust plume dilution rates for the species. The observations were used to estimate the initial OH concentration and NO2/NO(x) ratio at the engine exit and the combustor exit by back calculations using a chemistry box model. From the two different plume events, and using two different model simulation modes in each case, we inferred OH emission indices EI(OH) = 0.32-0.39 g/kg fuel (OH(0) = 9-14.4 ppmv) and (NO2/NO(x))(sub 0) = 0.12-0.17. Furthermore, our results indicate that the chemistry of the exhaust species during the short period between the combustion chamber exit and the engine exit must be considered, because OH is already consumed to a great extent in this engine section, due to conversion to HNO2 and HNO3. For the engines discussed here, the modeled OH concentration between combustor exit und engine exit decreases by a factor of about 350, leading to OH concentrations of 1-2.10(exp 12) molec/cc cm at the engine exit.

DOE

Exhaust Emission; Commercial Aircraft; Plumes; Hydroxyl Emission; Exhaust Gases; Carbon Dioxide; Air Pollution

19980210930 Department of Energy, Assistant Secretary for Nuclear Energy, Washington, DC USA

Nuclear air cleaning handbook

[1997]; 400p; In English

Contract(s)/Grant(s): DE-FG05-84OR-21420

Report No.(s): DOE/OR/21420-T1; DE98-003299; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This handbook summarizes available information pertinent to the design, construction, maintenance, and testing of very-high-efficiency air and gas cleaning systems for nuclear applications. The information is of a generic nature, designed to be relevant to designers, constructors, users and testers of all manner of nuclear air or gas cleaning systems regardless of the precise nature of the process or operation. The information supplements and up-dates the user's previous knowledge and understanding of ventilation and air cleaning design and construction by supplying background information on components and requirements for the design, construction, installation, and testing of these very specialized applications. In addition, there is information on the accessories that constitute an essential part of nuclear air and gas cleaning systems, such as ductwork, housings, and facilities for performing functional tests.

DOE

Air Purification; Handbooks; Cleaning; Pollution Control; Radioactive Contaminants; Aerosols

19980210937 Umweltbundesamt, Berlin, Germany

Determination and evaluation of air quality control. Manual of ambient air quality control in Germany

Lahmann, E., Umweltbundesamt, Germany; Jul. 1997; ISSN 0722-186X; 379p; Transl. Into ENGLISH of German: Feststellung und Bewertung von Immissionen - Leitfaden zur Immissionsueberwachung in Deutschland. Published by Umweltbundesamt, Berlin (DE); In English

Contract(s)/Grant(s): UFOPLAN 10402357

Report No.(s): UBA-FB-97-055/e(2.rev.ed.); DE98-723682; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

Measurement of air pollution emissions and ambient air quality are essential instruments for air quality control. by undertaking such measurements, pollutants are registered both at their place of origin and at the place where they may have an effect on people or the environment. Both types of measurement complement each other and are essential for the implementation of air quality legislation, particularly, in compliance with emission and ambient air quality limit values. Presented here are similar accounts of measurement principles and also contains as an Appendix a list of suitability-tested measuring devices which is based

on information provided by the manufacturers. In addition, the guide of ambient air quality control contains further information on discontinuous measurement methods, on measurement planning and on the assessment of ambient air quality data.
DOE
Air Pollution; Air Quality; Ambience; Manuals; Quality Control

19980210938 Bayerisches Landesamt fuer Umweltschutz, Munich, Germany
Air quality annual report 1996 ***Annual Report, 1996 Lufthygienischer Jahresbericht 1996***
1997; ISSN 0723-0028; 285p; In German
Report No.(s): ETDE-DE-606; DE98-723002; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The German Federal Emission Control Act (BImSchG) for protection against the harmful effects of air pollution, noise, vibrations and similar processes defines the legal instruments available to provide for air pollution monitoring and control. According to the legal provisions, responsibility for air pollution monitoring lies with the competent Land authorities, and monitoring activities are defined in terms of territory (areas subject to monitoring) and time periods as well as specific tasks for pollution measurement. The areas subject to monitoring are those with detected or expected air pollution very likely to cause harmful effects on the environment due to (1) frequency and prolongation of events, (2) pollutant concentrations, and (3) hazards emanating from synergistic action.
DOE
Air Pollution; Air Quality; Hazards; Time Series Analysis; Monitors

19980210963 Los Alamos National Lab., NM USA
Exposure estimates using urban plume dispersion and traffic microsimulation models
Brown, M. J., Los Alamos National Lab., USA; Mueller, C., Los Alamos National Lab., USA; Bush, B., Los Alamos National Lab., USA; Stretz, P., Los Alamos National Lab., USA; [1997]; 4p; In English; 9th; Global Change Studies, 14 - 16 Jan. 1998, Phoenix, AZ, USA; Sponsored by American Meteorological Society, USA
Contract(s)/Grant(s): W-7405-ENG-36
Report No.(s): LA-UR-97-3930; CONF-980121; DE98-001606; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The goal of this research effort was to demonstrate a capability for analyzing emergency response issues resulting from accidental or mediated airborne toxic releases in an urban setting. In the first year of the program, the authors linked a system of fluid dynamics, plume dispersion, and vehicle transportation models developed at Los Alamos National Laboratory to study the dispersion of a plume in an urban setting and the resulting exposures to vehicle traffic. This research is part of a larger laboratory-directed research and development project for studying the relationships between urban infrastructure elements and natural systems.
DOE
Estimates; Plumes; Traffic; Emergencies; Accidents; Toxicity; Transportation; Fluid Dynamics; Cities

19980210965 Los Alamos National Lab., NM USA
Nocturnal wind direction shear and its potential impact on pollutant transport
Bowen, B. M., Lawrence Livermore National Lab., USA; Baars, J. A., Los Alamos National Lab., USA; Stone, G. L., Los Alamos National Lab., USA; [1998]; 18p; In English; 10th; Applications of Air Pollution Meteorology, 11 - 16 Jan. 1998, Phoenix, AZ, USA
Contract(s)/Grant(s): W-7405-ENG-36
Report No.(s): LA-UR-97-3746; CONF-980116; DE98-001604; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The estimation of transport and diffusion of airborne pollutants during the nighttime is challenging, especially over complex terrain where gravity driven drainage flows may be overlain with wind from a different direction. This study investigates the character of wind direction shear in the lowest 100 m using tower measurements from a complex, semi-arid site where local thermally-driven flows are common. The effects of wind direction shear on plume transport are studied by simulating a hypothetical elevated term release. This is accomplished by first simulating transport and dispersion using wind measurements from only the 12 m level from a network of towers. This case represents the approach commonly taken at many facilities where a network of short towers is available. Then the release is modeled using wind measurements made at four levels in the lowest 100 m. The differences between the two simulations are significant and would lead to very different responses in an emergency situation.
DOE
Nocturnal Variations; Pollution Transport; Air Pollution; Wind Direction; Wind Measurement; Wind Effects

19980210994 Norwegian Inst. for Air Research, Kjeller, Norway

Monitoring air and precipitation quality in the border regions of Norway and Russia, ***Oct. 1995 - Mar. 1996 Overvaaking av luft- og nedboerkvalitet i grenseomraadene i Norge og Russland. Oktober 1995-mars 1996***

Hagen, L. O., Norwegian Inst. for Air Research, Norway; Sivertsen, B., Norwegian Inst. for Air Research, Norway; Johnsrud, M., Norwegian Inst. for Air Research, Norway; Bekkestad, T., Norwegian Inst. for Air Research, Norway; 1997; 71p; In Norwegian

Report No.(s): NILU-OR-68/96; DE98-718984; ISBN 82-425-0830-5; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A comprehensive study of the occurrence and extent of air pollution along the Russian border in Soer-Varanger, Norway, started in 1988. The measurement programme includes air quality, meteorological conditions and precipitation chemistry. The highest SO2 concentrations in Norway are measured in this area, and the smelters in Nikel and Zapoljarnij are the main sources. The highest hourly mean concentration on the Norwegian side in the winter 1995/1996 was 2352 micrograms per cu m. The results are given in this report, and the work was part of the Norwegian governmental programme for pollution monitoring.

DOE

Air Quality; Air Pollution; Pollution Monitoring; Precipitation (Chemistry)

19980210996 Norwegian Inst. for Air Research, Kjeller, Norway

Air Quality Monitoring in the Border Areas of Norway and Russia ***Progress Report, Apr. - Sep. 1996 Overvaaking av luft- og nedboerkvalitet i grenseomraadene i Norge og Russland, april-september 1996***

Hagen, L. O., Norwegian Inst. for Air Research, Norway; Sivertsen, B., Norwegian Inst. for Air Research, Norway; Arnesen, K., Norwegian Inst. for Air Research, Norway; Bekkestad, T., Norwegian Inst. for Air Research, Norway; 1997; 70p; In Norwegian

Report No.(s): NILU-OR-32/97; DE98-737151; ISBN 82-425-0884-4; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This report discusses the results of a comprehensive study of the occurrence and extent of air pollution along the Russian border in Soer-Varanger county. The measurement programme includes air quality, meteorological conditions and precipitation chemistry. The highest SO2 concentration in Norway are measured in the area under consideration. The smelters in Nikel and Zapoljarnij are the main sources of SO2 in the area. During the summer of 1996 the short-term average concentrations of SO2 at the Norwegian measuring stations far exceeded the Norwegian and international guideline values. SO2 concentrations increased from South-West towards North-East in Soer-Varanger and were higher on the Russian side of the border.

DOE

Air Pollution; Air Quality; Precipitation (Chemistry); Sulfur Dioxides

19980211019 Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht, Germany

The Baltic Sea experiment BALTEX: a brief overview and some selected results

Raschke, E., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Karstens, U., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Nolte–Holube, R., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Brandt, R., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Isemer, H. J., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Lohmann, D., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Lobmeyr, M., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Rockel, B., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Stuhlmann, R., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; 1997; ISSN 0344-9629; 27p; In English

Report No.(s): GKSS-97/E/13; DE98-741853; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The mechanisms responsible for the transfer of energy and water within the climate system are under worldwide investigation within the framework of the Global Energy and Water Cycle Experiment (GEWEX) to improve the predictability of natural and man-made climate changes at short and long ranges and their impact on water resources. Five continental-scale experiments have been established within GEWEX to enable a more complete coupling between atmospheric and hydrodlogical models. One of them is the Baltic Sea Experiment (BALTEX). In this paper, the goals and structure of BALTEX are outlined. A short overview of measuring and modelling strategies is given. Atmospheric and hydrological model results of the authors are presented. This includes validation of precipitation using station measurements as well as validation of modelled cloud cover with cloud estimates

form satellite data. Furthermore, results of a large-scale grid based hydrological model to be coupled to atmospheric models are presented.
DOE
Atmospheric Models; Baltic Sea; Climate; Climate Change; Cloud Cover; Hydrology Models

19980211023 Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht, Germany
Natural variability and anthropogenic change of storm related sea level variations along the North Sea coast
Langenberg, H., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Pfizenmayer, A., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Storch, H. von, Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Suendermann, J., Hamburg Univ., Germany; 1997; ISSN 0344-9629; 32p; In English
Report No.(s): GKSS-97/E/48; DE98-746525; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The influence of a changing wind climate on the sea surface elevations along the North Sea coast was investigated with a statistical downscaling technique and with a dynamical model. Both models agree on the following results: in the past, the winter means of high water levels along the North Sea coast increase on the order of 1-2 mm/year, on account of only the atmospheric forcing, whereas the high intra-monthly percentiles - reduced by the winter averages - show no clear trend: the British Coast exhibits a slight negative and the continental coast an equally small positive tendency. In the climate scenarios, the effect on the high percentiles follows the same pattern. A slightly larger and everywhere positive difference is diagnosed in the mean water levels along the North Sea coast. This study evaluates the impact of a changing atmospheric forcing, only. Additional influences, such as the eustatic and isostatic effects are not accounted for.
DOE
Elevation; Environment Effects; Man Environment Interactions; Ocean Surface

19980211024 Los Alamos National Lab., NM USA
Initial airborne CO2 DIAL measurements: Discussion of results and data analysis considerations
Tiee, J. J., Los Alamos National Lab., USA; Foy, B. R., Los Alamos National Lab., USA; Quick, C. R., Los Alamos National Lab., USA; [1997]; 16p; In English; 4th; Chemical Analysis by Laser Interrogation of Proliferation Effluents, 25-27 Feb. 1997, Livermore, CA, USA
Contract(s)/Grant(s): W-7405-ENG-36
Report No.(s): LA-UR-97-1586; CONF-970276-7; DE97-007745; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A detailed discussion of airborne CO2, DIAL measurements obtained from the first joint N-ABLE field campaign at INEL is presented. System performance characteristics, including return signal strength, averaging statistics, and temporal correlation as well as multi-line DIAL spectral data are discussed. In particular, we review data acquisition and analysis strategies pertinent to chemical detection from a moving platform, such as range determination and correction, and return signal processing (waveform vs. box-car integration, baseline correction). We also report observed effects and variations due to near-field light scattering, pointing and tracking stability, and stack-release plume dynamics.
DOE
Airborne Equipment; Carbon Dioxide; Data Acquisition; Aircraft; Signal Processing

19980211077 Norwegian Inst. for Air Research, Kjeller, Norway
[Norwegian Institute for Air Research] ***Annual Report, 1996 Aarsrapport 1996***
1997; 45p; In Norwegian
Report No.(s): NEI-NO-863; DE98-713805; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The annual report from the Norwegian Institute for Air Research presents the activities at the institute. The activities cover fields like motor traffic and air quality of urban areas, acid precipitation, the ozone layer, advanced environmental monitoring systems, environmental contamination, and environmental problems in Arctic.
DOE
Air Pollution; Pollution Control; Air Quality; Environmental Monitoring; Ozone; Urban Transportation

19980211086 Norwegian Inst. for Air Research, Kjeller, Norway

Atmospheric corrosion tests along the Norwegian-Russian border, Part 2

Henriksen, J. F., Norwegian Inst. for Air Research, Norway; Mikhailov, A. A., Norwegian Inst. for Air Research, Norway; 1997; 40p; In English

Report No.(s): NILU-OR-37/97; DE98-718994; ISBN 82-425-0892-5; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A bilateral exposure programme was carried out along the Norwegian-Russian border in 1990-1991, 1992-1993 and 1993-1994 to evaluate quantitatively the effect of sulphur pollutants on the atmospheric corrosion of important materials in subarctic climate. The first part of the programme demonstrated that also in subarctic climate do metals corrode depending on the atmospheric corrosivity, and dose-response functions were derived which combined the effects of SO2 and time of wetness. The second part of the programme, which is described in this report, involved exposures of carbon steel, zinc and copper at two sites in Norway and three sites in Russia. It is concluded that the accelerated atmospheric corrosion of metals in regions along the border is mainly due to dry deposition of sulphur. At some sites, dry deposition of Cl contributes because of sea-salt aerosols. The corrosivity of acid precipitation is certain but could not be represented as a function because of the small differences observed in the pH values at the different sites. At all test sites the kinetics of corrosion of steel, zinc and copper are characterized by a reduced corrosion rate after one year of exposure. Time of wetness is an important parameter in predicting atmospheric corrosion of metals even on a regional scale. Hence, for monitoring and for trend-effect analysis, it is very important to determine the corrosivity of SO2 with time of wetness. In accordance with dose-response functions obtained, the yearly corrosion rate for steel and zinc are higher for the areas with higher amounts of dry deposition of Cl than for areas with analogous but only SO2-containing atmosphere.

DOE

Atmospheric Effects; Corrosion Tests; Contaminants; Moisture Content; Time Dependence; Sulfur Dioxides; Corrosion

19980211087 Norwegian Inst. for Air Research, Kjeller, Norway

NILU's Atmospheric Research at Ny-Aalesund

Beine, H. J., Norwegian Inst. for Air Research, Norway; 1997; 50p; In English

Report No.(s): NILU-OR-20/97; DE98-718997; ISBN 82-425-0867-4; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

At Ny-Aalesund, Spitsbergen, NILU is involved in many scientific projects that focus on global and regional atmospheric chemistry such as stratospheric ozone depletion, the greenhouse effect (from gases and aerosols), tropospheric ozone (in-situ production and depletion in the boundary layer), or the transport of pollutants from mid-latitudes (Arctic haze). This report presents a brief historical overview of NILU's research activities at Ny-Aalesund since 1973. It also discusses the scientific results of the first years of operation of the Zeppelin station since 1989, and presents ongoing projects.

DOE

Aerosols; Arctic Regions; Atmospheric Chemistry; Ozone Depletion; Ozone; Pollution Transport

19980211091 New Energy and Industrial Technology Development Organization, Tokyo, Japan

Survey on the reduction technology of greenhouse effect gas emission from automobiles ***Jidosha kara no onshitsu koka gas haishutsuryo teigen gijutsu no chosa***

Mar. 1997; 163p; In Japanese

Report No.(s): NEDO-GET-9605; DE98-735479; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The developmental trend of the reduction technology of greenhouse effect gas emission from automobiles was surveyed. Development of low pollution, energy saving and substituting energy vehicles such as electric, methanol and natural gas vehicles is in rapid progress together with performance improvement of conventional gasoline vehicles. For example, since GDI engine directly injects fuel into cylinders, it can control an air/fuel ratio at will, and reduce CO2 emission. Lean burn engine vehicle and hybrid vehicle are also under development. Performance improvement of storage batteries for electric vehicles, in particular, that combined with solar cells, and the practicability of hybrid vehicles are being clarified. Among them, the superiority of fuel cell technology in the future is becoming clear from a general viewpoint, because of its high efficiency and no CO2 emission. As methanol is produced from plants, construction of cyclic energy systems is promising. However, since low emission vehicles are expensive, some policies such as legal obligation and subsidy system are important.

DOE

Carbon Dioxide; Greenhouse Effect; Methyl Alcohol; Automobiles; Fuel-Air Ratio

19980211095 Norwegian Inst. for Air Research, Kjeller, Norway

ENSIS YANTAI. Workshop Report 25-29 November 1996

Boehler, T., Norwegian Inst. for Air Research, Norway; Zhang, P. L., Norwegian Inst. for Air Research, Norway; 1997; 75p; In English

Report No.(s): NILU-OR-17/97; DE98-737144; ISBN 82-425-0863-1; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

NILU (Norwegian Institute for Air Research) carries out a project for Yantai Municipal Science and Technology Commission, China, regarding installation of an Environmental Surveillance and Information System (ENSIS). This system consists of modules for air and water monitoring and management. The project started in November 1996 and will last for three years. This report summarizes the start-up workshop held in November 1996.

DOE

Information Systems; Water Management; Modules; Research and Development

19980211096 Norwegian Inst. for Air Research, Kjeller, Norway

Monitoring of the ozone layer ***Annual Report, 1996 Overvaaking av ozonlaget. Aarsrapport 1996***

Dahlback, A., Norwegian Inst. for Air Research, Norway; Braathen, G. O., Norwegian Inst. for Air Research, Norway; Hansen, G. H., Norwegian Inst. for Air Research, Norway; Svenoee, T., Norwegian Inst. for Air Research, Norway; 1997; 38p; In Norwegian

Report No.(s): NILU-OR-29/97; DE98-737150; ISBN 82-425-0877-1; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This report presents the data for 1996 from the Norwegian Ozone Monitoring Programme. The measured monthly mean values of the total ozone in Oslo, Tromsoe and Ny-Aalesund are generally smaller compared with long-term monthly averages. A trend analysis based on ground measurements in Oslo 1979-1996 shows an average decrease of 0.54% in winter, 0.83% in spring, 0.24% in summer and 0.21% in autumn. The solar UV radiation is measured continuously. Frequently ozone probes are sent up in balloons from Bjoernoeya and Gardermoen. The observed distribution of ozone concentration with height does not vary as dramatically as is seen in September-November each year in Antarctic areas.

DOE

Ozone; Environmental Monitoring; Solar Radiation; Ultraviolet Radiation; Trend Analysis; Ozonosphere

19980211097 Swedish Transport and Communications Research Board, Stockholm, Sweden

Exposures due to emissions from ethanol and diesel fueled buses in Stockholm

Otson, R., Health Canada, Canada; Westerholm, R., Stockholm Univ., Sweden; Fellin, P., BOVAR Environmental, Canada; Davis, C., BOVAR Environmental, Canada; Dec. 1997; ISSN 1401-1271; 32p; In English

Report No.(s): KFB-MED-97-35; DE98-738173; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Personal exposure and ambient concentrations of 105 chemical species were determined during September in Stockholm, a northern urban area. This unique study provided personal exposure data equivalent to 8 person-days each on diesel and ethanol buses, and 12 person-days on streets in the urban area. If used judiciously, these data, and the ambient data, are useful for risk assessment, as well as for validation of dispersion models. The concentrations for many species were relatively low, when compared to results from other studies of outdoor concentrations in urban areas. This was probably due to the meteorological conditions during the study which favoured low concentrations. Personal exposures were generally higher than ambient concentrations, probably because of the proximity of subjects to sources of contaminants. As expected, alcohol compounds were found at greater levels in ethanol fueled buses and at bus stops on routes with predominantly ethanol fueled buses. No trends were evident for exposures of VOCs or PAC on diesel and ethanol buses. Exposures to particles at the bus stops were lower than exposures on buses, possibly due to the low traffic volumes at the bus stops, and the proximity of subjects on buses to other traffic. Upon factor analysis of the data, five factors explained the majority of the variance in the results, and showed associations between selected species and a few other parameters. These associations should be useful to design more efficient studies in the future. The chemical element mass balance results with measured profiles yielded uncertain results, but with literature profiles, the diesel and ethanol bus emissions accounted for a small fraction, i.e. less than 5%, of the exposures.

DOE

Diesel Engines; Exhaust Gases; Chemical Composition; Ethyl Alcohol; Mass Distribution; Exposure; Exhaust Emission

19980211098 Swedish Transport and Communications Research Board, Stockholm, Sweden

Exhaust gas emissions from ethanol fueled heavy duty vehicles

Pettersson, Esbjoern, Lulea Univ., Sweden; Dec. 1997; ISSN 1401-1271; 23p; In English

Report No.(s): KFB-MED-97-32; DE98-738174; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The purpose of the project was to contribute to the development of more efficient and better suited catalysts for ethanol fueled diesel vehicles, by characterization of the emissions of both regulated and unregulated exhaust emission components at different driving conditions for a bus engine. Measurements on three commercial and one prototype catalyst were performed at 22 'steady state' loading points. The measurements included the regulated emission components carbon monoxide, hydrocarbons and nitrogen oxides and the non-regulated emission components ethanol, formaldehyde, acetaldehyde, acetic acid and some light hydrocarbons. The investigation shows that there are large differences between the commercial catalysts regarding the oxidation capacity and the selectivity. One of the catalysts showed a very high oxidation capacity but relatively low selectivity. The emissions of both nitrogen dioxide and acetic acid became with this catalyst considerably larger than for the other two. On the other hand did the emission of acetaldehyde become lower than for the other two. The catalyst which were developed especially for ethanol fueled diesel vehicles showed somewhat higher selectivity for ethanol oxidation at most loading points. This gave very low emissions of acetic acid and low emissions of acetaldehyde. This catalyst showed on the other hand some oxidation of NO to NO(sub 2). Ageing in diesel exhaust did not impair the performance of this catalyst.

DOE

Acetaldehyde; Acetic Acid; Carbon Monoxide; Catalysts; Combustion Products

19980211099 Swedish Transport and Communications Research Board, Stockholm, Sweden

Chemical and biological characterization of exhaust emissions from ethanol and ethanol blended diesel fuels in comparison with neat diesel fuels

Westerholm, R., Stockholm Univ., Sweden; Christensen, Anders, Stockholm Univ., Sweden; Toernqvist, M., Stockholm Univ., Sweden; Ehrenberg, L., Stockholm Univ., Sweden; Haupt, D., Lulea Univ., Sweden; Dec. 1997; ISSN 1401-1271; 40p; In English

Report No.(s): KFB-MED-97-17; DE98-738175; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This report presents results from a project with the aim of investigating the potential environmental and health impact of emissions from ethanol, ethanol blended diesel fuels and to compare these with neat diesel fuels. The exhaust emissions were characterized regarding regulated exhaust components, particulate and semivolatile Polycyclic Aromatic Compounds (PAC) and with bioassays. The bioassays were mutagenicity and TCDD receptor affinity tests. Results: Neat ethanol fuels are 'low emission' fuels, while European diesel fuel quality (EDF) and an ethanol blended EDF are 'high emission' fuels. Other fuels, such as Swedish Environmental Class one (MK1) and an ethanol blended MK1, are 'intermediate' fuels regarding emissions. When using an oxidizing catalyst exhaust after-treatment device a reduction of harmful substances in the exhaust emissions with respect to determined exhaust parameters was found. The relatively low emission of PAH from ethanol fueled engines would indicate a lower cancer risk from ethanol than from diesel fuels due to this class of compounds. However, the data presented emphasize the importance of considering the PAH profile.

DOE

Bioassay; Environmental Surveys; Ethyl Alcohol; Exhaust Emission; Polycyclic Aromatic Hydrocarbons

19980211101 Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht, Germany

Analysis of the sea-level variability along the Chinese coast and estimation of the impact of global climate change

Cui, M., Qingdao Inst. of Oceanology, China; Zorita, E., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; 1997; ISSN 0344-9629; 29p; In English

Report No.(s): GKSS-97/E/19; DE98-741851; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The relationship between Chinese coastal sea level (SL) and the atmospheric circulation at montly time scales has been examined. A canonical correlation analysis between SL and sea-level pressure (SLP) indicates that the SL variability can be well explained by the intensities of the (seasonal) zonal and meridional circulations. Linear statistical models to hindcast SL from the SLP field reproduce reasonably well the SL evolution in an independent period. These models are used to estimate the contribution of a perturbed atmospheric circulation on coastal SL changes in a climate model experiment forced by the IPCC Scenario A green-

house-gas emissions from 1940 until 2090. The perturbed atmospheric circulation causes a SL change of a few centimeters at the end of the integration, and its sign depends on location and season.
DOE
Atmospheric Circulation; Climate Change; Climate Models; Climatology; Exhaust Emission; Exhaust Gases; Greenhouse Effect

19980211313 Lawrence Livermore National Lab., Livermore, CA USA
Use of geographic data in emergency response decision making system
Walker, H., Lawrence Livermore National Lab., USA; Jul. 01, 1997; 7p; In English; Emergency Preparedness and Response, 22-6th25 Apr. 1997, San Francisco, CA, USA; Sponsored by American Nuclear Society, USA
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-128133; CONF-970419; DE98-051129; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Geographic data have a number of key roles in emergency response systems focused on releases of hazardous material to the environment. Maps are a key element in allowing emergency response personnel to become oriented during a response and in presenting status information effectively to these personnel. Geographic data are essential for modeling to predict dispersal patterns during a release. It is also necessary to integrate model and measurement data with demographic information in order to assess the consequences of a release. Appropriate support for such capabilities is based on a number of evolving technologies including fast computers, large databases, network technology, remote sensing and geographic information systems.
DOE
Geographic Information Systems; Emergencies; Decision Making; Data Bases; Computers; Geography

19980211316 Lawrence Livermore National Lab., Livermore, CA USA
Chemistry implications of climate change
Atherton, C. S., Lawrence Livermore National Lab., USA; May 01, 1997; 5p; In English; 77th, 2-7 Feb. 1997, Long Beach, CA, USA; Sponsored by American Meteorological Society, USA
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-127340; CONF-970207; DE98-051117; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Since preindustrial times, the concentrations of a number of key greenhouse gases such as carbon dioxide CO2, methane CH4 and the nitric oxides N2O have increased. Additionally, the concentrations of anthropogenic aerosols have also increased during the same time period. Increasing concentrations of greenhouse gases are expected to increase temperature, while the aerosols tend to have a net cooling effect. Taking both of these effects into account, the current best scientific estimate is that the global average surface temperature is expected to increase by 2 deg. C between the years 1990 to 2100. A climate change if this magnitude will both directly and indirectly impact atmospheric chemistry. For example, many important tropospheric reactions have a temperature dependence (either Arrhenius or otherwise). Thus, if temperature increase, reaction rates will also increase.
DOE
Atmospheric Chemistry; Climate Change; Greenhouse Effect; Gas Composition

19980211363 Pacific Northwest National Lab., Richland, WA USA
Observation of (sup 135)Xe with the PNNL ARSA System
Reeder, P. L., Pacific Northwest National Lab., USA; Bowyer, T. W., Pacific Northwest National Lab., USA; Abel, K. H., Pacific Northwest National Lab., USA; Aug. 1997; 8p; In English
Contract(s)/Grant(s): DE-AC06-76RL-01830
Report No.(s): PNNL-11654; DE97-054298; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The automated radioxenon sampler-analyzer (ARSA) developed by PNNL and with funding and support form the DOE NN-20 CTBT research and development program, observed 9.1-hr (sup 135)Xe in a sample of New York City air obtained on April 4th, 1997. The report below briefly describes the ARSA system and the first ever reported measurement of the short-lived (sup 135)Xe from an automated radioxenon system.
DOE
Air Sampling; Air Quality

19980211378 National Chemicals Inspectorate, Solna, Sweden

Mercury in products: a source of transboundary pollutant transport

Munthe, J., Swedish Water and Air Pollution Research Lab., Sweden; Kindbom, K., Swedish Water and Air Pollution Research Lab., Sweden; Dec. 1997; ISSN 0284-1185; 48p; In English

Report No.(s): KEMI-10-97; DE98-750761; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The purpose of this report is to summarize current knowledge on product-related emissions of mercury to air on a European scale, and to estimate the contribution from mercury contained in products, to the total anthropogenic emissions of mercury to air and transboundary transport of mercury in Europe. Products included in this study are batteries, measuring and control instruments, light sources and electrical equipment, all intentionally containing mercury. The main result of this study is that product-related emission of mercury can contribute significantly to total emissions and transboundary transport of mercury in the European region and that measures to limit the use of mercury in products can contribute to an overall decrease of the environmental input of mercury in Europe. It is concluded that: -Mercury contained in products may be emitted to air during consumption, after disposal when incinerated or when volatilized from landfill. Mercury may also be emitted to air during recycling of scrap metal or when accumulated (stored) in society. -The amount of mercury consumed in batteries and in measuring and control instruments had decreased since the late 1980's. The total use of mercury in light sources and electrical equipment has not changed significantly during the same time period. The contribution to total anthropogenic emissions of mercury to air in Europe in the mid 1990's is estimated to be: for batteries 4%; for measuring and control instruments 3%; for lighting and electrical equipment 11%. -Mercury in products leads to significant wet deposition input in Scandinavia. The relative amount of the total deposition flux attributable to products is estimated to be 10-14%.

DOE

Light Sources; Lighting Equipment; Measuring Instruments; Mercury (Metal); Pollution Transport; Recycling

19980211506 United Nations Environment Programme, Collaborating Centre on Energy and Environment, Roskilde, Denmark

Preliminary report on inventory of greenhouse gases, Phase 1 ***Rapport preliminaire sur l'inventaire de gaz a effet de serre, Phase 1***

Fenhann, J., United Nations Environment Programme, Denmark; Jul. 1997; 70p; In French; Prepared in cooperation with Comite Interministeriel pour la Mise en Oeuvre des Actions de la Convention Cadre sur le Changement Climatique

Report No.(s): NEI-DK-3064; DE98-726252; ISBN 87-550-2321-5; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The United Nations Framework Convention on Climate Change (UNFCC) requires the signatory countries to develop, periodically update, publish and make available to the Conference of the Parties national inventories of anthropogenic greenhouse gas emissions (GHG) by sources and removals by sinks, using comparable methodologies as well as to formulate policies and programmes to adapt to or mitigate climate change. Following the entree-into-force of the Convention, the Government of Burkina Faso requested the Danish Government to provide technical assistance and support in order to assess national contributions to global GHG accumulation and to identify the most relevant GHG mitigation and adaptation options for national target-setting and action. This report presents the results of the Phase 1 of the project. The report summarises: (1) the national inventory on GHG emissions and sinks; (2) a preliminary forecast of GHG emissions and possible mitigation options, and (3) a first attempt to analyse the vulnerability and possible adaptation strategies to climate change.

DOE

Inventories; Greenhouse Effect; Sinks; Forecasting; Vulnerability; Climate Change; Adaptation; Exhaust Emission

19980211555 Bechtel Nevada Corp., Las Vegas, NV USA

US Department of Energy. Nevada Operations Office Environmental Monitoring Program summary data report: Second calendar quarter-1997

Black, S. C., Bechtel Nevada Corp., USA; Haworth, O. L., Bechtel Nevada Corp., USA; Townsend, Y. E., Bechtel Nevada Corp., USA; Dec. 1997; 31p; In English

Contract(s)/Grant(s): DE-AC08-96NV-11718

Report No.(s): DOE/NV/11718-163; DE98-052967; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The moratorium on the testing of nuclear explosive devices, possibility of alternate uses for the Nevada Test Site (NTS), and reduced budget have led to significant changes in the extent of environmental surveillance activities on and around the NTS. Not only have the number of monitored locations been reduced since 1992, but also the frequency and types of analyses have been

changed. This report consists of a summary of the radiological and non-radiological data collected and analyzed during the second quarter of 1997.
DOE
Environmental Monitoring; Nuclear Devices

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GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For space radiation see 93 Space Radiation.

19980210880 Clemson Univ., Dept. of Physics, SC USA
Coordinated Studies of Magnetospheric/Ionospheric Coupling and Dynamics in the Diffuse Aurora ***Final Report, 1 May 1993 - 31 Dec. 1996***
Larsen, M. F., Clemson Univ., USA; May 15, 1998; 53p; In English
Contract(s)/Grant(s): NAG5-5002
Report No.(s): NASA/CR-1998-208309; NAS 1.26:208309; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The results of the studies carried out under the grant are described in detail in the following publications: Atmospheric Response in Aurora experiment: Observations of E and F region neutral winds in a region of postmidnight diffuse aurora; Waltersscheid, Modified geostrophy in the thermosphere, ARIA II neutral flywheel-driven field-aligned currents in the postmidnight sector of the auroral oval: A case study; Observations of unstable atmospheric shear layers in the lower E region in the post-midnight auroral oval; and Depletion of oxygen in aurora: Evidence for a local mechanism. The objective of the Atmospheric Response in Aurora (ARIA) experiment was to measure the response of the E-region neutral flow to substorm activity in the post-midnight sector of the auroral oval. to this end, neutral wind profiles were obtained from a series of four sets of rocket flights using the chemical release technique. The measurements covered conditions ranging from quiet to disturbed. A consistent feature of the observed winds in disturbed conditions is the presence of an E-region jet located between approximately 110 and 120 km altitude. The profiles presented here show that the neutral wind speeds near 110-120 km altitude increase and the hodographs become more elongated or linear in response to higher magnetic activity levels. The wind speeds decrease and the hodographs become more circular as the activity level decreases. The presence of a wind maximum implies shears both above and below. The observations consistently show larger shears below the peak and smaller shears above. In fact, the bottom-side shears during disturbed conditions have Richardson numbers close to or below the critical value of 0.25 suggesting that the flow is highly unstable in that height range. The instability is expected to produce waves, turbulence, and enhanced diffusivity.
Derived from text
Atmospheric Stratification; Auroras; Diffusivity; Coriolis Effect; Magnetic Variations; Magnetosphere-Ionosphere Coupling

19980210889 Los Alamos National Lab., NM USA
Turbulence in the convective boundary layer observed by microwave interferometry
Shao, X. M., Los Alamos National Lab., USA; Carlos, R. C., Los Alamos National Lab., USA; Kirkland, M. W., Los Alamos National Lab., USA; [1997]; 7p; In English; 9th; Global Change Studies, 14 - 16 Jan. 1998, Phoenix, AZ, USA; Sponsored by American Meteorological Society, USA
Contract(s)/Grant(s): W-7405-ENG-36
Report No.(s): LA-UR-97-3987; CONF-980121; DE98-001608; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

A 9-antenna, 400 meter microwave interferometer was utilized in SALSA MEX on the San Pedro River area in July and August, 1997, to measure the turbulence in the Convective Boundary Layer. Water vapor has an appreciable index of refraction at radio frequencies around 10 GHz, and acts as a passive tracer of the magnitude and motion of turbulence. The relative phase changes of a signal from a satellite were tracked by an array of 9 antennas, and the phase differences between antennas were then used to derive the turbulence properties of the boundary layer. Preliminary analysis shows clearly different characteristics for the convection activity of the boundary layer between day and night. From the structure function analysis they can see that the turbulence structure starts to decorrelate at scale sizes of 200 meters for a temporal passband around 100 seconds. Derivation of average wind fields is currently in process.
DOE
Turbulence; Convection; Boundary Layers; Microwave Interferometers; Antenna Arrays

19980210909 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. fuer Physik der Atmosphaere, Wessling, Germany

The impact of stratospheric dynamics and chemistry on northern hemisphere mid-latitude ozone loss

Grewe, V., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Dameris, M., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Sausen, R., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Jul. 03, 1997; ISSN 0943-4771; 26p; In English

Report No.(s): ETDE-DE-611; DE98-722760; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The importance of stratospheric dynamics for the stratospheric ozone distribution in the Northern Hemisphere is investigated using multi-annual simulations of the coupled dynamic-chemical general circulation model ECHAM3/CHEM. This model includes a parameterization for heterogeneous reactions on Polar Stratospheric Clouds (PSC) and on sulphate aerosols. A warm and a cold stratospheric winter are examined to estimate the range of chemical ozone loss due to heterogeneous reactions on PSCs. Ozone depletion in the model mainly occurs inside the polar vortex. An additional ozone reduction due to heterogeneous reactions on PSCs is found as well outside the polar vortex. Secondary vortex formation and vortex contraction after an elongation lead to a transport of airmasses with chemically reduced ozone values out of the vortex. Except for such events, the edge of the modelled polar vortex acts as a barrier to transport. During the formation of secondary vortices no additional heterogeneous reactions occur therein. Other dynamic events like the elongation of the polar vortex and its displacement to lower latitudes lead to an intense ozone depletion. A modelled minor stratospheric warming causes a total deactivation of chlorine components and prevents further ozone depletion. In midlatitudes, the amplitude of short-term variations of total ozone is amplified by PSC heterogeneous chemical ozone reduction.

DOE

Stratosphere; Atmospheric Chemistry; Dynamic Models; Northern Hemisphere; Ozone Depletion; Atmospheric General Circulation Models

19980210910 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. fuer Physik der Atmosphaere, Wessling, Germany

Heterogeneous PSC ozone loss during an ozone mini-hole

Grewe, V., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Dameris, M., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Jul. 1997; ISSN 0943-4771; 16p; In English

Report No.(s): ETDE-DE-610; DE98-722759; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

An upper tropospheric high pressure system resulting in large scale ascent even in the stratosphere, is investigated by means of simulations using the coupled dynamic-chemical general circulation model ECHAM3/CHEM. These simulations show two kinds of impact on stratospheric ozone. Dynamic redistribution caused by ascent leads to a rapid decrease of total ozone, i.e. an ozone mini-hole. The formation of polar stratospheric clouds caused by adiabatic cooling leads to a chlorine activation at the location of the ozone mini-hole. The resulting chemical ozone depletion occurs downstream of the ozone mini-hole, due to the stratospheric circulation.

DOE

High Pressure; Atmospheric Models; Ozone; Heterogeneity; Losses; Ozone Depletion; Atmospheric General Circulation Models; Simulation

19980211025 Los Alamos National Lab., NM USA

Use of multivariate regression for analysis of CO2 laser lidar data from long pathlengths in ambient atmosphere

Sander, R. K., Los Alamos National Lab., USA; Quagliano, J. R., Los Alamos National Lab., USA; Fry, H., Los Alamos National Lab., USA; [1997]; 20p; In English; 4th; Chemical Analysis by Laser Interrogation of Proliferation Effluents, 25-27 Feb. 1997, Livermore, CA, USA

Contract(s)/Grant(s): W-7405-ENG-36

Report No.(s): LA-UR-97-1585; CONF-970276-6; DE97-007754; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Until recently use of lasers for long path absorption measurements has relied on using differential absorption at two wavelengths to look for one species at a time in the atmosphere. With the advent of multi-line CO2 lasers it is now feasible to generate 30 to 40 lines in a rapid burst to look for spectra of all the chemical species that may be present. Measurements have been made under relatively constant meteorological conditions in a summertime desert environment with a multi-line tunable laser. Multivariate regression analysis of this data shows that the spectra can be accurately fit using a small number of spectral factors or eigen-

vectors of the time dependent spectral data matrix. The factors can be rationalized in terms of lidar system effects and atmospheric composition changes.
DOE
Carbon Dioxide Lasers; Ambience; Atmospheric Composition; Regression Analysis

19980211026 Los Alamos National Lab., NM USA
Overview of the CALIOPE CO2 DIAL Project
Schultz, J., Los Alamos National Lab., USA; [1997]; 5p; In English; 4th; Chemical Analysis by Laser Interrogation of Proliferation Effluents, 25-27 Feb. 1997, Livermore, CA, USA
Contract(s)/Grant(s): W-7405-ENG-36
Report No.(s): LA-UR-97-1584; CONF-970276-5; DE97-007755; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

During 1996 the CALIOPE CO2 DIAL Project developed a new generation of lidar transmitter, receiver, data acquisition, and control technology, constructed new ground and airborne lidar systems, and used them to conduct extensive field tests. New data analysis algorithms were successfully applied to the test data, and CO2 DIAL capabilities were significantly improved. Recent activities and accomplishments are summarized, and future directions are discussed.
DOE
Carbon Dioxide; Data Acquisition; Airborne Equipment; Transmitter Receivers

19980211056 California Univ., Inst. of Tectonics, Santa Cruz, CA USA
Synthetic Seismograms in Heterogeneous Elastic Waveguides and Applications in Investigating LG-Wave Propagation ***Final Report, 10 Oct. 1994 - 30 Sep. 1997***
Wu, R. S., California Univ., USA; Jin, S., California Univ., USA; Xie, X. B., California Univ., USA; Lay, T., California Univ., USA; Mar. 20, 1998; 48p; In English
Contract(s)/Grant(s): F49620-95-1-0028
Report No.(s): AD-A347897; AFRL-SR-BL-TR-98-0563; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study is aimed at development and application of a new wave propagation and modeling method for regional waves in heterogeneous crustal waveguides using one-way wave approximation. As the first step, we solve the 2D SH-wave problem. A half-space GSP (Generalized Screen Propagator) is formulated for the SH half space problem. We apply our method to simulating regional wave propagation in different types of complex crustal waveguides including those with small-scale random heterogeneities and random rough interfaces of sedimentary layers. Synthetic seismograms and snapshots are shown to facilitate the study of path effects of Lg waves. Slowness domain analysis is especially useful in investigating energy transfer in crustal waveguides and for determining which part of the energy can be trapped in the waveguide. The influence of crustal heterogeneities and rough interfaces on Lg amplitude attenuation and Lg coda formation are studied.
DTIC
Seismic Waves; Procedures; Models; Computerized Simulation; Heterogeneity; Data Acquisition

19980211058 Russian Academy of Natural Sciences, Space Research Inst., Moscow, Russia
Space Plasma Studies by In-Situ and Remote Measurements
Jun. 09, 1998; 88p; In English
Contract(s)/Grant(s): F61775-98-W-E075
Report No.(s): AD-A347829; EOARD-CSP-98-1048; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Final Proceedings for International Symposium on Space Plasma Studies, 1 June 1998 - 5 June 1998. This is an interdisciplinary conference. Topics include physical processes in the solar wind and in the magnetosphere.
DTIC
Conferences; Solar Wind; Space Plasmas

19980211105 Maxwell Technologies, Inc., San Diego, CA USA
The Physical Basis for the Lg/P Discriminant: Signal Characteristics and Modeling ***Final Report, 31 Jul. 1995 - 31 Jul 1997***
Bennett, Theron J., Maxwell Technologies, Inc., USA; McLaughlin, Keith L., Maxwell Technologies, Inc., USA; Cook, Ronald W., Maxwell Technologies, Inc., USA; Carter, Jerry A., Maxwell Technologies, Inc., USA; Nov. 1997; 98p; In English
Contract(s)/Grant(s): F19628-95-C-0107; AF Proj. 5101
Report No.(s): AD-A347652; MFD-FR-97-15918; PL-TR-97-2149; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

Effective monitoring of the Comprehensive Test Ban Treaty (CTBT) for low-magnitude events can only be achieved through the use of regional seismic observations. One of the most widely heralded regional discrimination techniques is based on the measurement of Lg/P ratios at regional seismic stations. Although this technique seems to separate events of different source types in many geographic regions, the physical basis for the discriminant and the significance of regional propagation effects on the ratio measurements have generally not been resolved. This study has sought to determine the salient characteristics of Lg/P ratios as a function of frequency for events of different source types from various geographic regions, to assess how the measurements should have been affected by propagation path conditions, and to analyze the results in terms of physical properties of the seismic source mechanism and the propagation path.
DTIC
Seismology; Monitors; Signal Analysis; Models; Seismograms

19980211130 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
Ionospheric Modelling at Low Latitudes in the Brazil ***Modelagem Ionosferica em Baixas Latitudes no Brasil***
deSouza , Jonas Rodrigues, Instituto de Pesquisas Espaciais, Brazil; May 1997; 186p; In Portuguese; Original contains color illustrations
Report No.(s): INPE-6395-TDI/611; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche; US Sales Only; US Sales Only

in this work, the ionospheric model SUPIM (Sheffield University Plasmasphere-Ionosphere Model) is used to calculate the ionospheric parameters foF2 and hmF2, and the model results are compared with ionosonde data recorded at Huancayo, Peru, at Fortaleza and Cachoeira Paulista, in Brazil. The SUPIM input parameters, such as, solar EUV fluxes, electric fields and thermospheric winds are adjusted in order to get good agreement between model results and observations. The study for Huancayo data for solar maximum conditions shows that the value of the solar EUV flux calculated using model of Tobiska (1991) is overestimated by 40%. It also shows the importance of using E x B drift at the same epoch as of ionospheric data in modelling study. Most important part of this work is a study of the ionospheric F region over Brazil using SUPIM and h'F, foF2 and hmF2 data recorded simultaneously at Fortaleza and at Cachoeira Pauhsta. In this study, equatorial E x B drift, foF2, hmF2 and meridional thermospheric winds are calculated for geomagnetically calm periods and also for minimum and maximum solar activity conditions. For each solar activity level the F region behaviour during summer and winter is examined. The solar EUV flux using Tobiska (1991) model shows inconsistent result only for summer of minimum solar activity, indicating an underestimate of his flux values by 25%. The South Atlantic Anomaly effects in the ionosphere over Cachoeira Paulista are also taken into account in the SUPIM code, and the results indicate a seasonal variation with negligible effect during the winter. At Fortaleza, the parameter foF2 and hmF2 show sensitive variation due to changes in E x B drift. But, between 07:00-15:00 LT, the parameter hmF2 is also strongly controlled by combination of the winds and drifts. At Cachoeira Paulista, the local winds control hmF2. Also we verify that foF2 at this station shows significant dependence on the winds at magnetic conjugated point of Cachoeira Paulista. Comparative study of the calculated winds in this work (adjusted winds), the HWM90 model winds, the calculated winds by Medeiros (1995) and the winds data recorded by Fabry-Perot interferometer at Cachoeira Paulista is also done. The results show good agreement of the adjusted winds with the observed data and also show good agreement with the model of Medeiros (1995) during the evening and the night, except, during the winter of minimum solar activity. Analysing foF2 variation with the latitude and with the local time we verify that the Equatorial Anomaly peak reaches maximum intensity earlier in the winter hemisphere than in the summer hemisphere.
Author
Ionospherics; Atmospheric Models; Latitude; Brazil; Ionospheric Composition; Anomalies; F 2 Region

19980211291 Academy of Sciences (USSR), Alma-Ata, USSR
Planetary Waves and Mesoscale Disturbances in the Middle and Upper Atmosphere ***Final Report***
Pogoreltsev, Alexander I., Academy of Sciences (USSR), USSR; Yakovets, Arthur F., Academy of Sciences (USSR), USSR; Aushev, Victor M., Academy of Sciences (USSR), USSR; Kaliev, Malik Z., Academy of Sciences (USSR), USSR; Zachateiskiy, Dmitry E., Academy of Sciences (USSR), USSR; May 14, 1998; 115p; In English
Contract(s)/Grant(s): F61708-97-W-0122
Report No.(s): AD-A346700; EOARD-SPC-97-4017; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report results from a contract tasking Ministry - Academy of Science of Kazakhstan Republic as follows: The contractor will investigate wave motions of different scales in the middle and upper atmosphere.
DTIC
Planetary Waves; Middle Atmosphere; Upper Atmosphere; Mesoscale Phenomena; Mesopause; Gravity Waves

19980211310 Lawrence Livermore National Lab., Livermore, CA USA

Optimized filtering of regional and teleseismic seismograms: results of maximizing SNR measurements from the wavelet transform and filter banks

Leach, R. R., Lawrence Livermore National Lab., USA; Schultz, C., Lawrence Livermore National Lab., USA; Dowla, F., Lawrence Livermore National Lab., USA; Jul. 15, 1997; 13p; In English; Research Symposium on Monitoring a Comprehensive Test Ban Treaty, 23-25 Sep. 1997, Orlando, FL, USA

Contract(s)/Grant(s): W-7405-ENG-48

Report No.(s): UCRL-JC-127900; CONF-970967-; DE98-051134; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

Development of a worldwide network to monitor seismic activity requires deployment of seismic sensors in areas which have not been well studied or may have from available recordings. Development and testing of detection and discrimination algorithms requires a robust representative set of calibrated seismic events for a given region. Utilizing events with poor signal-to-noise (SNR) can add significant numbers to usable data sets, but these events must first be adequately filtered. Source and path effects can make this a difficult task as filtering demands are highly varied as a function of distance, event magnitude, bearing, depth etc. For a given region, conventional methods of filter selection can be quite subjective and may require intensive analysis of many events. In addition, filter parameters are often overly generalized or contain complicated switching. We have developed a method to provide an optimized filter for any regional or teleseismically recorded event. Recorded seismic signals contain arrival energy which is localized in frequency and time. Localized temporal signals whose frequency content is different from the frequency content of the pre-arrival record are identified using rms power measurements. The method is based on the decomposition of a time series into a set of time series signals or scales. Each scale represents a time-frequency band with a constant Q. SNR is calculated for a pre-event noise window and for a window estimated to contain the arrival. Scales with high SNR are used to indicate the band pass limits for the optimized filter.The results offer a significant improvement in SNR particularly for low SNR events. Our method provides a straightforward, optimized filter which can be immediately applied to unknown regions as knowledge of the geophysical characteristics is not required. The filtered signals can be used to map the seismic frequency response of a region and may provide improvements in travel-time picking, bearing estimation regional characterization, and event detection. Results are shown for a set of low SNR events as well as 92 regional and teleseismic events in the Middle East.

DOE

Seismology; Seismograms; Wavelet Analysis; Seismic Energy; Seismic Waves; Geophysics; Filters; Seismographs

19980211311 Lawrence Livermore National Lab., Livermore, CA USA

Seismic signals from underground cavity collapses and other mining-related failures

Walter, W. R., Lawrence Livermore National Lab., USA; Heuze, F., Lawrence Livermore National Lab., USA; Dodge, D., Lawrence Livermore National Lab., USA; Jul. 01, 1997; 12p; In English; Research Symposium on Monitoring a Comprehensive Test Ban Treaty, 23-25 Sep. 1997, Orlando, FL, USA

Contract(s)/Grant(s): W-7405-ENG-48

Report No.(s): UCRL-JC-127899; CONF-970967-; DE98-051133; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The sudden collapse of man-made underground cavities have generated seismic signals as large as magnitude 5.4. Collapses are just one of the many types of mining associated seismicity including coalbumps and rockbursts which need to be identified and distinguished from potential clandestine nuclear explosions under the recently signed Comprehensive Test Ban Treaty (CTBT). Collapses, coalbumps and rockbursts are of concern for seismically monitoring a CTBT for a number of reasons. First, they can look like explosions when using some seismic discriminant measures, such M(sub s):m(sub b), M(sub o): m(sub b), regional P/S ratios and depth. Second, underground nuclear explosions themselves produce cavities that might collapse, possibly aiding in the detection of a clandestine event. Finally, because all mine-related events occur in the vicinity of underground cavities, they may come under special scrutiny because of the concern that very large, specially constructed cavities could be used to evasively decouple a clandestine test. For these reasons mine-related seismicity in both active and former mining regions have the potential to be false alarms under a CTBT. We are investigating techniques to identify collapses, either directly via waveform modeling, or indirectly by combining several seismic discriminants. We are also investigating the source mechanisms of coalbumps and collapses to better understand the performance of seismic discriminants for these events. In particular we have found similarities in point source models of some longwall coalbumps, room- and-pillar mine collapses and NTS nuclear explosion cavity collapses. In order to understand coalbumps we are analyzing events from central Utah recorded at regional distances in Utah and Nevada including at the auxiliary station ELK. Some of these have anomalous, explosion- like high frequency P/S ratios. We are combining this new study with results from previous field work done in 1995 at a Colorado long-wall coal mining operation. Similarly to longwall coal mines in Utah and elsewhere, this Colorado mine completely excavates a 3 m high coal seam in 250 m wide

panels leaving the material above unsupported. The roof material above the excavated seam eventually collapses resulting in seismic events.
DOE
Seismology; Underground Explosions; Mining; Mines (Excavations); Failure; Collapse; Nuclear Explosions

19980211312 Lawrence Livermore National Lab., Livermore, CA USA
Seismic discrimination between earthquakes and explosions in the Middle East and North Africa
Walter, W. R., Lawrence Livermore National Lab., USA; Harris, D. B., Lawrence Livermore National Lab., USA; Myers, S. C., Lawrence Livermore National Lab., USA; Jul. 01, 1997; 13p; In English; Research Symposium on Monitoring a Comprehensive Test Ban Treaty, 23-25 Sep. 1997, Orlando, FL, USA
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-127898; CONF-970967-; DE98-051132; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The recently signed Comprehensive Test Ban Treaty provides for an international network of primary and auxiliary seismic monitoring stations (IMS) to verify its compliance. Calibration is required to confidently use these stations to identify and discriminate between earthquakes, mine-related events and clandestine nuclear explosions, particularly for small to moderate seismic events recorded regionally at only a few stations. Given the lack of regional recordings of underground nuclear tests in most of the world, we are making use of mining and industrial explosions to test discriminants. For example we use the Multimax compiled dataset of small earthquakes and quarry explosions in Israel to test regional discriminants at local distances with mixed results. Further complicating calibration is the fact that many INK sites have not yet been installed and others have very short operating histories. When IMS data is available, there is often a lack of independent information (ground truth) on the seismic sources. Here we describe a procedure for calibrating stations with limited data and apply it to the IMS auxiliary station MDT in Morocco. Data was initially available for three months in 1990 when MDT was operated as part of MEDNET. An event detector was run over the continuous data and regional events identified and roughly located using S-P time and back azimuth. The procedure uses spatial and temporal clustering to identify 'known' mine blasts. The spatial clustering is done using the waveform correlation technique of Harris (1991) to find events with similar sources and locations. Temporal clustering looks at the time of day and repetition in time of events with the mine blasts occurring during working hours and days repeatedly over a period of time. A set of 'known' earthquakes is also determined using location, time of day, distribution in time and size criteria. With these independent libraries of identified seismic events, we evaluate promising regional discriminants such as high frequency P/Lg. We also examine distance and path effects on the discriminants. Preliminary results indicate high frequency P/Lg provides some separation between mine blasts and earthquakes at MDT.
DOE
Seismology; Earthquakes; Calibrating

19980211317 Lawrence Livermore National Lab., Livermore, CA USA
36Cl/Cl ratios in geothermal systems: preliminary measurements from the Coso Field
Nimz, G. J., Lawrence Livermore National Lab., USA; Moore, J. N., Lawrence Livermore National Lab., USA; Kasameyer, P. W., Lawrence Livermore National Lab., USA; Jul. 01, 1997; 9p; In English; Geothermal Resources Council (GRC), 12 Oct. 1997, San Francisco, CA, USA
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-128115; CONF-971048; DE98-051087; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The 36Cl/Cl isotopic composition of chlorine in geothermal systems can be a useful diagnostic tool in characterizing hydrologic structure, in determining the origins and age of waters within the systems, and in differentiating the sources of chlorine (and other solutes) in the thermal waters. The 36Cl/Cl values for several geothermal water samples and reservoir host rock samples from the Coso, California geothermal field have been measured for these purposes. The results indicate that most of the chlorine is not derived from the dominant granitoid that host the geothermal system. If the chlorine was originally input into the Coso subsurface through meteoric recharge, that input occurred at least 1-1.25 million years ago. The results suggest that the thermal waters could be connate waters derived from sedimentary formations, presumably underlying and adjacent top the granitic rocks, which have recently migrated into the host rocks. Alternatively, most of the chlorine but not the water, may have recently input into the system from magmatic sources. In either case, the results indicate that most of the chlorine in the thermal waters has existed within

the granitoid host rocks for no more than about 100,00-200,00 years. this residence time for the chlorine is similar to residence times suggested by other researchers for chlorine in deep groundwaters of the Mono Basin north of the Coso field.
DOE
Chlorine; Geology

19980211318 Lawrence Livermore National Lab., Livermore, CA USA
Thermal-mechanical-hydrological-chemical responses in the single heater test at the ESF
Lin, W., Lawrence Livermore National Lab., USA; Blair, S., Lawrence Livermore National Lab., USA; Buettner, M, Lawrence Livermore National Lab., USA; Feb. 01, 1997; 18p; In English; 36th; USA Rock Mechanics Symposium, 29 Jun. - 2 Jul. 1997, New York, NY, USA
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-125611; CONF-970617-; DE98-050760; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The Single Heater Test (SHT) is conducted in the Exploratory Studies Facility (ESF) to study the thermal-mechanical responses of the rock mass. A set of boreholes were drilled in the test region for conducting a scoping test of the coupled thermal-mechanical- hydrological-chemical (TMHC) processes. The holes for the TMHC tests include electrical resistivity tomography (ERT), neutron logging/temperature, hydrological, and optical multiple point borehole extensometers. A 4-kW heater was installed in the heater hole, and was energized on August 26, 1996. Some observed movements of the water around the heater are associated with a possible dry-out region near the heater. The water that has been moved is more dilute than the in situ ground water, except for the concentration of Ca. This indicates that fractures are the major water pathways, and the displaced water may have reached an equilibrium with carbonate minerals on the fracture surfaces. No mechanical-hydrological coupling has been observed. The tests are on-going, and more data will be collected and analyzed.
DOE
Chemical Reactions; Heaters; Rocks; Mechanical Properties; Thermodynamic Properties

19980211371 Lettis (William) and Associates, Inc., Walnut Creek, CA USA
Application of advanced seismic reflection imaging techniques to mapping permeable zones at Dixie Valley, Nevada *Final Report*
Feb. 18, 1998; 77p; In English
Contract(s)/Grant(s): DE-FG07-97ID-13465
Report No.(s): DOE/ID/13465-T1; DE98-005072; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Multifold seismic reflection data from the Dixie Valley geothermal field in Nevada were reprocessed using a nonlinear optimization scheme called simulated annealing to model subsurface acoustic velocities, followed by a pre-stack Kirchhoff migration to produce accurate and detailed depth-migrated images of subsurface structure. In contrast to conventional processing techniques, these methods account for significant lateral variations in velocity and thus have the potential ability to image steeply-dipping faults and fractures that may affect permeability within geothermal fields. The optimization scheme develops two-dimensional velocity models to within 6% of velocities obtained from well and surface geologic data. Only the seismic data (i.e., first arrival times of P waves) are used to construct the velocity models and pre-stack migration images, and no other a priori assumptions are invoked. Velocities obtained by processing individual seismic tracks were integrated to develop a block diagram of velocities to 2.3 km depth within the Dixie Valley geothermal field. Details of the tectonic and stratigraphic structure allowed three dimensional extension of the interpretations of two dimensional data. Interpretations of the processed seismic data are compared with well data, surface mapping, and other geophysical data. The Dixie Valley fault along the southeastern Stillwater Range Piedmont is associated with a pronounced lateral velocity gradient that is interpreted to represent the juxtaposition of relatively low velocity basin-fill strata in the hanging wall against higher velocity crystalline rocks in the footwall. The down-dip geometry of the fault was evaluated by inverting arrival times from a negative move-out event, which we associate with the dipping fault plane, on individual shot gathers for seismic line SRC-3 for the location and depth of the associated reflection points on the fault.
DOE
Valleys; Stratigraphy; Imaging Techniques; Fractures (Materials); Geophysics; Crystallinity

19980211560 Los Alamos National Lab., NM USA
Thermodynamic modeling of natural zeolite stability
Chipera, S. J., Los Alamos National Lab., USA; Bish, D. L., Los Alamos National Lab., USA; Jun. 1997; 23p; In English; 11th;

International Clay Conference, 15-21 Jun. 1997, Ottawa, Canada
Contract(s)/Grant(s): W-7405-eng-36
Report No.(s): LA-UR-97-2160; CONF-9706169; DE97-008886; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Zeolites occur in a variety of geologic environments and are used in numerous agricultural, commercial, and environmental applications. It is desirable to understand their stability both to predict future stability and to evaluate the geochemical conditions resulting in their formation. The use of estimated thermodynamic data for measured zeolite compositions allows thermodynamic modeling of stability relationships among zeolites in different geologic environments (diagenetic, saline and alkaline lakes, acid rock hydrothermal, basic rock, deep sea sediments). This modeling shows that the relative cation abundances in both the aqueous and solid phases, the aqueous silica activity, and temperature are important factors in determining the stable zeolite species. Siliceous zeolites (e.g., clinoptilolite, mordenite, erionite) present in saline and alkaline lakes or diagenetic deposits formed at elevated silica activities. Aluminous zeolites (e.g., natrolite, mesolite/scolecite, thomsonite) formed in basic rocks in association with reduced silica activities. Likewise, phillipsite formation is favored by reduced aqueous silica activities. The presence of erionite, chabazite, and phillipsite are indicative of environments with elevated potassium concentrations. Elevated temperature, calcic water conditions, and reduced silica activity help to enhance the laumontite and wairakite stability fields. Analcime stability increases with increased temperature and aqueous Na concentration, and/or with decreased silica activity.
DOE
Thermodynamics; Zeolites; Stability; Geochemistry; Geology

19980211583 Universite de Marne-la-Vallee, Champs sur Marne, France
Water in the Gas Phase
Jun. 1998; 132p; In English, 21-24 Jun. 1998, Paris, France
Contract(s)/Grant(s): F61775-98-WE038
Report No.(s): AD-A349074; CSP-98-1059; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche; Abstracts Only; Abstracts Only

The Final Proceedings for International Conference on Water in the Gas Phase, 21 June 1998 - 24 June 1998 This is an interdisciplinary conference. Topics include a wide range of scientific aspects of the properties and structure of water and water nanoclusters in the gas phase.
DTIC
Conferences; Vapor Phases; Water

19980211694 Research Inst. for Optics, Tubingen, Germany
Optics in Atmospheric Propagation and Adaptive Systems 2 Volume 3219, Volume 3219
Kohnle, Anton, Editor, Research Inst. for Optics, Germany; Devir, Adam D., Editor, Research Inst. for Optics, Germany; May 21, 1998; 166p; In English; Optics in Atmospheric Propagation and Adaptive Systems 2, 23-26 Sep. 1997, London, UK, USA
Contract(s)/Grant(s): F61708-97-W-0251
Report No.(s): AD-A346630; EOARD-CSP-97-1066-Vol-3219; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The Final Proceedings for Optics in Atmospheric Propagation and Adaptive Systems 2, 23 September 1997 - 26 September 1997 Propagation and imaging through optical turbulence; propagation and imaging through inhomogeneous and dense media; multiple scattering effects on LIDAR and imager performance; imaging of ground based and airborne objects from space and vice versa; propagation models and correction methods for atmospheric effects in remote sensing; and techniques for mitigation of atmospheric effects.
DTIC
Remote Sensing; Optical Radar; Conferences; Atmospheric Turbulence

19980211719 Los Alamos National Lab., NM USA
Accuracy analysis of the phase-screen propagator: implications for modeling and migration
Huang, Lian–Jie, Los Alamos National Lab., USA; Fehler, M. C., Los Alamos National Lab., USA; Nov. 1997; 6p; In English; 67th; Annual Meeting and Expo of the Society of Exploration Geophysicists (SEG), 2-7 Nov. 1997, Dallas, TX, USA
Contract(s)/Grant(s): W-7405-eng-36
Report No.(s): LA-UR-97-1546; CONF-971111; DE97-007363; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We present formal and numerical error analyses of the phase-screen (or split-step Fourier) propagator. Numerical results suggest that the propagator is accurate up to 60 deg. of propagation angle relative the main propagation direction for media with small

velocity perturbations. We investigate the errors from various approaches for splitting the exponential operator of the phase-screen propagator. The symmetrically split equations are slightly more accurate than the one-step split equations. Numerical examples show that the differences among splitting approaches are not significant. Therefore. relative to the symmetrically split equations. the one-step-free one-step-perturbation split equation is more efficient for migration in which wavefields in the space domain at all depth levels must be calculated. However. the half-step-free one-step-perturbation half-step-free split equation has almost the same efficiency as the one-step split equations for forward wave simulations.
DOE
Migration; Error Analysis; Accuracy; Fourier Transformation; Propagation

19980213328 Spectral Sciences, Inc., Burlington, MA USA
Development of Atmospheric Infrared Emission Models ***Final Report, Apr. 1991 - Oct. 1997***
Duff, J. W., Spectral Sciences, Inc., USA; Gruninger, J. H., Spectral Sciences, Inc., USA; Sundberg, R. L., Spectral Sciences, Inc., USA; Acharya, P. K., Spectral Sciences, Inc., USA; Adler–Golden, S. M., Spectral Sciences, Inc., USA; Berk, A., Spectral Sciences, Inc., USA; Bernstein, L. S., Spectral Sciences, Inc., USA; Robertson, D. C., Spectral Sciences, Inc., USA; Dec. 19, 1997; 79p; In English
Contract(s)/Grant(s): F19628-91-C-0083; AF Proj. S321
Report No.(s): AD-A346253; SSI-TR-304; AFRL-VS-HA-TR-98-0002; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report describes the development of atmospheric infrared (IR) radiance models to describe atmospheric NLTE radiation and structure in the IR spectral region for arbitrary diurnal conditions, Several of the models have been included into the suite of standard Air Force atmospheric radiation computer models. These models calculate the radiation from quiescent, auroral, and structured atmospheres in the 2-40 microns spectral region for arbitrary paths above 30 km under nighttime, terminator, and day-time conditions. In addition, a radiance model based on SHARC and MODTRAN has been developed which allows arbitrary viewing geometries from the ground to 300 km. In conjunction with the research into atmospheric radiance models, an atmospheric generator which uses empirical models to generate atmospheric profiles for the solar terminator and other systematic atmospheric variations has been developed. If further support of the atmospheric radiance model program, a detailed chemical kinetic model has been developed to describe O3 emission in the mesophere resulting from high-lying vibrational states. The predicted O3 spectral radiances are in good agreement with the SPIRIT-1 and CIRRIS-1A data sets.
DTIC
Atmospheric Models; Emission Spectra; Infrared Radiation; Atmospheric Physics

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METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

19980210873 Sandia National Labs., Albuquerque, NM USA
Apparent spatial blurring and displacement of a point optical source due to cloud scattering
Brower, K. L., Sandia National Labs., USA; Sep. 1997; 48p; In English
Contract(s)/Grant(s): DE-AC04-94AL-85000
Report No.(s): SAND-97-2164; DE98-000060; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A Monte Carlo algorithm is used to determine the apparent spatial blurring of a terrestrial 1.07 micron optical point source due to cloud scattering as seen from space. The virtual image of a point source over a virtual source plane area 22.4 x 22.4 square kilometers arising from cloud scattering was determined for stratus clouds (NASA cloud number 5) and altostratus clouds optical source arises from photon scattering by cloud water droplets. Displacement of the virtual source is due to the apparent illumination of the cloud top region directly about the actual source which when viewed at a nonzero look angle gives a projected displacement of the apparent source relative to the actual source. These features are quantified by an analysis of the Monte Carlo computational results.
DOE
Stratus Clouds; Blurring; Algorithms; Scattering; Optical Communication

19980210902 Naval Research Lab., Meso- and Finescale Ocean Physics Sect., Stennis Space Center, MS USA

A New Model on Equilibrium Spectrum of Wind Waves

Liu, Yuguang, University of Southern Mississippi, USA; Hwang, Paul A., Naval Research Lab., USA; Su, Ming–Yang, Naval Research Lab., USA; Liu, W. T., California Inst. of Tech., USA; May 1998; 8p; In English; 8th; Offshore and Polar Engineering, 24-29 May 1998, Montreal, Canada

Report No.(s): AD-A348600; NRL/PP/7332-98-0005; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Based on the joint-distribution of wave amplitude and wave period, a new model on the equilibrium spectrum of wind waves is derived. The derived model is related to the wind speed, spectral width and wave age. The related coefficients are determined empirically based on the observation. This model can be used to explain the variability of spectral level and spectral curve slope. It is found that the spectral level is controlled by both wind speed and wave age; the slope of spectral curve is related to only the wave age. The relationships between the spectral width and wave age, between the spectral level and wave age are obtained based on the spectral properties and empirical observations.

DTIC

Air Water Interactions; Slopes; Spectra; Water Waves; Wind Velocity

19980210907 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. fuer Physik der Atmosphaere, Wessling, Germany

The role of entrainment in surface-atmosphere interactions over the boreal forest

Davis, K. J., Minnesota Univ., USA; Lenschow, D.H., National Center for Atmospheric Research, USA; Oncley, S.P., National Center for Atmospheric Research, USA; Kiemle, C., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Ehret, G., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Giez, A., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Mann, J., Risoe National Lab., Denmark; Jul. 1997; ISSN 0943-4771; 38p; In English

Report No.(s): ETDE-DE-608; DE98-722918; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

We present a description of the evolution of the Convective Boundary Layer (CBL) over the boreal forests of SASkatchewan and Manitoba, as observed by the national center for atmospheric research (NCAR) Electra research aircraft during the 1994 boreal ecosystem-atmosphere study (BOREAS). All observations were made between 1530 and 2230 UT (0930-1630 local solar time, LST). We show that the CBL flux divergence often led to drying of the CBL over the course of the day, with the greatest drying (approaching 0.5 g/kg hr) observed in the morning, 1000-1200 LST, and decreasing over time to nearly no drying (0 to 0.1 g/kg hr) by midafternoon (1500-1600 LST). The maximum warming (0.45 K/hr) also occurred in the morning and decreased slightly to about 0.4 K/hr) by midafternoon. The CBL vapor pressure deficit (VPD) increases over the course of the day. A significant portion of this increase can be explained by the vertical flux divergence, though horizontal advection also appears to be important. We suggest a linkage between boundary layer growth, the vertical flux divergences, and boundary layer cloud formation, with cloud activity peaking at midday in response to rapid CBL growth, then decreasing somewhat later in the day in response to CBL warming and decreased growth. We also see evidence of feedback between increasing VPD and stomatal control.

DOE

Entrainment; Surface Reactions; Forests; Boundary Layers; SASkatchewan

19980211355 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. fuer Physik der Atmosphaere, Wessling, Germany

A diagnostic study of the global coverage by contrails, Part 1, Present day climate

Sausen, R., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Gierens, K., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Schumann, U., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Sep. 1997; ISSN 0943-4771; 29p; In English

Report No.(s): ETDE-DE-635; DE98-741599; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The global distribution of the contrail formation potential and the contrail cloud coverage are estimated using meteorological analysis data for temperature and humidity (ECMWF re-analyses) and a data base on aircraft fuel consumption. Regions with humidity between ice and liquid saturation and with temperature low enough to let aircraft trigger contrail formation are identified as regions in which persistent contrails may be formed. The frequency with which a region is conditioned for such persistent contrail formation measures the contrail formation potential. The mean contrail cloud coverage is computed by multiplying this frequency with a suitable function of fuel consumption (linear or non-linear). The product is normalized such that the contrail coverage equals the observed value of 0.5% in a domain between 30 W to 30 E, 35 N to 75 N. The results show a large potential for contrail formation in the upper troposphere, in particular in the tropics but also at mid-latitudes. At northern mid-latitudes about 20% of the upper tropospheric air is conditioned to form persistent contrails. Part of this region may be covered by otherwise forming cirrus clouds. When multiplied with fuel consumption of 1992 aviation, large cover by persistent contrail clouds is computed

over Europe, the North Atlantic, the continental USA, and south-east Asia. The computed contrail coverage reaches 2% over the USA, and is larger in winter than in summer. The global mean contrail coverage is about 0.11% for linear fuel dependence and the given normalization. The result is only weakly sensitive to the propulsion efficiency of aircraft, but strongly sensitive to aircraft flight altitude.
DOE
Contrails; Meteorological Parameters; Atmospheric Temperature; Atmospheric Moisture; Troposphere

19980211379 Tripod Wind Energy ApS, Soeborg, Denmark
Investigation of measuring wind speed using anemometers on a measuring mast
Gjerding, J. B., Tripod Wind Energy ApS, Denmark; Dyre Jespersen, K., Tripod Wind Energy ApS, Denmark; Langhans, F., Tripod Wind Energy ApS, Denmark; Jan. 1998; 38p; In English
Contract(s)/Grant(s): ENS-51171-95.0012
Report No.(s): NEI-DK-3174; DE98-750807; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The report describes a project carried out by Tripod Wind Energy from September 1996 to September 1997 comprising wind measurements and data analyses. The aim of the project was to investigate the possible influence of the anemometer position on the measuring mast on the measured wind speed. The investigation is of special interest in connection with wind turbines, where the result from wind speed measurements forms the basis of the majority of economic calculations. The report therefore in particular describes the conditions in connection with the measuring wind turbine power curves. The conclusion of the work is that even small variations of the wind speed measuring set up have a significant effect on the measured wind speed. An influence which in turn has an impact of the calculated energy output of a wind turbine and/or wind farm. Varying measurements set-ups are acceptable within the frames of existing and acknowledged codes and recommendations. The work indicates that the frames are too wide leading to ambiguous wind speed measurements. In order to eliminate this ambiguousness it is recommended that it is carefully considered to revise the mentioned documents, particularly with respect to specification of anemometer positioning. The work presented had been funded by The Danish Energy Agency.
DOE
Windpower Utilization; Wind Measurement; Wind Turbines

19980211418 Army Research Lab., White Sands Missile Range, NM USA
Description of the Battlescale Forecast Model *Final Report*
Henmi, Teizi, Army Research Lab., USA; Dumais, Robert, Jr., Army Research Lab., USA; May 1998; 141p; In English
Report No.(s): AD-A347163; ARL-TR-1032; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The Battlescale Forecast Model, which was developed at the U.S. Army Research Laboratory, is a major part of the U.S. Army Integrated Meteorological System Block 2 software. The Battlescale Forecast Model can be used operationally over any part of the world by using meteorological data obtained through the Automated Weather Distribution System. The Integrated Weather Effects Decision Aids utilize the Battlescale Forecast Model output file to calculate the values of their parameters. The Atmospheric Sounding Program generates products such as probability of thunderstorm occurrence, icing, visibility, and turbulence. This report describes the theoretical and mathematical principles used in the Battlescale Forecast Model, and shows some examples of input/output data.
DTIC
Weather Forecasting; Meteorological Parameters; Decision Support Systems; Computer Programs

19980211487 Atmospheric and Environmental Research, Inc., Cambridge, MA USA
Diagnostic Studies With GLA Fields *Final Report, 1995-1997*
Salstein, David A., Atmospheric and Environmental Research, Inc., USA; Dec. 1997; 97p; In English
Contract(s)/Grant(s): NAS5-32861
Report No.(s): NASA/CR-1997-206882; NAS 1.26:206882; P602; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

Assessments of the NASA Goddard Earth Observing System-1 Data Assimilation System (GEOS-1 DAS) regarding heating rates, energetics and angular momentum quantities were made. These diagnostics can be viewed as measures of climate variability. Comparisons with the NOAA/NCEP reanalysis system of momentum and energetics diagnostics are included. Water vapor and angular momentum are diagnosed in many models, including those of NASA, as part of the Atmospheric Model Intercomparison Project. Relevant preprints are included herein.
Author
GEOS 1 Satellite; Earth Observing System (EOS); Atmospheric Models; Climate

19980211519 Washington Univ., Applied Physics Lab., Seattle, WA USA

Establishing A Mapping Methodology For NSCAT Winds

Dickinson, S., Washington Univ., USA; Singh, S., Washington Univ., USA; Kelly, K. A., Washington Univ., USA; Spillane, M., Washington Univ., USA; McPhaden, M. J., Washington Univ., USA; Apr. 1998; 30p; In English

Contract(s)/Grant(s): JPL-9-60927; NOAA-NA-67RJ0155

Report No.(s): AD-A347135; APL-UW-TR-9801; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A methodology is presented for mapping swath-oriented NASA scatterometer (NSCAT) wind data into gridded maps suitable for forcing ocean circulation models. NSCAT samples the winds over the equatorial Pacific Ocean unevenly in both space and time, and care must be taken in mapping them onto a grid to prevent aliasing the fields. It was necessary to develop a ”true” wind field with which to test the mapping methodology. Prior to the availability of NSCAT data, the European Centre for Medium-Range Weather Forecasts (ECMWF) and Fleet Numerical Meteorology and Oceanography Center (FNMOC) analysis wind fields were studied. Spectral analysis of the ECMWF and FNMOC wind fields showed a drastic drop in energy at scales smaller than 600 km. These energy levels were ”pumped up” in the Fourier domain to represent a true wind field more accurately. These ”true” wind fields were converted to pseudostress, subsampled with the known NSCAT sampling pattern (termed ”synthetic NSCAT” winds), and then objectively averaged. A study of the expected errors of the mapped pseudo- stress was conducted using a convarience function of the equatorial Pacific wind field determined with data from the Tropical Atmosphere Ocean (TAO) buoy array. A 5-day, 20 resolution was chosen for the daily mapped pseudostress. Comparisons of the ”true” winds converted to pseudostress and the mapped synthetic NSCAT pseudostress show errors consistent with the expected values. Maps made of actual NSCAT data are also presented and discussed.

DTIC

Mapping; Procedures; Wind Velocity; Wind Measurement; Velocity Distribution; Meteorology

19980211564 Radex, Inc., Bedford, MA USA

Preliminary Climatology of UHF Scintillation over the South American Equatorial Anomaly at Solar Minimum

Long, Anthony R., Radex, Inc., USA; McNeil, William J., Radex, Inc., USA; Kendra, Michael J., Radex, Inc., USA; Feb. 15, 1998; 28p; In English

Contract(s)/Grant(s): F19628-95-C-0106; AF Proj. 7659

Report No.(s): AD-A347301; RXR-980201; AFRL-VS-HA-TR-98-0014; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have deployed two 250 MHz radio receivers in South America; one at the magnetic equator and another near the peak of the anomaly crest. These stations listen continuously to both an eastern and western communications satellite. The unique deployment allows for two measurements at common magnetic latitudes and one along a common field line. Data has been gathered for more than a year and statistical studies have been performed, which are compared to the popular Wide Band Scintillation Model (WBMOD). The preliminary results presented here show a persistence of scintillation several hours later into the evening than predicted by the model. The seasonal variation of the model matches the measurements quite well, however. The results elucidate both the strengths and weaknesses of our predictive capability. In addition to these statistical measures, we present results on east west asymmetry in scintillation from the two stations. The equatorial station shows little asymmetry while the southern station exhibits a significantly stronger scintillation to the east than to the west. The asymmetry appears to have a seasonal dependence. The origin of this phenomenon is unclear, but a few possibilities are suggested. Simultaneous data from the common field line links are also compared. A brief presentation is made of the PL-SCINDA scintillation warning system, which uses the data from these stations for now casting and scintillation forecasts. Work in progress on the deployment and utilization of GPS units in this effort is also discussed.

DTIC

Climatology; Equatorial Regions; Magnetic Fields; Magnetic Equator; Scintillation; Ultrahigh Frequencies

19980213311 Radex, Inc., Bedford, MA USA

Integrated Efforts for Analysis of Geophysical Measurements and Models ***Final Report, Feb. 1993 - Aug. 1997***

Ayer, S. M., Radex, Inc., USA; Hein, C. A., Radex, Inc., USA; Seeley, G. P., Radex, Inc., USA; Bass, J. N., Radex, Inc., USA; Kendra, M. J., Radex, Inc., USA; Sep. 26, 1997; 234p; In English; Original contains color plates

Contract(s)/Grant(s): F19628-93-C-0023; AF Proj. 7659

Report No.(s): AD-A346154; RXR-971002; PL-TR-97-2137; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

This contract supported investigations of integrated applications of physics, ephemerides, and mathematics of the atmosphere and near space. Projects undertaken and reported include spacecraft, ionospheric, atmospheric, and astronomical circumstances; data based studies of air combat targeting; meteorology including cloud scene simulation and ITASCA expert system; ionospheric

scintillations; atmospheric metal deposition; auroral particle and electric field modeling, magnetic field studies for CRRES; atmospheric density models, databases and drag; PL-GEOSpace code for 3D visualization studies; DMSP magnetic field studies: (1) ephemerides; (2) comparison of LOKANGL and SPACETRACK codes for orbital prediction, and (3) software development for most of these fields of study.
DTIC
Computerized Simulation; Meteorology; Atmospheric Models; Atmospheric Sounding; Ephemerides; Geophysics

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OCEANOGRAPHY

Includes biological, dynamic, and physical oceanography; and marine resources. For related information see also 43 Earth Resources and Remote Sensing.

19980211102 Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht, Germany
A survey of statistical downscaling techniques
Zorita, E., Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; Storch, H. von, Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Germany; 1997; ISSN 0344-9629; 45p; In English
Report No.(s): GKSS-97/E/20; DE98-741852; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The derivation of regional information from integrations of coarse-resolution General Circulation Models (GCM) is generally referred to as downscaling. The most relevant statistical downscaling techniques are described here and some particular examples are worked out in detail. They are classified into three main groups: linear methods, classification methods and deterministic non-linear methods. Their performance in a particular example, winter rainfall in the Iberian peninsula, is compared to a simple downscaling analog method. It is found that the analog method performs equally well than the more complicated methods. Downscaling analysis can be also used as a tool to validate regional performance of global climate models by analyzing the covariability of the simulated large-scale climate and the regional climates.
DOE
Atmospheric General Circulation Models; Climate; Climate Models; Climatology; Statistical Analysis

19980211474 NASA Goddard Space Flight Center, Greenbelt, MD USA
An Ecosystem Model for the Simulation of Physical and Biological Oceanic Processes-IDAPAK User's Guide and Applications
McClain, Charles R., NASA Goddard Space Flight Center, USA; Arrigo, Kevin, NASA Goddard Space Flight Center, USA; Murtugudde, Ragu, Maryland Univ., USA; Signorini, Sergio R., General Sciences Corp., USA; Tai, King–Sheng, General Sciences Corp., USA; Apr. 1998; 74p; In English
Report No.(s): NASA/TM-1998-206856; NAS 1.15:206856; Rept-98B00042; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This TM describes the development, testing, and application of a 4-component (phytoplankton, zooplankton, nitrate, and ammonium) ecosystem model capable of simulating oceanic biological processes. It also reports and documents an in-house software package (Interactive Data Analysis Package - IDAPAK) for interactive data analysis of geophysical fields, including those related to the forcing, verification, and analysis of the ecosystem model. Two regions were studied in the Pacific: the Warm Pool (WP) in the Equatorial Pacific (165 deg. E at the equator) and at Ocean Weather Station P (OWS P) in the Northeast Pacific (50 deg. N, 145 deg. W). The WP results clearly indicate that the upwelling at 100 meters correlates well with surface blooms. The upwelling events in late 1987 and 1990 produced dramatic increases in the surface layer values of all 4 ecosystem components, whereas the spring-summer deep mixing events, do not seem to incur a significant response in any of the ecosystem quantities. The OWS P results show that the monthly profiles of temperature, the annual cycles of solar irradiance, and 0- to 50-m integrated nitrate accurately reproduce observed values. Annual primary production is 190 gC/m(exp 2)/yr, which is consistent with recent observations but is much greater than earlier estimates.
Author
Ecosystems; Applications Programs (Computers); Environment Models; Marine Meteorology; Ocean Models; Phytoplankton; Surface Layers

19980211158 California Univ., San Francisco, CA USA
Fludrocortisone: Role in Central Regulation of Fluid Balance ***Final Report, 1 Jul. 1993 - 15 Jan. 1996***
Dallman, M. F., California Univ., USA; 1996; 12p; In English
Contract(s)/Grant(s): NCC2-764
Report No.(s): NASA/CR-1996-206754; NAS 1.26:206754; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have performed 7 experiments in rats on the effects of systemic treatment with fludrocortisone (9a-FF) given in a variety of doses over a variety of times, in the AM and in the PM. These experiments were designed to determine the best treatment protocol to use in the head-down rat model studies which were performed at NASA-Ames Research Center during the final year. The results of the experiments in non-stressed rats have been, on the whole, disappointing in that we have so far been unable to obtain direct evidence that the 9a-FF acts as a mineralocorticoid. In the ultimate experiments using control and suspended rats, we showed mineralocorticoid and glucocorticoid effects of 9aFF. However, suspension served in our rats as a chronic stressor when they were examined 5 d after the onset of treatment.
Derived from text
Cortisone; Rats; Adrenal Gland; Body Fluids; Hormone Metabolisms

19980211331 New Energy and Industrial Technology Development Organization, Tokyo, Japan
Leading research on cell proliferation regulation technology ***Saibo zoshoku seigyo gijutsu no sendo kenkyu***
Mar. 1997; 132p; In Japanese
Report No.(s): NEDO-PR-9610; DE98-745396; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

For developing intelligent material, animal test alternative model, bio-cell analysis equipment, self-controlling bio-reactor and medical material, development of functional cells was studied by cell proliferation regulation technology. In fiscal 1996, the expression analysis and separation technology of specific gene for cell proliferation, and the intracellular regulation technology were surveyed from the viewpoint of intracellular regulation. The cell proliferation regulation technology by specific regulating material of cells, extracellular matrix, coculture system and embryonic cell was surveyed from the viewpoint of extracellular regulation. In addition, based on these survey results, new cell culture/analysis technology, new bio-material, artificial organ system, energy saving bio-reactor, environment purification microorganism, and animal test alternative model were surveyed as applications to industrial basic technologies from a long-term viewpoint. The approach to cell proliferation regulation requires preparation of a concrete proliferation regulation technology system of cells, and concrete application targets.
DOE
Cells (Biology); Targets; Animals; Smart Materials; Microorganisms; Reactor Materials; Bioreactors; Biotechnology; Control

19980211479 Energia Nucleare e Delle Energie Alternative, Dipt. Innovazione, Rome, Italy
Biotechnological innovation impacts, social and ethical aspects and public acceptability ***Sicurezza, implicazioni etico-sociali e percezione pubblica delle biotecnologie***
Capuano, V., Energia Nucleare e Delle Energie Alternative, Italy; Nov. 1997; ISSN 1120-5571; 78p; In Italian
Report No.(s): ENEA-RT-INN-97-26; DE98-759694; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

Biotechnology is a highly distinctive area of scientific activity and its applications can strongly influence human life. Biotechnological innovations impact on sanitary, environmental, social, ethical and economic aspects and it is particularly important a greater public understanding of biotechnology issues in the view of increasing its acceptability. Knowledge and acceptance do not go always in the same direction, as the last is influenced by various complex factors, but without a knowledgeable public there can be no effective democratic agreement. So it appears important that scientific community and industry can promote and diffuse more knowledge among citizens and consumers, taking into account also of social and ethical issues raised by public and public interest groups. In this report bio safety of biotechnology applications and social and ethical issues are analyzed. They receive much attention in the discussion in the biotechnology arena (scientists, industry, institutions and the public). In particular health and environmental risks, gene therapy, transgenic animals, patent issues and genetic resources access, consumers rights are considered. Since the media are central to the dissemination of information and views about science, is has been evidenced their role, in addition to a short analysis of public perception and communication strategies.
DOE
Biotechnology; Genetics; Health

19980211497 Georgia Univ., Research Foundation, Athens, GA USA
Nitrogen control of chloroplast differentiation ***Final Report***
Schmidt, G. W., Georgia Univ., USA; [1998]; 3p; In English
Contract(s)/Grant(s): DE-FG05-93ER-20100
Report No.(s): DOE/ER/20100-T1; DE98-005187; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This project was directed toward understanding at the physiological, biochemical and molecular levels of how photosynthetic organisms adapt to long-term nitrogen-deficiency conditions is quite incomplete even though limitation of this nutrient is the most commonly restricts plant growth and development. For our work on this problem, the unicellular green alga, Chlamydomonas reinhardtii, was grown in continuous cultures in which steady-state levels of nitrogen can be precisely controlled. N-limited cells exhibit the classical symptoms of deficiency of this nutrient, chlorosis and slow growth rates, and respond to nitrogen provision by rapid greening and chloroplast differentiation. We have addressed three aspects of this problem: (1) the regulation of pigment synthesis; (2) control of expression of nuclear genes encoding photosynthetic proteins; (3) changes in metabolic and electron transport pathways that enable sustained CO(sub 2) fixation even though they cannot be readily converted into amino and nucleic acids. For the last, principle components are: (a) enhanced mitochondrial respiratory activity intimately associated with photosynthates, and (b) the occurrence in thylakoids of a supplemental electron transport pathway that facilitates reduction of the plastoquinone pool. Together, these distinguishing features of N-limited cells are likely to enable cell survival, especially under conditions of high irradiance stress.
DOE
Nitrogen; Chloroplasts; Physiology; Biochemistry; Photosynthesis; Organisms; Biosynthesis

19980211512 Energia Nucleare e Delle Energie Alternative, Dipt. Innovazione, Rome, Italy
Laboratory LiF characterization of different phytoplankton species originating harmful blooms
Barbini, R., Energia Nucleare e Delle Energie Alternative, Italy; Colao, F., Energia Nucleare e Delle Energie Alternative, Italy; Fantoni, R., Energia Nucleare e Delle Energie Alternative, Italy; Palucci, A., Energia Nucleare e Delle Energie Alternative, Italy; Ribezzo, S., Energia Nucleare e Delle Energie Alternative, Italy; Micheli, C., Energia Nucleare e Delle Energie Alternative, Italy; Nov. 1997; ISSN 1120-5571; 31p; In English
Report No.(s): ENEA-RT-INN-97-21; DE98-759690; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

A systematic laboratory characterization of different phytoplankton cultures has been performed in combination with LiF (Laser Induced Fluorescence) measurements aimed to investigate the possibility of their remote monitoring by means of lidar fluoro sensor systems. Cultures of microalgae characterized by different pigment contents have been analyzed in the visible region upon UV laser excitation. High resolution laboratory spectra have been measured in order to obtain the fingerprint of each species. Emission wavelength related to the main pigments contribution have been identified. Detection limits of the emitted red chlorophyll signal have been evaluated for the different species after dilution in the culture medium and in real sea water. Prior to the LiF excitation aimed to the remote characterization the algal cultures were morphologically analyzed by fluorescence and scanning electron microscopy. Furthermore the relevant cell number was counted for biomass estimation, and the chlorophylls content was determined by different chemical methods.
DOE
Scanning Electron Microscopy; Laser Induced Fluorescence; Chlorophylls; Algae; Phytoplankton

52
AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19980210921 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada
Recommendations to Enhance Spatial Disorientation Training for the Canadian Forces
Cheung, Bob, Defence and Civil Inst. of Environmental Medicine, Canada; Feb. 1998; 27p; In English
Report No.(s): AD-A345707; DCIEM-98-R-32; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Spatial disorientation (SD) in flight wastes millions of dollars worth of defence capability and continues to kill aircrew. A number of CF (Canadian Forces) surveys have identified SD as the most detrimental of all listed aircraft and human factor issues in terms of its effects on flight safety and operational effectiveness. Two retrospective studies by Hartzell and Cheung et al. confirmed that SD was a significant contributing factor in 12 (between 1968-78) and 14 (between 1982-92) accidents respectively.

Following a series of SD implicated mishaps in the CF-18 between 1986-90; the Commander of AIRCOM directed the initiation of ground-based disorientation training and the acquisition of an effective ground-based SD trainer. However, without a recent mishap, on-going fiscal restraint and other factors, the support and resources for acquiring an effective ground-based trainer are not available. In order to solve the SD problem, we believe that research on underlying mechanisms is productive and that hardware improvements will eventually provide substantial additional protection. Research and technological improvements that deal with SD will require a great deal of effort and money to implement and is a distant goal. For the near term, the only practical approach is to enhance SD awareness training for pilots and should be addressed without delay. This report reviews current SD training practices in the CF, and makes recommendations to enhance spatial disorientation training on the ground and in-flight. It is hoped that this report will generate continued discussions among pilots, aeromedical instructors, flight surgeons and research scientists in maintaining progress towards mounting an attack on SD.
DTIC
Disorientation; Training Devices; Flight Crews; Flight Safety; System Effectiveness; Spatial Distribution

19980210952 Medical Coll. of Wisconsin, Milwaukee, WI USA
Frontiers in Head and Neck Trauma: Clinical and Biomechanical ***Final Report, 1 Sep. 1996 - 19 Jun. 1998***
Yoganandan, Narayan, Medical Coll. of Wisconsin, USA; Pintar, Frank A., Medical Coll. of Wisconsin, USA; Larson, Sanford J., Medical Coll. of Wisconsin, USA; Jun. 19, 1998; 246p; In English
Contract(s)/Grant(s): N00014-96-1-1234
Report No.(s): AD-A348631; MCW-NS-980615; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

Clinical and biomedical aspects of head and neck injuries are covered in this presentation. Recent research stemming from laboratory-driven experimental and mathematical models, and clinical and epidemiological investigations are discussed. Topics covered include the basic anatomy of the head and neck of the pediatric and adult human population; the effects of the presence of uncovertebral joints in the adult human neck; and radiographic, computed tomography and magnetic resonance imaging of craniocerebral and cervical trauma. An evaluation is made of the Hybrid III anthropomorphic test device with the human neck structure. Inertial loading of the human neck and its implications in the production of whiplash injuries are given. Mathematical modeling describes continuum mechanics-type buckling models, and numerical finite element techniques to evaluate the effect of clinical procedures such as surgery and stabilization. Instrumentation techniques are discussed for the upper and lower cervical spine. Head and neck injury issues in Naval Aviation are also presented.
DTIC
Magnetic Resonance; Tomography; Spine; Military Aviation; Imaging Techniques

19980210954 Pennsylvania Univ., Philadelphia, PA USA
Evaluation of Muscle Function in Persian Gulf Veterans ***Annual Report, 15 Jun. 1996 - 14 Jun 1997***
Vandenborne, Krista, Pennsylvania Univ., USA; Jul. 1997; 16p; In English
Contract(s)/Grant(s): DAMD17-96-C-6055
Report No.(s): AD-A348644; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In an effort to investigate the etiology responsible for the ongoing chronic fatigue (CF) and muscle weakness in veterans with Persian Gulf (PG) illness we are performing a comprehensive evaluation of skeletal muscle in PG veterans with CF and healthy control veterans. Preliminary evaluation of 18 veterans with CF and 7 healthy control veterans shows evidence that muscle function is impaired in veterans with PG illness. Specifically, a significant decrease was found in the mitochondrial ATP producing capacity in Gulf veterans with CF compared to healthy veterans. MRI measurements show that there is no difference in the cross-sectional area of the calf muscles of both populations, indicating that the decrease in mitochondrial function of the veterans with CF is not simply the result of severe disuse or deconditioning. In addition, while the relative fatigability of skeletal muscle in the healthy veterans and veterans with CF is not different, the total amount of work that can be performed is significantly higher in the healthy veterans. Further examination of skeletal muscle using a combination of electrical stimulation, muscle biopsies and EMG is being performed to confirm the myopathic origin of chronic fatigue in PG illness.
DTIC
Musculoskeletal System; Adenosine Triphosphate; Persian Gulf; Mitochondria; Electromyography

19980210970 Iowa Univ., Iowa City, IA USA
Neural Control Mechanisms and Body Fluid Homeostasis ***Interim Report, 1 Apr. 1995 - 31 Mar. 1998***
Johnson, Alan Kim, Iowa Univ., USA; 1998; 5p; In English
Contract(s)/Grant(s): NAG5-6171
Report No.(s): NASA/CR-1998-208294; NAS 1.26:208294; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The goal of the proposed research was to study the nature of afferent signals to the brain that reflect the status of body fluid balance and to investigate the central neural mechanisms that process this information for the activation of response systems which restore body fluid homeostasis. That is, in the face of loss of fluids from intracellular or extracellular fluid compartments, animals seek and ingest water and ionic solutions (particularly Na(+) solutions) to restore the intracellular and extracellular spaces. Over recent years, our laboratory has generated a substantial body of information indicating that: (1) a fall in systemic arterial pressure facilitates the ingestion of rehydrating solutions and (2) that the actions of brain amine systems (e.g., norepinephrine; serotonin) are critical for precise correction of fluid losses. Because both acute and chronic dehydration are associated with physiological stresses, such as exercise and sustained exposure to microgravity, the present research will aid in achieving a better understanding of how vital information is handled by the nervous system for maintenance of the body's fluid matrix which is critical for health and well-being.
Author
Nervous System; Body Fluids; Homeostasis; Data Bases

19980211066 Boston Univ., School of Medicine, Boston, MA USA
Neuropsychological Functioning in Persian Gulf War Era Veterans ***Annual Report, 1 May 1997 - 30 Apr. 1998***
White, Roberta F., Boston Univ., USA; May 1998; 28p; In English
Contract(s)/Grant(s): DAMD17-96-1-6043
Report No.(s): AD-A347712; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Persian Gulf War (PGW) veterans have reported a constellation of health symptoms referred to as Gulf War Syndrome. Suggested causes of these symptoms include exposure to environmental hazards and biological or chemical warfare agents. Some of the symptoms reported overlap with those of post-traumatic stress disorder (PTSD), Multiple Chemical Sensitivity (MCS) or chronic fatigue syndrome (CFS). Both exposure to neurotoxicants and the disorders noted above are known to produce cognitive impairments. This study evaluates the neuropsychological functioning of PGW era veterans who are seeking treatment or evaluation for any type of health or adjustment complaint. PGW deployed patients will be compared with non-deployed patients. These subjects will also be compared with subjects from a (non-treatment seeking) research sample of PGW veterans. All patients and research subjects will additionally be administered a standardized set of questionnaires and interviews to identify their health symptoms including their physical and mental health condition. These instruments permit diagnosis of PTSD, MCS, CFS and other psychiatric disorders. The purpose of these comparisons is to isolate factors that differentiate PGW veterans who are seeking treatment for health complaints from their treatment seeking counterparts who are not PGW veterans.
DTIC
Neurology; Exposure; Mental Health; Signs and Symptoms; Mental Performance

19980211307 New Energy and Industrial Technology Development Organization, Tokyo, Japan
Leading research on brain functional information processing ***No kino joho shori no sendo kenkyu***
Mar. 1997; 184p; In Japanese
Report No.(s): NEDO-PR-9609; DE98-745395; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This research aims at searching the concept of an information processing device with a fully different architecture from a previous ones based on the study on human brain function, sense and perception, and developing the basic fabrication technology for such system, and realizing the human-like information processing mechanism of memorization, learning, association, perception, intuition and value judgement. As an approach deriving biological and technological models from experimental brain studies, the model was derived from the brain functional information processing based on brain development/differentiation mechanism, the control mechanism/material of brain activities, and the knowledge obtained from brain measurement and study. In addition, for understanding a brain oscillation phenomenon by computational neuroscience, the cerebral cortex neural network model composed of realistic neuron models was proposed. Evaluation of the previous large-scale neural network chip system showed its ability of learning and fast processing, however, the next-generation brain computer requires further R and D of some novel architecture, device and system.
DOE
Brain; Information; Human Performance; Data Processing; Computers; Genetic Engineering; Architecture (Computers)

19980211438 Institute for Human Factors TNO, Soesterberg, Netherlands
Thermal Comfort in a Temperature Range from minus 13 to plus 35 C Relation to the Performed Work ***Final Report Thermisch comfort en een temperatuur-range van -13 tot +35 deg C in relatie tot de verrichte arbeid***
Heus, R., Institute for Human Factors TNO, Netherlands; Kistemaker, J. A., Institute for Human Factors TNO, Netherlands; Have-

nith, G., Institute for Human Factors TNO, Netherlands; Dec. 04, 1997; 27p; In English
Contract(s)/Grant(s): A93/KL/317
Report No.(s): TNO-TM-97-A-75; TD97-0260; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, 3769 DE Soesterberg, The Netherlands); US Sales Only, Hardcopy, Microfiche

Thermal comfort of humans is determined by subjective sensations of temperature, humidity and comfort. These subjective sensations can partly be explained by physiological and physical parameters. A large literature review has led to formulas for temperature and humidity sensations. In this study, these formulas have been validated under experimental conditions and besides we searched for a formula for comfort sensation in terms of physiological parameters. In three climates (-13, 13 and 35 C) male and female subjects exercised on four levels (rest, fight, moderate and heavy work). The subjects were asked to give their continuous evaluations of temperature, humidity and comfort. We measured body temperatures and metabolism of the subjects and the environmental parameters. These data were used to validate the formulas for temperature and humidity sensations and stepwise regression analysis was used to find a formula for comfort sensation. The results of this study showed that total temperature sensation can be predicted by rectal temperature, temperature of the extremities and environmental temperature and that the proposed formula can be validated partly, but that the model can be simplified by only using the metabolic rate and the temperature of the extremities in the formula. Local sensations of temperature can be explained by only the local skin temperature. The psychophysical law is a less good predictor for local temperature sensation. The humidity formula could also be validated very well by explaining the subjective humidity by relative humidity of the skin, sweat production and rectal temperature. The present data set was not sufficient to explain comfort, but thermal comfort can be explained by thermal and humidity sensations. The data set offers lots of possibilities for further analyses.
Author
Thermal Comfort; Body Temperature; Humidity; Physiology

19980211488 British Columbia Univ., B.C. Office of Health Technology Asessment, Vancouver, British Columbia Canada
Bone Mineral Density Testing: Does the Evidence Support its Selective use in Well Women?
Green, C. J., British Columbia Univ., Canada; Bassett, K., British Columbia Univ., Canada; Foerster, V., British Columbia Univ., Canada; Kazanjian, A., British Columbia Univ., Canada; Dec. 1997; 192p; In English
Report No.(s): BCOHTA-97:2T; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Primary care physicians, perimenopausal women, and health policy makers currently are or soon will be facing a key decision regarding Bone Mineral Density (BMD) testing: Should all, a selected subset, or no well women have BMD testing at or near the time of menopause? This decision is critical because it will determine both the future breadth of BMD application across, and its duration of use within, the female population. The potential application varies widely, ranging from all women from 45-50 years of age until death, to no well woman at any age. The decision will not be easy. Physicians, women, and health policy makers must situate BMD testing, within the natural aging process, relate it to medical management schemes designed to reduce fracture rates in seniors, and evaluate it in relation to controversial drug treatment effectiveness. In addition, policy makers must weigh the costs and benefits of BMD testing against alternate uses of limited health care funds, including other programs designed to improve women's health. And, all this must be achieved in the face of the intense marketing pressure from the drug and device industry. The decision regarding how to use BMD testing, will be difficult enough without introducing misconceptions about the technology. For example, no one involved in the decision should believe that improvements in BMD technical accuracy and replicability alone will translate into improved patient outcome. Technical accuracy refers to the degree to which BMD measurements represent the true BMD value of the site being measured. Replicability refers to the extent to which the same value is obtained with repeat measurements of the same site. Accuracy and replicability are important issues but mean little without evidence of validity; in this instance, evidence establishing a link between BMD testing and improved patient outcome. Another misconception is that drug treatment increasing BMD will translate into improved patient outcome. Treatment effectiveness also depends on the extent to which therapy is applied to the correct individuals, taken for an adequate period of time and results in an actual decrease in fracture rates. of all the ongoing misconceptions, arguably the most insidious is one currently promoted by the drug and device industry and its representatives; that is, that 'selective' as opposed to 'whole population' screening of women is a reasonable way to proceed. This approach is dangerous because it seems reasonable. It seems to involve judicious use of scarce health resources in general and of this technology in particular. In addition, it seems to reflect and support the interests of women, especially those considered at elevated risk for what are often debilitating fractures. Furthermore, and most pernicious, it is likely to seem reasonable to clinicians.
Derived from text
Bone Demineralization; Bone Mineral Content; Females; Fractures (Materials); Public Health; Patients; Policies

19980214902 Naval Health Research Center, San Diego, CA USA
Environmental Heat Transfer to a Microclimate Cooling System During Heat Exposure ***Final Report***
Canine, Katherine, Naval Health Research Center, USA; Feb. 02, 1998; 20p; In English
Report No.(s): AD-A349469; NHRC-98-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Heat transfer from the environment (Q(env)) to a water-based microclimate cooling system (MCS), operated at four temperatures of water (T(w)), Was measured utilizing a rubber manikin outfitted in coveralls and chemical protective clothing. Q(env) increased in direct proportion to the difference in T(w) and ambient temperature (T(a)). Good linear models were found for predicting Q(env) when T(a) or temperature between clothing layers and T(w) are known. These models can be used in future physiological tests to apportion heat transfer between the environment and the body. Q(env) was substantial, greater than 100 w at the lowest temperature of water, even when insulated from the environment. Because many MCSs have limited cooling capacities, it is important to reduce Q(env) Thus, it is advantageous to wear insulating garments in hot environments when microclimate cooling is used.
DTIC
Heat Transfer; Microclimatology; Environment Effects; Cooling Systems; Temperature Effects

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

19980214924 Columbia Univ., Dept. of Psychology, New York, NY USA
DURIP97 Human Cognitive Performance in the Interpretation of False Color Non-Literal Imagery ***Final Report, 1 Apr. 1997 - 31 Aug. 1998***
Markman, Arthur B., Columbia Univ., USA; Apr. 1997; 2p; In English
Contract(s)/Grant(s): F49620-97-1-0155; AF Proj. 3484
Report No.(s): AD-A346277; AFRL-SR-BL-TR-98-0493; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The purpose of this grant was to purchase equipment to enable us to study the influence of people's beliefs about thermodynamics and the influence of those beliefs on their ability to interpret infrared images. For this project, we purchased an Inframetrics Thermacam PM250 to collect thermal images. In addition, we purchased a Compaq Deskpro personal computer for processing the images. The computer was used to run a variety of images processing programs including Thermonitor. The Thermacam stores both video and still picture output.
DTIC
Mental Performance; Cognition; Images; Pattern Recognition; Visual Perception; Image Processing; Infrared Imagery; Color

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

19980210877 Sapient Inst., Houston, TX USA
Biochemical Capture and Removal of Carbon Dioxide, ***1 Aug. 1995 - 31 Jul. 1997***
Trachtenberg, Michael C., Sapient Inst., USA; Jun. 06, 1998; 7p; In English
Contract(s)/Grant(s): NAGw-4850
Report No.(s): NASA/CR-1998-208214; NAS 1.26:208214; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We devised an enzyme-based facilitated transport membrane bioreactor system to selectively remove carbon dioxide (CO2) from the space station environment. We developed and expressed site-directed enzyme mutants for CO2 capture. Enzyme kinetics showed the mutants to be almost identical to the wild type save at higher pH. Both native enzyme and mutant enzymes were immobilized to different supports including nylons, glasses, sepharose, methacrylate, titanium and nickel. Mutant enzyme could be attached and removed from metal ligand supports and the supports reused at least five times. Membrane systems were constructed to test CO2 selectivity. These included proteic membranes, thin liquid films and enzyme-immobilized teflon membranes. Selec-

tivity ratios of more than 200:1 were obtained for CO2 versus oxygen with CO2 at 0.1%. The data indicate that a membrane based bioreactor can be constructed which could bring CO2 levels close to Earth.
Author
Bioreactors; Carbon Dioxide; Removal; Membranes

19980210898 Trip-A-Larm, Deerfield Beach, FL USA
Loss-Prevention and Risk-Mitigation by Reducing False-Alarms in Equipment Protection Systems
Corso, Philip P., Trip-A-Larm, USA; Jan. 1998; 12p; In English
Report No.(s): AD-A347812; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Like death and taxes Equipment Protection System failures (alarms) are undesirable, unpredictable, unwarranted, and unexplainable. 95% of industrial alarms are false, 99% in aircraft, and 99.9% in security systems. They excite management, incite environmentalists, spur regulatory agencies, and frighten many. Product loss and wasted resources are obvious consequences. Not so obvious is the negative impact on safety. Fail-safe... shutdown upon failure... doesn't make the situation safer. Instead, there's a high-risk of damage or catastrophe during restart.
DTIC
Losses; Prevention; Warning Systems; System Failures; Fail-Safe Systems

19980210972 Institute for Human Factors TNO, Soesterberg, Netherlands
Difference Between Manual Anthropometric Measurements and Anthropometric Measures Derived Manually from Whole Body Scans: A Pilot Study *Interim Report*
Daanen, H. A. M., Institute for Human Factors TNO, Netherlands; Brunsman, M. A., Air Force Research Lab., USA; Jan. 22, 1998; 12p; In English
Contract(s)/Grant(s): A96/KL/302; TNO Proj. 789.1
Report No.(s): TD98-0008; TNO-TM-98-A004; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, 3769 DE Soesterberg, The Netherlands); US Sales Only, Hardcopy, Microfiche

Fifteen anthropometric measures of six subjects were determined in two ways: using traditional standardized manual measurements and using manual retrieval of the measures from a whole body scan. Markers were applied to the body prior to scanning. In the scan image the markers were identified manually by manipulating the scan image. The stature and circumference yielded higher values when derived from the scanned image. Likely explanations for these differences are, respectively, the bald cap on the head which increases the stature and the absence of soft tissue compression in the determination of the anthropometric measures from the scan. The difference between the two methods is dependent on the measurement location: the axilla height shows differences of up to 36 mm, while the differences in calf circumference never exceed 7 mm. Current clothing sizes are based on traditional body measures. The systematic deviation found in this study between traditional and scan measurements has to be taken into account when whole body scanners are used to determine the body dimensions. A correction factor can be used to establish the correct link between body measures and clothing sizes.
Author
Anthropometry; Size Determination; Body Measurement (Biology)

19980211062 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
A Comparison of Various Types of Head-Related Transfer Functions for 3-D Sound in the Virtual Environment *Final Report*
Savick, Douglas S., Army Research Lab., USA; May 1998; 24p; In English
Contract(s)/Grant(s): Proj-1L162716AH70
Report No.(s): AD-A347740; ARL-TR-1605; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Simulation using virtual reality (VR) is becoming an effective tool for the Army in training soldiers to do their required tasks. In VR, the human operator can interact with a wide variety of computer generated worlds developed from real or imaginary scenarios or both. The training that a soldier receives by simulation is usually cost effective to the Army and in a number of cases is safer for the individual than training in the real environment. Three dimensional (3-D) sound in the virtual environment (VE) provides a more realistic simulation of acoustic environments compared to diotic (mono) or dichotic (stereo) sound presentation. The major benefit of using 3-D sound is that an individual can determine the sound source direction. When sounds that are perceived to have direction and sights that represent virtual objects that produce the sounds are provided through a head mounted display, a person can monitor and identify sources of information from all possible locations. The purpose of this study was to determine if 3-D sound generated by a 3-D sound system could enhance the realism or fidelity of the VE. The main objective of the study was to determine if an individual could distinguish the direction of a sound source within a reasonable degree of accuracy. Three dimen-

sional sound is produced by using a mathematical representation of the filtering characteristics of the pinnae provided through Head Related Transfer Functions (HRTFs). The HRTFs can be developed by recording a generated broadband sound using a probe microphone in the ear canal and subsequently dividing the Fourier transform of the recorded sound by that of the generated sound. When digital filtering techniques are used, HRTFs can be applied to sounds through headphones. When an arbitrary sound is filtered with HRTF based filters, the sound should appear to come from specified virtual locations outside the earphones.
DTIC
Auditory Signals; Auditory Perception; Fourier Transformation; Transfer Functions; Acoustic Simulation; Education

19980211324 Department of Energy, Richland, WA USA
Portable Oxygen Generation for Medical Applications ***Final Report, 8 May 1996 - 1 Jul. 1997***
Armstrong, Timothy R., Department of Energy, USA; Jul. 1997; 44p; In English
Contract(s)/Grant(s): MIPR-96MM6730
Report No.(s): AD-A346676; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A prototypical high-temperature planar oxygen generator was developed within one year. This generator utilizes yttria stabilized zirconia electrolyte and dope lanthanum manganite as the electrodes and separator plate. Several stack (1 to 3- cell) were constructed and tested. The tests demonstrated that: (1) all 25 sq cm of the active area was operational, (2) the cells possessed a low area specific resistance hat improved with time, and (3) stack power consumption decreased with time without affecting oxygen output. Important accomplishments were achieved in the areas of separator plate fabrication, metallic seal development, and stack assembly and testing.
DTIC
Portable Equipment; Medical Services; Oxygen Production; Oxygen; Gas Generators

19980211458 NASA Marshall Space Flight Center, Huntsville, AL USA
Life Testing of the Vapor Compression Distillation/Urine Processing Assembly (VCD/UPA) at the Marshall Space Flight Center (1993 to 1997) ***Final Report***
Wieland, P., NASA Marshall Space Flight Center, USA; Hutchens, C., NASA Marshall Space Flight Center, USA; Long, D., NASA Marshall Space Flight Center, USA; Salyer, B., ION Electronics, USA; Aug. 1998; 76p; In English
Report No.(s): NASA/TM-1998-208539; M-887; NAS 1.15:208539; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Wastewater and urine generated on the International Space Station will be processed to recover pure water using vapor compression distillation (VCD). To verify the long-term reliability and performance of the VCD Urine Processor Assembly (UPA), life testing was performed at the Marshall Space Flight Center (MSFC) from January 1993 to April 1996. Two UPA'S, the VCD-5 and VCD-5A, were tested for 204 days and 665 days, respectively. The compressor gears and the distillation centrifuge drive belt were found to have operating lives of approximately 4,800 hours, equivalent to 3.9 years of operation on ISS for a crew of three at an average processing rate of 1.76 kg/h (3.97 lb/h). Precise alignment of the flex-splines of the fluids and purge pump motor drives is essential to avoid premature failure after about 400 hours of operation. Results indicate that, with some design and procedural modifications and suitable quality control, the required performance and operational life can be met with the VCD/UPA.
Author
Service Life; Distillation; Waste Water; Urine

19980213261 Air Force Operational Test and Evaluation Center, Kirtland AFB, NM USA
Advanced Aircrew Oxygen Mask Insert Evaluation ***Interim Report, Feb. 1996 - Jan. 1998***
Liptak, Lynda, Air Force Operational Test and Evaluation Center, USA; Jun. 1998; 41p; In English
Contract(s)/Grant(s): Proj-2830
Report No.(s): AD-A349018; AFRL-HE-BR-TR-1998-0043; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Crew Technology Division of Armstrong laboratory is developing an insert for the MBU-20/P aircrew oxygen mask. The insert is placed inside the mask to enhance comfort and seal at high mask cavity pressures. The Air Force Operational Test and Evaluation Center, Rapid Test and Evaluation Directorate (AFOTEC/TA), conducted this evaluation of prototype mask inserts using Air National Guard pilots flying training sortics in F-16 aircraft. The evaluation addresses the operational use of an aircrew oxygen mask insert. The objective was to evaluate mask comfort and mask seal. A re-evaluation questionnaire was designed to assess the comfort and seal of the masks without the insert. A post-evaluation questionnaire addressed the comfort and seal of the mask with the insert. It was planned that each pilot would fly with the insert for at least two sortics. Each pilot had their original mask without insert and an unmodified mask with insert so they could swap masks between sortics and evaluate the seal and comfort of the altered mask. Pilots answered questionnaires as soon as possible after the last flights. Eighteen pilots evaluated the

insert. Five pilots reported previous seal problems. All five pilots indicated the insert improved the mask seal and they would continue using the insert. However, most pilots indicated there was a problem with the comfort of the mask with the insert. There was an insufficient sample size to make a statistical determination of the mask insert improvement. Seven of 18 pilots stated they would continue to use the mask insert as it improved the mask seal. However, these pilots were split on the issue of improved comfort, and half reported that comfort decreased with the insert.
DTIC
Helmets; Oxygen Masks; Evaluation; Product Development; Aircraft Pilots

19980213277 Department of the Navy, Washington, DC USA
Back-Reinforced Two-Piece Upper Torso Assembly for Articulated One-Atmosphere Diving Suit
Hughes, Robert J., Inventor, Department of the Navy, USA; Mar. 03, 1998; 7p; In English; Supersedes US-Patent-Appl-SN-679839
Patent Info.: Filed 15 Jul. 1996; US-Patent-Appl-SN-679839; US-Patent-5,722,090
Report No.(s): AD-D018977; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A back-reinforced two-piece upper torso assembly for an articulated diving suit. The upper torso assembly includes a lower hollow rigid body of rounded shape for housing a diver's upper trunk, an upper hollow rigid body of rounded shape for housing a diver's head and being seated upon the lower hollow rigid body, and a clamping and sealing mechanism releasably coupling the upper hollow rigid body to the lower hollow rigid body about adjacent seated portions thereof so as to form a watertight joint therebetween wherein the upper hollow rigid body can rotate relative to the lower hollow rigid body. The upper torso assembly also includes a reinforcement structure connecting the upper hollow rigid body to the lower hollow rigid body along adjacent rear portions thereof so as to permit a lifting load applied to the assembly during water entry and exit to transfer to the lower hollow rigid body in such manner as to avoid stressing the watertight joint therebetween.
DTIC
Torso; Diving (Underwater); Suits; Water

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MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

19980210870 Odyssey Research Associates, Inc., Ithaca, NY USA
Flight Guidance System Validation Using SPIN ***Final Report***
Naydich, Dimitri, Odyssey Research Associates, Inc., USA; Nowakowski, John, Odyssey Research Associates, Inc., USA; Jun. 1998; 48p; In English
Contract(s)/Grant(s): NAS1-20335; RTOP 522-33-31-01
Report No.(s): NASA/CR-1998-208434; NAS 1.26:208434; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To verify the requirements for the mode control logic of a Flight Guidance System (FGS) we applied SPIN, a widely used software package that supports the formal verification of distributed systems. These requirements, collectively called the FGS specification, were developed at Rockwell Avionics & Communications and expressed in terms of the Consortium Requirements Engineering (CoRE) method. The properties to be verified are the invariants formulated in the FGS specification, along with the standard properties of consistency and completeness. The project had two stages. First, the FGS specification and the properties to be verified were reformulated in PROMELA, the input language of SPIN. This involved a semantics issue, as some constructs of the FGS specification do not have well-defined semantics in CoRE. Then we attempted to verify the requirements' properties using the automatic model checking facilities of SPIN. Due to the large size of the state space of the FGS specification an exhaustive state space analysis with SPIN turned out to be impossible. So we used the supertrace model checking procedure of SPIN that provides for a partial analysis of the state space. During this process, we found some subtle errors in the FGS specification.
Author
Program Verification (Computers); Avionics; Control Systems Design; Computer Programs

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COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM.

19980210874 California Univ., Electrical Engineering and Computer Science, Berkeley, CA USA
Data Understanding Applied to Optimization ***Final Report***
Buntine, Wray, California Univ., USA; Shilman, Michael, California Univ., USA; 1998; 18p; In English
Contract(s)/Grant(s): NCC2-5227
Report No.(s): NASA/CR-1998-208290; NAS 1.26:208290; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this research is to explore and develop software for supporting visualization and data analysis of search and optimization. Optimization is an ever-present problem in science. The theory of NP-completeness implies that the problems can only be resolved by increasingly smarter problem specific knowledge, possibly for use in some general purpose algorithms. Visualization and data analysis offers an opportunity to accelerate our understanding of key computational bottlenecks in optimization and to automatically tune aspects of the computation for specific problems. We will prototype systems to demonstrate how data understanding can be successfully applied to problems characteristic of NASA's key science optimization tasks, such as central tasks for parallel processing, spacecraft scheduling, and data transmission from a remote satellite.
Author
Parallel Processing (Computers); Computer Programs; Optimization; Data Processing; Prototypes

19980210892 Universite de Corse, Corte, France
Proceedings of the 6th Annual Advance Technology Workshop
May 1998; 156p; In English; 6th; Advance Technology, 19-20 May 1998, Corte, France
Contract(s)/Grant(s): F61775-98-WE037
Report No.(s): AD-A348690; CSP-98-1060; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This report presents the final proceedings for 6th annual advanced technology workshop. This is an interdisciplinary conference. Topics include systems design, application, and technology transfer with the main focus on enhancing technology utilization. Specific areas include: (1) embedded systems, (2) commercial standards, (3) modeling/simulation, (4) space applications, and (5) industrial networks.
DTIC
Systems Engineering; Technology Transfer; Technology Utilization

19980210932 Idaho National Engineering Lab., Idaho Falls, ID USA
XMGR5 users manual
Jones, K. R., Idaho National Engineering Lab., USA; Fisher, J. E., Idaho National Engineering Lab., USA; Mar. 1997; 96p; In English
Contract(s)/Grant(s): DE-AC07-94ID-13223
Report No.(s): INEL/EXT-97-00346; DE98-002837; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

ACE/gr is XY plotting tool for workstations or X-terminals using X. A few of its features are: User defined scaling, tick marks, labels, symbols, line styles, colors; Batch mode for unattended plotting; Read and write parameters used during a session; Polynomial regression, splines, running averages, DFT/FFT, cross/auto-correlation; and Hardcopy support for PostScript, HP-GL, and FrameMaker.mif format. While ACE/gr has a convenient point-and-click interface, most parameter settings and operations are available through a command line interface (found in Files/Commands).
DOE
User Manuals (Computer Programs); Computer Programs

19980210978 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
Proposal of a Software Elements Control Scheme to the Object-Oriented Approach ***Proposta de um Esquema de Controle de Elementos de Software Para a Abordagem Orientada a Objectos***
Itami, Sergio Norio, Instituto de Pesquisas Espaciais, Brazil; Apr. 1997; 152p; In Portuguese
Report No.(s): INPE-6394-TDI/610; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche; US Sales Only; US Sales Only

One of the challenging problems in the field of Software Engineering is the management and the control of the changes of all software elements generated and maintained during the software's life cycle. Solving this problem is the goal of Software Con-

figuration Management (SCM). The progress of SCM's technology allowed the enlargement of its functionality, making it a managing element tool as well as a developer's task supporting one. Researching solutions for SCM's activities related to the object-oriented approach, this work proposes a Software Elements Control Scheme which has the capability of managing and controlling the changes of software elements, including classes of objects, generated and maintained during object-oriented software development.
Author
Object-Oriented Programming; Software Engineering; Configuration Management

19980211015 Army Research Lab., Aberdeen Proving Ground, MD USA
Quantifying Capability Vectors ***Final Report, Mar - Dec. 1996***
Kunkel, Robert W., Jr., Army Research Lab., USA; Ruth, Brian G., Army Research Lab., USA; Jun. 1998; 43p; In English
Report No.(s): AD-A348163; ARL-TR-1702; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The analysis process through the years has progressed to see the evolution of measurable and observable metrics. Trying to enhance the process is an ongoing endeavor and pursuit. Recently, the work has been focused on tailoring system analysis output metrics for input into end-game simulations. The concepts introduced in this report will attempt to address this issue; these concepts include: (1) the quantification of capability vectors, (2) capability granularity, and (3) capability networks.
DTIC
Game Theory; Lethality; Vulnerability; Computerized Simulation; Systems Analysis; Combat

19980211349 Defence Evaluation Research Agency, Equipment Health Monitoring Group, Farnborough, UK
The Development of Technological Support for RAF Early Failure Detection Centers
Hodges, D., Defence Evaluation Research Agency, UK; Nowell, T. J., Defence Evaluation Research Agency, UK; Barraclough, T., Wales Univ., UK; Roylance, B., Wales Univ., UK; Sperring, T., Wales Univ., UK; Apr. 24, 1998; 6p; In English; Prepared in cooperation with Equipment and Health Monitoring Group, Hampshire, UK.
Report No.(s): AD-A347997; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Because of staffing policy within the Royal Air Force, personnel are rotated on a regular basis. This can often result in an experienced member of a team being replaced by someone with minimal knowledge of the job. This is true of Early Failure Detection Centres (EFDCs) which perform first line Equipment Health Monitoring (EHM) at RAF air-bases. Experience is probably one of the most powerful tools in EHM and, in particular, debris monitoring; therefore, there is an ongoing need for the development of condition monitoring systems and techniques that will assist RAF EFDC staff new to the post. The RAF use a number of modem analytical techniques in their EFDCs, including optical microscopy, image analysis, Scanning Electron Microscopy with Energy Dispersive X-Ray (SEM/EDX) micro analysis packages and Energy Dispersive X-Ray Fluorescence (EDXRF) analytical equipment. Therefore, the need exists for equally sophisticated, but user-friendly tools that will aid the EFDC operative in the everyday job of EHM. For a number of years the Mechanical Engineering Department, University of Wales Swansea and the Defence Evaluation and Research Agency (DERA) Fuels and Lubricants Centre, Pyestock have been collaborating on such projects, funded by the Ministry of Defence. The aim of this paper is to give a summary of the work so far and to outline intended future programmes.
DTIC
Failure; Detection; Armed Forces (USA); Image Analysis; Images; Mechanical Engineering; Personnel; Computer Programs; Computers; Debris

19980211372 Lawrence Livermore National Lab., Livermore, CA USA
Commercial off the shelf (COTS) software in safety systems
Scott, J. A., Lawrence Livermore National Lab., USA; Preckshot, G. G., Lawrence Livermore National Lab., USA; Jan. 25, 1998; 14p; In English; 6th; Nuclear Engineering, 10-15 May 1998, San Diego, CA, USA
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-129500; CONF-980520; DE98-052276; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Many safety systems, such as those in nuclear power plants, are systems for which the consequences of failure can be severe or catastrophic. These systems must be developed, implemented, and maintained in ways that provide assurance that catastrophic consequences will be prevented. This paper discusses various aspects of the question of using commercially available software

in these systems. Risk, grading, and system assessment are discussed, and relevant standards are summarized. Recommendations for addressing key issues are given.
DOE
Nuclear Power Plants; Software Engineering; Safety

19980211374 Central Research Inst. of Electric Power Industry, Tokyo, Japan
Development of DENKEN method FPA version 2.0 and improvement of quality characteristics trees. Improvement of measurement accuracy and expansion of measurable domains ***Denchukenho FPA dai 2 han no kaihatsu to hinshitsu tokusei taikei no kairyo. Keisoku seido no kojo to tekiyo taisho bun'ya no kakudai***
Takahashi, M., Central Research Inst. of Electric Power Industry, Japan; Hishitani, J., Central Research Inst. of Electric Power Industry, Japan; Apr. 1997; 27p; In Japanese
Report No.(s): CRIE-R-96005; DE98-736447; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The traditional DENKEN functional point analysis (FPA) method version 1.4 has been revised into version 2.0, to improve easiness and accuracy of measurement and compatibility with the ISO standards (draft). For improvement of easiness and accuracy of measurement, a new rule procedure for systematically counting functional elements is provided, where a processing flow diagram is drawn after dividing system functions stepwise. This allows the functional elements to be enumerated at a consistent accuracy. For expansion of the applicable domains, development of application software and the associated improvement of system software are clearly distinguished from each other, and a new counting procedure is provided for each domain. A new functional element is also provided to allow measurement of incorporation/control software. Another improvement is increased in compliance with the requirements by the draft international standards now under deliberation by ISO, and the detailed measurement manual has been prepared to allow users to study the measurement techniques by themselves.
DOE
Applications Programs (Computers); Computer Programming; Functional Analysis

19980211412 Mission Research Corp., Nashua, NH USA
Plexus (Phillips Laboratory Expert System-Assisted User Software) ***Final Report, 17 Sep. 1991 - 31 Dec. 1996***
Myers, Thomas M., Mission Research Corp., USA; McDonough, J., Mission Research Corp., USA; Noah, M., Mission Research Corp., USA; Campbell, T., Mission Research Corp., USA; Mar. 01, 1997; 54p; In English
Contract(s)/Grant(s): F19628-91-C-0147; AF Proj. 3054
Report No.(s): AD-A347202; MRC-NSH-97-001; PL-TR-97-2071; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report summarizes the results of the Phillips Lab PLEXUS project to design, build, and distribute a user friendly, expert system assisted, GUI enhanced software suite of sophisticated atmospheric effects and backgrounds models (FASCODE, MODTRAN, LOWTRAN, SHARC, Celestial Backgrounds Model) developed by PL/GPO to determine the effects of the atmosphere on electrooptical sensor performance. Although a complex task with high technical risk, the project was extremely successful as measured by the fact that PLEXUS has been distributed to over 200 users and has become widely accepted as one of the key E-O engineering support tools within the DoD and NATO.
DTIC
Software Engineering; Expert Systems; Computer Programs; User Requirements

19980211414 Congressional Budget Office, Washington, DC USA
Changing the Treatment of Software Expenditures in the National Accounts
Apr. 1998; 36p; In English
Report No.(s): AD-A347194; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Statistics from the national economic accounts play an important role in economic forecasting, both for federal agencies and the private sector. One issue of recent concern has been whether the way those accounts treat businesses spending on software makes current statistics misleading. This memorandum describes how an alternative treatment of software spending would affect the accounts and provides rough estimates of those effects. The analysis was undertaken as background research in support of the Congressional Budget Office's work on economic forecasting.
DTIC
Estimates; Statistical Analysis; Economic Analysis

19980211415 Naval Postgraduate School, Monterey, CA USA

Analysis of Java Distributed Architectures in Designing and Implementing a Client/Server Database System

Akin, Ramis, Naval Postgraduate School, USA; OBrien, Frederick P., Naval Postgraduate School, USA; Jun. 1998; 248p; In English

Report No.(s): AD-A347186; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

Having timely and accurate information is essential for effective management practices and optimization of limited resources. Information is scattered throughout organizations and must be easily accessible. A new solution is needed for effective and efficient management of data in today's distributed client/server environment. Java is destined to become a language for distributed computing. Java Development Kit (JDK) comes with a broad range of classes for network and database programming. Java Database Connectivity (JDBC) is one such class for providing client/server database access. There are many different approaches in using JDBC, ranging from low level socket programming, to a more abstract middleware approach. This thesis will analyze three different approaches: Sockets, Remote Method Invocation (RMI) and Commercial Middleware servers. Among the three approaches this thesis examined, database access through RMI is the most viable approach because it uses an effective distributed object model. RMI abstracts the communication interface to the level of a procedure call. Instead of working directly with sockets, programmers can invoke a remote procedure as if it resided locally.

DTIC

Data Bases; Client Server Systems; Programmers; Procedures; Object-Oriented Programming

19980211491 Physics and Electronics Lab. TNO, The Hague, Netherlands

Distributed Interactive Simulation: From DIS to HLA ***Gedistribueerde interactieve simulatie***

Elias, R. J. D., Physics and Electronics Lab. TNO, Netherlands; deJong, W. G., Physics and Electronics Lab. TNO, Netherlands; Feb. 1998; 71p; In Dutch

Contract(s)/Grant(s): A95KL841

Report No.(s): AD-A347336; FEL-98-A014; TDCK-97-0394; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In this report an outline is given of the ongoing developments of distributed simulation and its standardisation for interoperability of simulations. It highlights the High Level Architecture (HLA) initiative of the DoD DM50, with its base module, the Run-Time Infrastructure (RTI), which provides for communication between simulation applications. It also discusses the Real-time Platform-level Reference Federation Object Model (RPR-FOM), a proposal for a data standardisation for DIS-like, real-time, human-in-the-loop physical platform simulation in HLA. Finally the Advanced Simulation Framework (ASF) is presented. The ASF is a software infrastructure for the development of distributed simulation applications and provides for a smooth transition from DIS to HLA by shielding the application developer from the underlying distributed simulation standards through a generic application programmer's interface.

DTIC

Standardization; Distributed Interactive Simulation; Computer Programs

19980211523 Xinotech Research, Inc., Minneapolis, MN USA

Object Abstractor Ada 9X ***Final Report, Jun. 1994 - Jun 1997***

Rivera, Romel, Xinotech Research, Inc., USA; Shankar, Subash, Xinotech Research, Inc., USA; Seaholm, Susan, Xinotech Research, Inc., USA; May 1998; 15p; In English

Contract(s)/Grant(s): F30602-94-C-0175; AF Proj. B132

Report No.(s): AD-A347094; AFRL-IF-RS-TR-1998-62; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes the work done by Xinotech Research on the Xinotech metalanguage-based object abstractor for ADA 9X program transformation. The goal of this project was to developed a knowledge-based metalanguage-based tool to support object abstraction for forward and reverse engineering of ADA programs. The capabilities of the object abstractor include those for improving software analysis, software understanding, software reengineering, and automatic program transformation. The tools developed under this effort support automatic translation from other languages to ADA, automatic generation of graphical architectural models from source code, user-assisted refinement and tuning of the graphical architectural model, and automatic transformation of the source code to the final model.

DTIC

Ada (Programming Language); Computer Programs

19980211580 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA

Performance Comparison of Superresolution Array Processing Algorithms

Barabell, A. J., Massachusetts Inst. of Tech., USA; Capon, J., Massachusetts Inst. of Tech., USA; DeLong, D. F., Massachusetts

Inst. of Tech., USA; Johnson, J. R., Massachusetts Inst. of Tech., USA; Senne, K. D., Massachusetts Inst. of Tech., USA; Jun. 15, 1998; 193p; In English
Contract(s)/Grant(s): F19628-95-C-0002
Report No.(s): AD-A347296; ESC-TR-97-121; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

This report summarizes the results of the initial phase of a comprehensive simulation study of alternative signal processing algorithms for data adaptive superresolution direction finding and spatial nulling to support signal copy in the presence of strong cochannel interference. The need for such a study arises because, although most of the techniques evaluated have been documented in the literature, no systematic comparison has heretofore been undertaken. The general approach of the current study is to simulate a sequence of increasingly more general, i.e, realistic, signaling environments, and to expose each of the more promising algorithms to all of the ”standardized” experiments, in turn. For the initial phase of the inquiry, we have selected an ideal environment characterized by a uniform, linear array of identical isotropic elements and perfect receivers. In addition, partial results are obtained for the case when the array steering vectors are in error by a small amount which might be caused by residual calibration errors, unmodeled multipath distortions, near-field emitters, etc.
DTIC
Algorithms; Signal Processing; Linear Arrays; Direction Finding; Computerized Simulation

19980211598 Technische Hogeschool, Centre for Mechanical Engineering, Delft, Netherlands
GES User’s Guide, Version 1.05 ***Final Report***
van ugt, J., Technische Hogeschool, Netherlands; Dec. 15, 1997; 227p; In English
Report No.(s): AD-A346439; TNO-96-CMC-R0274; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

This report is a user’s guide for the computer program GES. The objective of this program is to simulate ship installations with different kinds of energy systems. The program contains a library with special apparatuses to describe ship’s propulsion installations and systems.
DTIC
Applications Programs (Computers); User Manuals (Computer Programs); Computer Aided Design; Ships

19980211603 BEAM Technologies, Inc., Ithaca, NY USA
An Object-Oriented Toolbox for Distributed Parameter Control Design With Application to JSF ***Final Report, 27 May 1997 - 18 May 1998***
Bhaskaran, Rajesh, BEAM Technologies, Inc., USA; Long, Kevin, BEAM Technologies, Inc., USA; Berkooz, Gal, BEAM Technologies, Inc., USA; May 18, 1998; 12p; In English
Contract(s)/Grant(s): F49620-97-C-0025
Report No.(s): AD-A346477; Rept-0002AA; AFRL-SR-BL-TR-98-0485; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have developed the core functionality for an object-oriented toolbox for modeling, control design and analysis of distributed parameter systems. The toolbox is based on PDESolve, our C++ class library for simulating partial differential equation (PDE) systems. The capabilities developed are: (1) High-level specification and analysis of the PDE control problem; (2) Calculation of basic system matrices using a finite-element approximation of PDE control problems; (3) Interface with MATLAB providing access to MATLAB functionality from within the control toolbox; (4) Simulation of open and closed-loop response; and (5) Model reduction at the PDE level using a modal basis. We have successfully demonstrated the toolbox on the LQR control of plate vibration using a distributed actuator. This problem takes about 0.5 man-days to solve using the toolbox whereas it is estimated that it will take at least a man-month to solve it by modifying a conventional finite-element code.
DTIC
Applications Programs (Computers); Partial Differential Equations; Problem Solving; Computer Aided Design; Object-Oriented Programming

19980213241 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
DoD Product Line Practice Workshop Report ***Final Report***
Bergey, John, Carnegie-Mellon Univ., USA; Clements, Paul, Carnegie-Mellon Univ., USA; Cohen, Sholom, Carnegie-Mellon Univ., USA; Donohoe, Pat, Carnegie-Mellon Univ., USA; Jones, Larry, Carnegie-Mellon Univ., USA; May 1998; 99p; In English
Contract(s)/Grant(s): F19628-95-C-0003
Report No.(s): AD-A346252; CMU/SEI-98-TR-007; ESC-TR-98-007; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

The Department of Defense (DoD) Product Line Practice workshop, Product Lines: Bridging the Gap, Commercial Success to DoD Practice was a hands-on meeting held in March 1998. Its purpose was to identify industry wide best practices in software product lines, to share DoD product line experience, to explore the technical and non-technical issues involved, and to discuss ways in which the current gap between commercial best practice and DoD practice can be bridged. This report synthesizes the workshop presentations and discussions that described selected product line practices and identified barriers and enablers to achieving these practices within the DoD.
DTIC
Software Engineering; Production Engineering

19980213252 Alabama Univ., Huntsville, AL USA
Trainer Methodology Study ***Final Report, 28 Mar - 30 Sep. 1997***
Dow, Stephen J., Alabama Univ., USA; Sep. 30, 1997; 29p; In English
Contract(s)/Grant(s): DAAH01-91-D-R005
Report No.(s): AD-A346170; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This task focused on development of two software programs for use with training devices which display moving targets overlaid on bitmapped terrain images. The first, called PathEdit, is used to define target paths across the terrain. The second, called Depth Finder, is used to produce per-pixel depth data for terrain images generated by taking photos with a digital camera. The report describes and documents these two programs.
DTIC
Applications Programs (Computers); Training Devices; Software Engineering; Image Processing; Computer Graphics; Computer Assisted Instruction

19980213307 UES, Inc., Dayton, OH USA
3D Engineering Workstation and Connected Engineering ***Final Report, 8 May 1997 - 8 Feb. 1998***
Gegel, Harold L., UES, Inc., USA; Feb. 1998; 60p; In English
Contract(s)/Grant(s): F3615-97-C-5844; AF Proj. 3005
Report No.(s): AD-A346109; AFRL-ML-WP-TR-1998-4033; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The purpose of this Phase I research project was to determine the feasibility for developing a 3D Engineering Workstation for designing custom precision forgings. An industrial advisory board was formed to guide the research, and it consisted of members from USCAR corporations, national laboratories and the parts supplier industry. Rules were developed for designing a graphical user interface (GUI) for non analyst designers, and emphasis was placed on linking discreet simulations of different processes, e.g., forging, quenching and heat treatments, which are needed for producing a finished part. Gleeble testing was done, and the results show that thermal gradients can have a significant effect on the mechanical properties of aluminum alloy 7050. The inverse FEM was evaluated for determining surface heat transfer coefficients, and the feasibility for using thermal probes with important geometrical features of the part was shown to be a viable way for handling complex 3D geometries. The results of this work can be used to develop a design system for making custom netshape forgings more affordable for the DoD. The precision forging of netshape aerospace and automotive parts is of prime interest, because netshape forgings save energy, materials and reduce overall part cost.
DTIC
Graphical User Interface; Mechanical Properties; Three Dimensional Models; Forging; Thermodynamic Properties

19980214899 Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA USA
Effects of Field of View on Judgements of Self-Location: Distance Estimations Using Plainview Representations as a Function of Observer Eye Station Points (ESP) and Geometric Field of View (FOVg) ***Interim Report, Aug. 1990 - Oct. 1994***
Psotka, Joseph, Army Research Inst. for the Behavioral and Social Sciences, USA; Lewis, Sonya A., Army Research Inst. for the Behavioral and Social Sciences, USA; Jul. 1998; 30p; In English
Contract(s)/Grant(s): Proj-0611102B74F
Report No.(s): AD-A349446; ARI-RN-98-24; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The accurate location of one's (sometimes virtual) egocenter in a geometric space is of critical importance for immersion technologies. Self - location is a relatively unexplored component of size and distance estimations. This experiment was conducted to investigate the role of field of view (FOV) and observer eye station points (ESP) in the perception of the location of one's egocenter (the personal viewpoint) in virtual space. Fifty students viewed an animated 3D model, either of a similar room to the one where they sat, or of a space of round orbs of unfamiliar size, binocularly, from ESPs of either 1/2, 1, 2, 3, 4, or 5 feet. The display was on an 190 by 245 mm monitor, at a resolution of 320 by 200 pixels with 256 colors. They saw six models of both the room

or orbs designed with six geometric field of view (FOVg) conditions of 18, 28, 37, 48, 86, and 140 degrees. They drew the apparent paths of the camera in each model of the room on a bitmap image of the room as seen from infinity above. The results indicate that distance perception and self - location are substantially affected by the display field of view and the computed field of view of the synthetic environment. The errors in self - location may underlie the widespread findings of underestimation of distances in virtual worlds and computer - generated imagery. They may also contribute to a better understanding of the many findings of simulator sickness in realistic tank and helicopter trainers. These results offer a new understanding of the phenomena that may be exploited to create solutions for improving training and real - time use of computer - generated imagery.
DTIC
Computerized Simulation; Visual Perception; Virtual Reality; Position (Location); Military Operations; Training Devices; Flight Simulators

62
COMPUTER SYSTEMS

Includes computer networks and special application computer systems.

19980210852 Sandia National Labs., Albuquerque, NM USA
Network-based collaborative research environment LDRD ***Final Report***
Davies, B. R., Sandia National Labs., USA; McDonald, M. J., Sandia National Labs., USA; Sep. 1997; 57p; In English
Contract(s)/Grant(s): DE-AC04-94AL-85000
Report No.(s): SAND-97-2315; DE98-000059; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The Virtual Collaborative Environment (VCE) and Distributed Collaborative Workbench (DCW) are new technologies that make it possible for diverse users to synthesize and share mechatronic, sensor, and information resources. Using these technologies, university researchers, manufacturers, design firms, and others can directly access and reconfigure systems located throughout the world. The architecture for implementing VCE and DCW has been developed based on the proposed National Information Infrastructure or Information Highway and a tool kit of Sandia-developed software. Further enhancements to the VCE and DCW technologies will facilitate access to other mechatronic resources. This report describes characteristics of VCE and DCW and also includes background information about the evolution of these technologies.
DOE
Technology Assessment; Computer Networks; Variable Cycle Engines; Information Dissemination; Architecture (Computers)

19980210890 SRI International Corp., Menlo Park, CA USA
Optimization Techniques for Trusted Semantic Interoperation ***Final Report, Aug. 1994 - Oct. 1997***
Dawsen, Steven, SRI International Corp., USA; May 1998; 105p; In English
Contract(s)/Grant(s): ARPA ORDER-B401; Proj-B401
Report No.(s): AD-A348650; AFRL-IF-RS-TR-1998-39; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

SRI International has completed a research program on the development of techniques and tools for efficient, trusted interoperation of autonomous heterogeneous information sources. This program has produced novel techniques for integration of heterogeneous databases into large applications, efficient algorithms for optimization and security of semantic interoperation, and a prototype query mediation system that demonstrates the utility and effectiveness of these techniques and algorithms.
DTIC
Autonomy; Data Bases; Heterogeneity; Information Systems

19980211308 Lawrence Livermore National Lab., Livermore, CA USA
Performance characteristics of gang scheduling in multiprogrammed environments
Jette, M. A., Lawrence Livermore National Lab., USA; Nov. 01, 1997; 21p; In English; Supercomputing ’97: High Performance Networking and Computing, 15-21 Nov. 1997, San Jose, CA, USA
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-127313; CONF-971138-; DE98-051347; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Gang scheduling provides both space-slicing and time-slicing of computer resources for parallel programs. Each thread of execution from a parallel job is concurrently scheduled on an independent processor in order to achieve an optimal level of program performance. Time-slicing of parallel jobs provides for better overall system responsiveness and utilization than otherwise

possible. Lawrence Livermore National Laboratory has deployed three generations of its gang scheduler on a variety of computing platforms. Results indicate the potential benefits of this technology to parallel processing are no less significant than time-sharing was in the 1960's.
DOE
Scheduling; Computers; Slicing

19980211314 Lawrence Livermore National Lab., Livermore, CA USA
Dose rate effects during damage accumulation in silicon
Caturla, M. J., Lawrence Livermore National Lab., USA; DiazdelaRubia, T., Lawrence Livermore National Lab., USA; Jan. 01, 1997; 8p; In English, 2-6 Dec. 1996, Boston, MA, USA; Sponsored by Materials Research Society, USA
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-126223; CONF-961202-; DE98-051125; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We combine molecular dynamics and Monte Carlo simulations to study damage accumulation and dose rate effects during irradiation of Silicon. We obtain the initial stage of the damage produced by heavy and light ions using classical molecular dynamics simulations. While heavy ions like As or Pt induce amorphization by single ion impact, light ions like B only produce point defects or small clusters of defects. The amorphous pockets generated by heavy ions are stable below room temperature and recrystallize at temperatures below the threshold for recrystallization of a planar amorphous-crystalline interface. The damage accumulation during light ion irradiation is simulated using a Monte Carlo model for defect diffusion. In this approach, we study the damage in the lattice as a function of dose and dose rate. A strong reduction in the total number of defects left in the lattice is observed for lower dose rates.
DOE
Dosage; Damage; Silicon; Molecular Dynamics; Monte Carlo Method; Ion Irradiation

19980211322 Lawrence Livermore National Lab., Livermore, CA USA
Information engineering
Hunt, D. N., Lawrence Livermore National Lab., USA; Feb. 01, 1997; 34p; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-ID-125477; DE98-050687; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The Information Engineering thrust area develops information technology to support the programmatic needs of Lawrence Livermore National Laboratory's Engineering Directorate. Progress in five programmatic areas are described in separate reports contained herein. These are entitled Three-dimensional Object Creation, Manipulation, and Transport, Zephyr: A Secure Internet-Based Process to Streamline Engineering Procurements, Subcarrier Multiplexing: Optical Network Demonstrations, Parallel Optical Interconnect Technology Demonstration, and Intelligent Automation Architecture.
DOE
Information Systems; Progress; Internets; Optical Interconnects; Computer Programs

19980211411 Scalable System Solutions, Los Angeles, CA USA
IMPACT: Integrated Multi-Level Performance Framework for Scalable Systems ***Final Report, 8 Oct. 1997 - 8 Jun. 1998***
Martin, Jay, Scalable System Solutions, USA; Bagrodia, Rajive, Scalable System Solutions, USA; Jun. 15, 1998; 61p; In English
Contract(s)/Grant(s): DAAH01-98-CR-010
Report No.(s): AD-A347226; SSS-9802; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The current state of art in performance technology does not facilitate detailed performance evaluation of complex, large scale systems. The aim of the Phase 1 effort was to demonstrate the feasibility of an Integrated Multi-Level Performance Framework for Complex Systems (IMPACT) for simulation of a parallel database system. As described in this report, the Phase 1 effort resulted in the design and an initial implementation of an object oriented scalable simulator. A prototype model to simulate a parallel database machine was developed and the model was used to simulate the performance of a database running on a shared nothing architecture. The model was developed using three different simulators: CSIM, a commercial sequential simulator, (3) PARSEC, an existing C based parallel discrete event simulator, and COMPOSE, a new C++ library for parallel discrete event simulation. The parallel models were validated against the functionally equivalent CSIM model and were found to produce identical outputs. The performance of the parallel models was subsequently studied for different workloads and substantial performance improvements were observed from parallel execution of the model. Based on the positive results obtained from the Phase 1 study, we have

initiated development of a state of the art performance modeling tool for scalable data base systems using the COMPOSE parallel object oriented simulator.
DTIC
Data Bases; Feasibility Analysis; Evaluation; Data Processing Equipment; Performance Prediction; Parallel Processing (Computers)

19980211501 Sandia National Labs., Albuquerque, NM USA
A user's guide for BREAKUP: A computer code for parallelizing the overset grid approach
Barnette, D. W., Sandia National Labs., USA; Apr. 1998; 64p; In English
Contract(s)/Grant(s): DE-AC04-94AL-85000
Report No.(s): SAND-98-0701; DE98-005259; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

In this user's guide, details for running BREAKUP are discussed. BREAKUP allows the widely used overset grid method to be run in a parallel computer environment to achieve faster run times for computational field simulations over complex geometries. The overset grid method permits complex geometries to be divided into separate components. Each component is then gridded independently. The grids are computationally rejoined in a solver via interpolation coefficients used for grid-to-grid communications of boundary data. Overset grids have been in widespread use for many years on serial computers, and several well-known Navier-Stokes flow solvers have been extensively developed and validated to support their use. One drawback of serial overset grid methods has been the extensive compute time required to update flow solutions one grid at a time. Parallelizing the overset grid method overcomes this limitation by updating each grid or subgrid simultaneously. BREAKUP prepares overset grids for parallel processing by subdividing each overset grid into statically load-balanced subgrids. Two-dimensional examples with sample solutions, and three-dimensional examples, are presented.
DOE
User Manuals (Computer Programs); Computer Programs; Parallel Computers; Parallel Processing (Computers); Computational Grids

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CYBERNETICS

Includes feedback and control theory, artificial intelligence, robotics and expert systems. For related information see also 54 Man/System Technology and Life Support.

19980210896 Lawrence Livermore National Lab., Livermore, CA USA
Integrated computer control system architectural overview
VanArsdall, P., Lawrence Livermore National Lab., USA; Jun. 18, 1997; 21p; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-ID-128811; DE98-051490; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This overview introduces the NIF Integrated Control System (ICCS) architecture. The design is abstract to allow the construction of many similar applications from a common framework. This summary lays the essential foundation for understanding the model-based engineering approach used to execute the design.
DOE
Architecture (Computers); Control Systems Design

19980211063 Pennsylvania Univ., Dept. of Electrical and Engineering and Science, Philadelphia, PA USA
Biomorphic Networks for ATR and Higher-Level Processing *Quarterly Report No. 14, 1 Apr - 1 Jul. 1998*
Farhat, Nabil H., Pennsylvania Univ., USA; Jan. 10, 1998; 27p; In English
Contract(s)/Grant(s): N00014-94-0931
Report No.(s): AD-A347722; TR-14; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Invariant features in two dimensional binary images are extracted in a single layer network of locally coupled spiking (pulsating) model neurons with prescribed synapto dendritic response. The feature vector for an image is represented as invariant structure in the aggregate histogram of interspike intervals obtained by computing time intervals between successive spikes produced from each neuron over a given period of time and combining such intervals from all neurons in the network into a histogram. Simulation results show that the feature vectors are more pattern specific and invariant under translation, rotation, and change in scale

or intensity than achieved in earlier work. We also describe an application of such networks to segmentation of line (edge enhanced or silhouette) images. The biomorphic spiking network's capabilities in segmentation and invariant feature extraction may prove to be, when they are combined, valuable in Automated Target Recognition (ATR) and other automated object recognition systems.
DTIC
Neural Nets; Networks; Morphology; Pattern Recognition; Models; Biochemistry

19980211600 Idaho Univ., Moscow, ID USA
Peripheral Displays for Spatial Orientation ***Final Report, 1 Mar. 1997 - 28 Feb. 1998***
Dyre, Brian P., Idaho Univ., USA; May 28, 1998; 6p; In English
Contract(s)/Grant(s): F49620-97-1-0093
Report No.(s): AD-A346451; APK529; AFRL-SR-BL-TR-98-0489; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This report describes the equipment acquired with funds from grant F49620-97-1-0093, awarded by the Air Force Office of Scientific Research (AFOSR) through the 1997 Defense University Research Instrumentation Program (DURIP) to Dr. Brian Dyre, Assistant Professor of Psychology, University of Idaho. Part I describes the equipment acquired, special circumstances regarding the acquisition, changes to the equipment as listed in the original proposal, and justifications thereof. Part II summarizes the research projects, completed and ongoing, for which the equipment was used. As proposed, this program of research consists of basic psychophysical studies of the visual mechanisms underlying spatial orientation (the perception of our location in and movement through space) in the context of high workload and wide fields-of-view. Preliminary studies in this line of research have been conducted along two lines: (a) perception of the speed of self-motion, or ego speed; and (b) perception of the direction of self-motion, or heading. However, because the wide field-of-view display system became operational only recently, the research conducted to date, and summarized in this report, addressed issues requiring only a small field-of-view. The laboratory is expected to be fully functional by July 1998.
DTIC
Display Devices; Visual Perception; Field of View; Psychology

19980211701 Air Force Materials Lab., Wright-Patterson AFB, OH USA
Enabling Technology: Analysis of Categories with Potential to Support the Use of Modeling and Simulation in the USA Air Force ***Final Report, Jan. 1996 - Jul. 1997***
Andrews, Dee H., Air Force Materials Lab., USA; Brown, Jarvis, Air Force Materials Lab., USA; Byrnes, Jack, Air Force Materials Lab., USA; Chang, James, Air Force Materials Lab., USA; Hartman, Rob, Air Force Materials Lab., USA; May 1998; 248p; In English
Contract(s)/Grant(s): Proj-1123
Report No.(s): AD-A348974; AFRL-HE-AZ-TR-1998-0041; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

This report presents results of a research effort conducted at the request of AF/XOM to AFMC/ST to conduct a comprehensive review of long lead, modeling and simulation related technologies (both within and outside the USAF) to identify those areas that would be of high interest or significance to the USAF for constructive, virtual, live, or hybrid simulations, both local and distributed. The Ad Hoc Working Group on Modeling and Simulation (M&S) Enabling Technology (ET) adapted/developed a taxonomy consisting of five main categories: (1) Interconnection Technology, (2) Information Technology; (3) Representation Technology; (4) Interface Technology, and (5) Pervasive Technology. The working group conducted a survey with representatives of the US Air Force, academia, industry, and Federally Funded Research and Development Centers to collect a sample of existing and planned ETs. The result of the survey was a set of subjective ratings of 93 ETs and 38 current M&S projects which make use of enabling technologies. Based mostly upon the Working Group's experience with M&S and upon the team's ratings of the ETs and M&S projects gathered during the survey, recommendations are made concerning the M&S ET projects and contain detailed rationale statements. The Ad Hoc team views the current effort as only the first phase to identify enabling technologies that have potential to improve the Air Force's M&S capability and strongly recommends that collection of ETs continues. For Phase 2, they recommend that a group of M&S experts external to the Air Force continue this analysis with users of M&S ETs and the operational community. The ET users and operational community can identify operational requirements pull for M&S ETs that when combined with the technology push efforts identified in this report, can be used to build an Air Force ET investment strategy.
DTIC
Information Retrieval; Simulation; Information Systems

19980213233 Carnegie-Mellon Univ., School of Computer Science, Pittsburgh, PA USA

Research in the Automated Analysis of Remotely Sensed Imagery ***Annual Report, Sep. 1993 - Sep 1994***

McKeown, David M., Jr, Carnegie-Mellon Univ., USA; Gifford, Stephen J., Carnegie-Mellon Univ., USA; Cochran, Steven D., Carnegie-Mellon Univ., USA; Ford, Stephen J., Carnegie-Mellon Univ., USA; Roux, Michel, Carnegie-Mellon Univ., USA; Mar. 1998; 60p; In English; Original contains color plates

Contract(s)/Grant(s): DACA76-92-C-0036

Report No.(s): AD-A346261; TEC-0107; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report presents an overview of Carnegie Mellon University's (CMU) program of research at the Digital Mapping Laboratory in the general area of the automated analysis of remotely sensed imagery. We report progress in the areas of digital photogrammetry, automatic building extraction, stereo analysis, multispectral image analysis, virtual world construction, and knowledge-based systems for scene interpretation.

DTIC

Images; Image Processing; Remote Sensing; Photogrammetry; Image Analysis; Computer Aided Mapping; Imagery

19980213279 Department of the Navy, Washington, DC USA

Neural Network for Maximum Likelihood Classification with Supervised and Unsupervised Training Capability

Streit, Roy L., Inventor, Department of the Navy, USA; Mar. 03, 1998; 12p; In English; Supersedes US-Patent-Appl-SN-499336

Patent Info.: Filed 7 Jul. 1995; US-Patent-Appl-SN-499336; US-Patent-5,724,487

Report No.(s): AD-D018980; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A neural network comprising an input layer, two hidden layers for generating an number of outcome class component values, and an output layer for classifying input vectors to an outcome class, under the assumption that the outcome classes are characterized by mixtures of component populations with each component population having a multivariate Gaussian likelihood distribution. The first hidden layer includes a number of first layer nodes each connected receive input vector components from the input layer and generates in response a first layer output value representing the absolute value of the sum of a function of the difference between each input vector component and a threshold value. The second hidden layer includes a plurality of second layer nodes each for generating an outcome class component value, each second layer node being connected to predetermined ones of the first layer nodes and generating in response to the first layer output values an outcome class component value representing a function related to the exponential of the negative square of the sum of first layer output values connected thereto. The output layer includes a plurality of output layer nodes each associated with an outcome class. Each output layer node uses the output class component values from the second layer nodes in combination with weighting values to generate the likelihood that the input vector is properly classified to the output layer node's outcome class.

DTIC

Neural Nets; Classifications; Maximum Likelihood Estimates

19980214909 Department of the Navy, Washington, DC USA

Neural Network Architecture for Non-Gaussian Components of a Mixture Density Function

Streit, Roy L., Inventor, Department of the Navy, USA; Jan. 27, 1998; 8p; In English; Supersedes US-Patent-Appl-SN-499243

Patent Info.: Filed 7 Jul. 1995; US-Patent-Appl-SN-499243; US-Patent-5,712,959

Report No.(s): AD-D018930; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A neural network for classifying input vectors to an outcome class, under the assumption that the outcome classes are characterized by mixtures of component populations, with each component population having a multivariate non-Gaussian likelihood distribution. The neural network comprising an input layer for receiving the components of the input vector, two hidden layers for generating an number of outcome class component values, and an output layer that identifies an outcome class in response to the outcome class component values. The first hidden layer includes a number of first layer nodes each connected receive input vector components from the input layer and generating in response a first layer output value representing a selected first layer power of the absolute value of the sum of the difference between a function of each input vector component and a threshold value. The second hidden layer includes a plurality of second layer nodes each being connected to predetermined ones of the first layer nodes and generating in response to the first layer output values an outcome class component value representing a function related to the exponential of the negative square of the sum of first layer output values. The output layer includes a plurality of output layer nodes each associated with an outcome class. Each output layer node receives the output class component values from all of the second layer nodes and uses them, in combination with respective weighting values, to generate a value that represents the likelihood that the input vector is properly classified to the output layer node's outcome class.

DTIC

Normal Density Functions; Neural Nets; Architecture (Computers)

19980214925 Reliability Analysis Center, Rome, NY USA

A Web based FMECA Interface Linked to an Expert System for Oil Analysis

Denson, William, Reliability Analysis Center, USA; Wiseman, Murray, Predictive Maintenance Corp., Canada; Jan. 1998; 6p; In English

Report No.(s): AD-A347353; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A World Wide Web (WWW) interface to a FMECA (Failure Mode Effects and Criticality Analysis) building tool and database is described in this paper. The WWW FMECA has been linked to an oil analysis expert system. The interface is based on an Oracle 7 distributed database tightly integrated with Web server functions. A second laboratory Oracle distributed database contains historical oil analysis data. A rule based expert system accesses both databases and matches pertinent failure mode and detection method details from the FMECA database with current and statistical trend data from the laboratory database. The FMECA database contains both public and private data. Publicly accessible tables contain failure rates, failure mode distributions, causes, effects, detection methods, and severity classifications while private tables contain the failure mode analyses accessible only to the authenticated user. The general data tables provide cooperative and synergistic advantages to a diverse spectrum of users and industries. These advantages include consistent naming of parts and failure modes even where multiple languages are used. The FMECA database provides knowledge that is easily assimilated by an expert system.

DTIC

Maintenance; Lubricating Oils; Failure Analysis; Fault Tolerance; Systems Analysis; World Wide Web; Expert Systems

64
NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

19980211014 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA

Trigonometric Transforms for Image Reconstruction

Foltz, Thomas M., Air Force Inst. of Tech., USA; Jun. 01, 1998; 148p; In English

Report No.(s): AD-A348168; AFIT/DS/ENG/98-04; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This dissertation demonstrates how the symmetric convolution-multiplication property of discrete trigonometric transforms can be applied to traditional problems in image reconstruction with slightly better performance than Fourier techniques and increased savings in computational complexity for symmetric point spread functions. The fact that the discrete Fourier transform a circulant matrix provides an alternate way to derive the symmetric convolution-multiplication property for discrete trigonometric transforms. Derived in this manner, the symmetric convolution-multiplication property extends easily to multiple dimensions and generalizes to multidimensional asymmetric sequences. The symmetric convolution-multiplication property allows for linear filtering of degraded images via point-by-point multiplication in the transform domain of trigonometric transforms. Specifically in the transform domain of a type-II discrete cosine transform, there is an asymptotically optimum energy compaction about the low-frequency indices of highly correlated images which has advantages in reconstructing images with high-frequency noise. The symmetric convolution-multiplication property allows for well-approximated scalar representations in the trigonometric transform domain for linear reconstruction filters such as the Wiener filter. An analysis of the scalar Wiener filter's improved mean-squared error performance in the trigonometric transform domain is given.

DTIC

Trigonometry; Trigonometric Functions; Image Reconstruction

19980211031 Texas Univ., Inst. for Fusion Studies, Austin, TX USA

Invariants and labels for Lie-Poisson Systems

Thiffeault, J. L., Texas Univ., USA; Morrison, P. J., Texas Univ., USA; Apr. 1998; 16p; In English

Contract(s)/Grant(s): DE-FG03-96ER-54346

Report No.(s): DOE/ER/54346-815; IFSR-815; DE98-004876; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Reduction is a process that uses symmetry to lower the order of a Hamiltonian system. The new variables in the reduced picture are often not canonical: there are no clear variables representing positions and momenta, and the Poisson bracket obtained is not of the canonical type. Specifically, we give two examples that give rise to brackets of the noncanonical Lie-Poisson form: the rigid body and the two-dimensional ideal fluid. From these simple cases, we then use the semidirect product extension of algebras to describe more complex physical systems. The Casimir invariants in these systems are examined, and some are shown to be linked to the recovery of information about the configuration of the system. We discuss a case in which the extension is not

a semidirect product, namely compressible reduced MHD, and find for this case that the Casimir invariants lend partial information about the configuration of the system.
DOE
Hamiltonian Functions; Magnetohydrodynamics; Lie Groups

19980211456 Old Dominion Univ., Dept. of Aerospace Engineering, Norfolk, VA USA
A 2-D Interface Element for Coupled Analysis of Independently Modeled 3-D Finite Element Subdomains ***Final Report***
Kandil, Osama A., Old Dominion Univ., USA; Aug. 14, 1998; 26p; In English
Contract(s)/Grant(s): NAG1-1670; ODURF Proj. 150511; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Over the past few years, the development of the interface technology has provided an analysis framework for embedding detailed finite element models within finite element models which are less refined. This development has enabled the use of cascading substructure domains without the constraint of coincident nodes along substructure boundaries. The approach used for the interface element is based on an alternate variational principle often used in deriving hybrid finite elements. The resulting system of equations exhibits a high degree of sparsity but gives rise to a non-positive definite system which causes difficulties with many of the equation solvers in general-purpose finite element codes. Hence the global system of equations is generally solved using, a decomposition procedure with pivoting. The research reported to-date for the interface element includes the one-dimensional line interface element and two-dimensional surface interface element. Several large-scale simulations, including geometrically nonlinear problems, have been reported using the one-dimensional interface element technology; however, only limited applications are available for the surface interface element. In the applications reported to-date, the geometry of the interfaced domains exactly match each other even though the spatial discretization within each domain may be different. As such, the spatial modeling of each domain, the interface elements and the assembled system is still laborious. The present research is focused on developing a rapid modeling procedure based on a parametric interface representation of independently defined subdomains which are also independently discretized.
Derived from text
Finite Element Method; Nonlinearity; Three Dimensional Models; Interfaces; Computerized Simulation

19980211508 Energia Nucleare e Delle Energie Alternative, Dipt. Innovazione, Rome, Italy
Evolution operator equation: Integration with algebraic and finite difference methods. Applications to physical problems in classical and quantum mechanics and quantum field theory
Dattoli, Giuseppe, Energia Nucleare e Delle Energie Alternative, Italy; Torre, Amalia, Energia Nucleare e Delle Energie Alternative, Italy; Ottaviani, Pier Luigi, Energia Nucleare e Delle Energie Alternative, Italy; Vasquez, Luis, Madrid Univ., Spain; Oct. 1997; ISSN 1120-5571; 171p; In English
Report No.(s): ENEA-RT-INN-97-20; DE98-732712; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The finite-difference based integration method for evolution-line equations is discussed in detail and framed within the general context of the evolution operator picture. Exact analytical methods are described to solve evolution-like equations in a quite general physical context. The numerical technique based on the factorization formulae of exponential operator is then illustrated and applied to the evolution-operator in both classical and quantum framework. Finally, the general view to the finite differencing schemes is provided, displaying the wide range of applications from the classical Newton equation of motion to the quantum field theory.
DOE
Algebra; Quantum Mechanics; Quantum Theory

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing: Monte Carlo method; and stochastic processes.

19980210949 North Carolina Univ., Chapel Hill, NC USA
Optimal Two Stage Procedures for Estimating Functions of Parameters in Reliability and Queueing Models
Burns, Kevin E., North Carolina Univ., USA; Jan. 1998; 75p; In English
Report No.(s): AD-A348622; Rept-98-011D; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In this dissertation, we consider the problem of estimating functions of parameters found in reliability and queueing models. The problem is to allocate a fixed sampling budget among the populations with the goal of minimizing the mean squared error

(MSF) of the estimator. We consider the reliability model with three components such that the probability the system works is f(u1,u2,u3) = u1(u2+u3), and the mean waiting time of the M/G/I queue. For each of these models, we consider a set of sample sizes referred to as a first-allocation procedure which minimizes the first-order approximation to the MSE. Since the first-order allocation procedure depends on the unknown parameters in the model, we propose a two-stage procedure in which we first use a fraction of the sampling budget to estimate the unknown parameters and then allocate the remaining budget based on the initial sample. We show that the difference between the MSE for the two-stage procedure and the minimum MSE obtained using the optimal set of sample sizes from the first-allocation procedure goes to zero as the budget goes to infinity. Simulations are used to demonstrate the asymptotic optimality results for the two stage procedures. The empirical studies show that the two stage estimation procedures work well for reasonable sample sizes.
DTIC
Optimization; Probability Theory; Queueing Theory; Reliability Analysis; Statistical Analysis

19980211589 California State Univ., Coll. of Arts and Sciences, San Marcos, CA USA
Tournaments in Consensus Methods Based on Voting; Dominance in Tournaments; Centrality in Graphs ***Final Report, 1 Jan. 1992 - 31 May 1998***
Reid, K. B., California State Univ., USA; Jun. 05, 1998; 11p; In English
Contract(s)/Grant(s): N00014-92-J-1400
Report No.(s): AD-A349114; Rept-85008-FTR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Final Technical Progress Report contains brief descriptions of published and to be published work. This work resulted in new knowledge concerning several areas of combinatorial mathematics including the aggregation of individual preferences via majority rule with an agenda, the determination of digraphs that arise in population ecology as domination graphs of tournaments representing the relation to prey on a collection of species, the determination of sub trees which are most central in a tree. the determination of which sequences of integers are score sequences for tournaments and for semicomplete digraphs, the discoveries and investigations of a two parameter family of central sets in trees and a novel concept of balance vertices in trees, the determination of some bounds for the domination and irredundance numbers for tournaments, and the determination of near automorphisms of complete multi-partite graphs.
DTIC
Combinatorial Analysis; Topology; Integers; Automorphisms; Populations

19980211695 American Univ., Washington, DC USA
Number Theoretic Methods in Parameter Estimation ***Final Report, 1 Apr. 1997 - 29 May 1998***
Casey, Stephen D., American Univ., USA; May 29, 1998; 19p; In English
Contract(s)/Grant(s): N00014-97-1-0566
Report No.(s): AD-A346613; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have combined results from analysis and number theory with statistical signal processing to develop new results in parameter estimation. In particular, our developments in the theory on the Riemann Zeta Function and algorithms on extensions of Euclidean domains have led to new computationally straightforward algorithms for parameter estimation from sparse, noisy data. Robust versions have been developed that are stable despite significant jitter noise and the presence of arbitrary outliers. We have continued the development of the theory, including the development computationally straightforward techniques for spectral analysis of a very broad class of periodic processes, including procedures so that estimates achieve the Cramer-Rao bound. We have extended these techniques to the complete analysis of zero-crossing data and multiply periodic point processes, including the recovery of the fundamental period(s), phase information, the multiples of the periods, and the deinterleaving of the data. The algorithms will work on data from currently deployed sonar, radar, and communication systems. We have also applied our techniques to other data sets containing sparse noisy information generated by a periodic process, e.g., the geometric pattern generated by minefield placement. We also briefly report on our work on multichannel deconvolution and our work on derivatives.
DTIC
Algorithms; Signal Processing; Least Squares Method; Euclidean Geometry; Roots of Equations

19980211721 Los Alamos National Lab., NM USA
Second Order Perturbations of Monte Carlo Criticality Calculations
Densmore, J. D., Los Alamos National Lab., USA; Hendricks, J. S., Los Alamos National Lab., USA; McKinney, G. W., Los Alamos National Lab., USA; Jul. 1997; 6p; In English; 1997 American Nuclear Society (ANS) Winter Meeting, 16-20 Nov. 1997, Albuquerque, NM, USA
Contract(s)/Grant(s): W-7405-eng-36

Report No.(s): LA-UR-97-2836; CONF-971125; DE97-008329; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Perturbation techniques are powerful tools for determining the effects of small changes, or perturbations, to a problem. Perturbations have long been problematic in Monte Carlo calculations because the effects of small changes to the problem are usually masked by the inherent statistical uncertainties. The recently released MCNP4B Monte Carlo computer code uses the differential operator technique, to calculate changes in tallies caused by perturbations in density and composition over given energy ranges and reaction types. This technique will allow for precise calculation of the changes in tallies even if the standard deviation of the unperturbed tally is larger than the change. The differential operator is approximated by a second order Taylor series. The implementation of the Taylor series expansion assumes that the coefficients are independent of any perturbed cross-sections. However, if the tally is multiplied by cross-section data this assumption is invalid and incorrect results will be generated. of significant interest is the use of perturbations in criticality calculations. Although the criticality source feature for MCNP cannot directly calculate perturbed eigenvalues, a track-length estimate for Keff can be tallied and the perturbation feature can be applied to this tally. However, since the tally multiplies the flux by the macroscopic fission cross-section, this tally is dependent on perturbed cross-section data and incorrect results will be calculated by the perturbation feature. In order to compute the correct tally, a correction term is needed that will account for the dependence of the Taylor series coefficients on the perturbed cross-section data.

DOE

Perturbation; Monte Carlo Method; Computer Programs; Perturbation Theory

66
SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

19980210923 Army War Coll., Carlisle Barracks, PA USA

Army Aviation Strike Force: A New Strategic Asset for the 21st Century

Madden, Craig K., Army War Coll., USA; Apr. 12, 1998; 46p; In English

Report No.(s): AD-A345790; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This essay recommends the establishment of an Army Aviation Strike Force (ASF) consisting of a mobile airborne Command and Control platform, AH-64 Longbow Apaches, RAH-66 Comanche's, and tactical UAV's. The ASF will be a highly mobile, early entry unit designed for rapid strategic deployment worldwide. The capabilities of the ASF will include: joint and combined mobile C2, battlefield synchronization, precision attack, multi-target destruction, anti-armor/tank, stealth armed reconnaissance, unmanned aerial reconnaissance, counter-air, and tactical missile defense. The ASF is designed to provide the National Command Authority with a new joint and combined air mechanized decisive force capability. The Aviation Strike Force should be developed in conjunction with the Army's Force XXI program.

DTIC

AH-64 Helicopter; Command and Control; Military Operations

19980211613 University of Southern Illinois, Carbondale, IL USA

Distributed Sensor Fusion Based on Statistical Inference ***Annual Report, 1 Jun. 1997 - 31 May 1998***

Viswanathan, Ramanarayanan, University of Southern Illinois, USA; Jun. 10, 1998; 4p; In English

Contract(s)/Grant(s): N00014-97-1-0917

Report No.(s): AD-A346543; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In the twelve month period between June 1997 and May 1998, we have looked into two problems related to data fusion from multiple sensors. The first deals with the distributed constant false alarm rate radar target detection and the other examines a rank based test for M-ary detection problem. The rank based test was also applied to diversity combining of antenna array signals in a wireless DS/CDMA system.

DTIC

Multisensor Fusion; Target Acquisition; Radar Targets; Code Division Multiple Access

67
THEORETICAL MATHEMATICS

Includes topology and number theory.

19980211289 Army Research Lab., Sensors and Electron Devices Directorate, Adelphi, MD USA
Continuous Lattices and Mathematical Morphology ***Interim Report, Oct. 1996 - Oct. 1997***
McGuire, Dennis W., Army Research Lab., USA; Jun. 1998; 51p; In English
Report No.(s): AD-A346769; ARL-TR-1548; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

I generalize the topological structure of the concrete forms of mathematical morphology to the lattice-algebraical framework using the theory of continuous lattices. I show that when a complete lattice, fl, exhibits the dual of the property that defines a continuous lattice, then fl together with a certain intrinsic lattice topology, m(fl), which is related by duality to the Lawson topology, has almost all the familiar properties, suitably generalized, of the topologized lattices that constitute the basic mathematical structure of the concrete forms of mathematical morphology; for instance, the complete lattice of closed subsets of the Euclidean plane topologized with Matheron's hit-miss topology.
DTIC
Mathematical Models; Target Recognition; Lattice Parameters; Lattice Vibrations; Morphology

19980211295 Florida Univ., Inst. for Fundamental Theory, Gainesville, FL USA
Quantum transformations
Faraggi, A. E., Florida Univ., USA; Matone, M., Padua Univ., Italy; Jan. 09, 1998; 13p; In English
Contract(s)/Grant(s): DE-FG05-86ER-40272
Report No.(s): DOE/ER/40272-294; UFIFT-HEP-98-1; DFPD-97/TH/50; HEP-TH-9; DE98-005175; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We show that the quantum Hamilton-Jacobi equation can be written in the classical form with the spatial derivative (partial derivative)(sub q) replaced by (partial derivative)(sub q) with dq = dq/(radical)1(minus)(beta)(sup 2)(q), where (beta)(sup 2)(q) is strictly related to the quantum potential. This can be seen as the opposite of the problem of finding the wave function representation of classical mechanics as formulated by Schiller and Rosen. The structure of the above (open quotes)quantum transformation(close quotes), related to the recently formulated equivalence principle, indicates that the potential deforms space geometry. In particular, a result by Flanders implies that both W(q) = V(q) (minus) E and the quantum potential Q are proportional to the curvatures (kappa)(sub W) and (kappa)(sub Q) which arise as natural invariants in an equivalence problem for curves in the projective line. In this formulation the Schroedinger equation takes the geometrical form ((partial derivative)(sub q)(sup 2) + (kappa)(sub W))(psi) = 0.
DOE
Schroedinger Equation; Hamilton-Jacobi Equation; Quantum Mechanics; Transformations (Mathematics)

70
PHYSICS (GENERAL)

For precision time and time interval (PTTI) see 35 Instrumentation and Photography; for geophysics, astrophysics or solar physics see 46 Geophysics, 90 Astrophysics, or 92 Solar Physics.

19980211054 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia
Crack Growth Behaviour of Spur Gears: A Fractographic Analysis
Vavlitis, C., Defence Science and Technology Organisation, Australia; Jan. 1998; 46p; In English
Report No.(s): AD-A348047; DSTO-TN-0137; DODA-AR-010-463; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Vibration Analysis offers a means of detecting faults in gear systems without the need for costly periodic overhaul and inspection, and promises substantial cost savings in several military platform applications. The correlation of vibration analyses with fatigue crack growth forms an essential part of ongoing research aimed at maximizing the information which can be obtained from vibration analyses. This report discusses the use of fractographic analysis to determine the growth behaviour of fatigue cracks in four case-hardened low-alloy steel spur gears.
DTIC
Kurtosis; Crack Propagation; Gears; Vibration; Fatigue (Materials); Dynamic Structural Analysis; High Strength Steels; Cracking (Fracturing)

19980211127 National Inst. for Fusion Science, Toki, Japan
Topological Structure of Magnetic Flux Lines Generated by Thermal Convection in a Rotating Spherical Shell
Kitauchi, Hideaki, National Inst. for Fusion Science, Japan; Dec. 1997; ISSN 0915-633X; 18p; In English; Original contains color illustrations
Report No.(s): NIFS-523; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

Topological structure and reconnection of magnetic flux lines are investigated by analyzing the numerical solution of the Boussinesq magneto-hydrodynamic equations in a rotating spherical shell. Five pairs of Taylor-Proudman vortex columns are generated and drift westward steadily. Magnetic field is intensified around the tops of these vortex columns. Magnetic flux lines connect east-west adjacent domains of intense magnetic field, which migrate eastward relative to the vortex columns. We describe the variation of topology of magnetic flux lines associated with this eastward migration.
Author
Topology; Magnetic Flux; Numerical Analysis; Hydrodynamic Equations

19980211618 Westinghouse Research and Development Center, Pittsburgh, PA USA
Program to Study AC Loss in High-Tc Superconductors ***Final Report, 1 Mar. 1995 - 28 Feb. 1998***
Carr, W. J., Jr, Westinghouse Research and Development Center, USA; Apr. 30, 1998; 37p; In English
Contract(s)/Grant(s): F49620-95-C-0016
Report No.(s): AD-A346511; AFRL-SR-BL-TR-98-0474; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Work performed under this program consisted of (a) consultative work with Wright-Patterson Air Force Base, (b) joint work with WPAFB to develop a concept for converting YBCO films deposited on a wide substrate strip into a conductor with a pattern of narrow spiral filamentary strips for AC operation, (c) calculation of the additional losses due to substrates on YBCO conductors and sheaths on BSCCO type conductors, and (d) new loss theory for polycrystalline high-T(c) superconductors based on Maxwell's equations.
DTIC
Alternating Current; High Temperature Superconductors; Superconducting Films; Substrates; Maxwell Equation

19980211622 Naval Surface Warfare Center, Coastal Warfare Systems Dept., Panama City, FL USA
Evaluation of a Three-Channel High-Temperature Superconducting Magnetometer System
Purpura, John W., Naval Surface Warfare Center, USA; Jun. 1997; 40p; In English
Contract(s)/Grant(s): N61331-94-C-0049
Report No.(s): AD-A346228; CSS-TR-97-16; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report presents the results of an evaluation of a three channel high temperature superconducting magnetometer sensor which operates at liquid nitrogen temperature. Measurements of sensor white noise levels, low frequency noise, and response to applied magnetic fields were performed in shielded and unshielded environments. The intrinsic noise of the sensor was found to be independent of the ambient environment in which it was operated. Nonhysteretic response to applied magnetic field was limited to a dynamic range of approximately 2 microtesla.
DTIC
High Temperature Superconductors; Superconducting Devices; Magnetometers; Signal Processing

71
ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see 45 Environmental Pollution.

19980210901 Mississippi Univ., Physical Acoustics Research Lab., University, MS USA
Resonance Meeting, Volume 2, Transparencies
Bass, H. E., Mississippi Univ., USA; Cauthen, Elizabeth A., Mississippi Univ., USA; May 1997; 570p; In English, 11-15 May 1997, Pacific Grove, CA, USA
Contract(s)/Grant(s): N00014-97-1-0270
Report No.(s): AD-A348597; No Copyright; Avail: CASI; A24, Hardcopy; A04, Microfiche

The purpose of the Resonance Meeting was to cover a broad range of uses of acoustic resonances to determine physical properties of matter. The meeting grew out of prior meetings in 1994 and 1995 that were devoted entirely to Resonant Ultrasound Spectroscopy (RUS). The international list of participants included cutting edge users of RUS and other resonance techniques, as well as researchers and graduate students who wanted to learn about and use these techniques. Universities from the USA and Japan,

national laboratories and private research organizations were represented. The Resonance Meeting proved to stimulate extended discussions outside the scheduled sessions. The proceedings of the Resonance Meeting consist of two volumes. Volume 1 contains a verbatim transcript of each presentation. Volume 2 contains accompanying transparencies for each transcript. Anyone interested in obtaining more information on a particular presentation may contact the author(s). Volume 1 contains a complete list of participants and addresses.
DTIC
Cutting; Matter (Physics); Spectroscopy; Ultrasonics

19980210911 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Inst. fuer Physik der Atmosphaere, Wessling, Germany
Coupled simulation of meteorological parameters and sound intensity in a narrow valley
Heimann, D., Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Germany; Gross, G., Technische Hochschule, Germany; Jul. 1997; ISSN 0943-4771; 35p; In English
Report No.(s): ETDE-DE-609; DE98-722758; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

A meteorological mesoscale model is used to simulate the inhomogeneous distribution of temperature and the appertaining development of thermal wind systems in a narrow two-dimensional valley during the course of a cloud-free day. A simple sound particle model takes up the simulated meteorological fields and calculates the propagation of noise which originates from a line source at one of the slopes of this valley. The coupled modeling system ensures consistency of topography, meteorological parameters and the sound field. The temporal behaviour of the sound intensity level across the valley is examined. It is only governed by the time-dependent meteorology. The results show remarkable variations of the sound intensity during the course of a day depending on the location in the valley.
DOE
Simulation; Mesoscale Phenomena; Meteorological Parameters; Atmospheric Models; Mathematical Models

19980211000 Department of the Navy, Washington, DC USA
System and Method for Compensating for Doppler Shifts in Signals by Downsampling
Jarvis, Susan M., Inventor, Department of the Navy, USA; Mar. 24, 1998; 11p; In English; Supersedes US-Patent-Appl-SN-715741
Patent Info.: Filed 19 Sep. 1996; US-Patent-Appl-SN-715,741; US-Patent-5,732,044
Report No.(s): AD-D018916; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A signal shift compensation system and method compensates for a shift in a signal, such as a Doppler shift in an acoustic signal. The system includes a signal sampler for oversampling the shifted signal at a fixed oversampling rate to establish an oversampled shifted signal digital value sequence. The fixed sampling rate is greater than the typical sampling rate, such as the Nyquist rate of the signals by an oversampling factor. The system further includes a compensation downsampler for decimating the oversampled Doppler shifted signal according to a downsampling factor to establish a decimated digital value sequence. The downsampling factor is determined according to the oversampling factor by which the signal is oversampled and an estimate of the (Doppler) shift value. In one example, the downsampling factor is equal to the oversampling factor divided by a Doppler multiplier reflecting the Doppler shift. Each sample in the decimated sequence is given the value of a corresponding sample in the oversampled sequence. Decimation according to the downsampling factor results in a decimated sequence that closely approximates the original unshifted signal.
DTIC
Doppler Effect; Signal Transmission; Sampling; Signal Processing; Underwater Acoustics

19980211006 Department of the Navy, Washington, DC USA
Hydrophone for Determining Direction of Underwater Sound
Fisher, Stanley A., Inventor, Department of the Navy, USA; Dec. 09, 1997; 7p; In English; Supersedes US-Patent-Appl-SN-758044
Patent Info.: Filed 27 Nov. 1996; US-Patent-Appl-SN-758044; US-Patent-5,696,736
Report No.(s): AD-D018907; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The invention is directed to an improved acoustic sensor system for determining the direction of underwater sound signals relative to a user is disclosed. The sensor system includes first and second sensing means for sensing incoming acoustic energy and for providing first and second acoustic energy signals in response thereto; separation means for separating the first and second sensing means a distance S=E(CW/CA) where E is substantially equal to the separation distance between the users ears, CW is

the speed of sound in water, and CA is the speed of sound in air; detector means, operatively connected with the first and second sensing means, for providing first and second output signals in response to the first and second acoustic energy signals; and audio means, operatively connected with the detector means, for providing an audio output to the user in response to the first and second output signals.
DTIC
Hydrophones; Underwater Acoustics; Signal Detectors

19980211567 Army Aeromedical Research Lab., Fort Rucker, AL USA
Blast Overpressure Studies ***Final Report***
Johnson, Daniel L., Edgerton, Germeshausen and Grier, Inc., USA; May 1998; 283p; In English
Contract(s)/Grant(s): Proj-3016287A878
Report No.(s): AD-A347634; USAARL-CR-98-03; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche
To satisfy the Army's need for realistic safe limits for heavy weapons noise while wearing hearing protection, a 2-1/2 year study was undertaken. Using active duty military volunteers, 64 subjects established that the auditory system could be adequately protected with the RACAL muff from one to three exposures of the reverberant waveforms obtained from a rocket launcher out of an enclosure. Thus, nonauditory considerations set the exposure limits for this type of waveform. This research was accomplished under Task Order 1. Using 27 subjects, two types of nonlinear (increasing attenuation with level) hearing protection were evaluated using 6 to 100 exposures of a freefield waveform of 1.5 ms duration. With the limited number of subjects, neither plug was adequate to protect the auditory system from this type of waveform. Several subjects had a temporary threshold shift (TTS) of their hearing of more than 25 dB. The compressible foam plug did appear to provide adequate protection up to the auditory limits for this waveform. This research was accomplished under Task Order 4.
DTIC
Overpressure; Hearing; Damage Assessment; Ear Protectors; Blasts

19980211602 North Carolina State Univ., Center for Research in Scientific Computation, Raleigh, NC USA
Modeling and Control in Distributed Parameter Physical Systems ***Final Report, 1 Mar. 1995 - 28 Feb. 1998***
Banks, H. T., North Carolina State Univ., USA; May 15, 1998; 15p; In English
Contract(s)/Grant(s): F49620-95-1-0236
Report No.(s): AD-A346461; AFRL-SR-BL-TR-98-0486; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Research efforts and achievements in the area of modeling and control in distributed parameter physical systems are summarized. Progress is reported on specific topics including: (1) control of structure borne noise/mechanical vibrations, (2) modeling of hepatic uptake and elimination of dioxin, (3) modeling and parameter estimation in electromagnetic field/solid interactions, and (4) vibration based damage detection and health monitoring.
DTIC
Electromagnetic Fields; Health; Vibration; Noise (Sound); Pharmacology

19980213239 Naval Research Lab., Acoustics Div., Stennis Space Center, MS USA
Alternate Norms for the Cabrelli and Wiggins Blind Deconvolution Algorithms ***Final Report***
Pflug, Lisa A., Naval Research Lab., USA; Broadhead, Michael K., Naval Research Lab., USA; May 08, 1998; 24p; In English
Report No.(s): AD-A346235; NRL/MR/7173--97-8069; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Two blind deconvolution algorithms are extended to include alternate norms and used to estimate transient source signatures. The inputs to the blind algorithms are received signals which have undergone propagation through a medium and may be difficult to recognize by a classifier. Both of the algorithms are based on an assumption of sparseness for the Green's or impulse response function. Simulations using model signals indicate that the results using alternate norms are better in some cases than the results using the original algorithm norms, meaning that the best source estimate is more similar to the true source, or that good source estimates are produced more consistently with varying filter length. No predictable pattern emerges to provide guidelines as to when each norm will work best when the Green's function consists of a series of alternating positive and negative spikes. However, if the Green's function consists of a series of spikes skewed to either the positive or negative amplitudes, then the odd order alternate norms appear to work better than the original norms.
DTIC
Algorithms; Signal Processing; Underwater Acoustics; Green"S FUNCTIONS

19980213275 Department of the Navy, Washington, DC USA

Acoustic Absorbing Device

Hanson, Jeffrey S., Inventor, Department of the Navy, USA; Feb. 03, 1998; 7p; In English; Supersedes US-Patent-Appl-SN

Patent Info.: Filed 14 May 1996; US-Patent-Appl-SN-645736; US-Patent-5,714,713

Report No.(s): AD-D018975; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An acoustically absorbing device is presented which can be mounted in the structure of a vehicle. The acoustic absorbing device includes an acoustic barrier layer proximate the structure surface, an acoustic absorption material layer adjacent the acoustic barrier layer, and isolation mounts mounting the acoustic absorption material to the structure. The acoustic barrier layer includes either a barrier layer of free airspace or a barrier layer of an acoustic barrier material that is heat resistant and fluid resistant. The acoustic absorption layer is made of a material capable of dispersing incident normal pressure waves within the structure, such as a sintered aluminum absorption material. The mounts are typically spaced throughout the structure and typically include an isolation mounting device that provides isolation from vibrations in the structure.

DTIC

Absorption; Acoustics; Acoustic Attenuation

19980213278 Department of the Navy, Washington, DC USA

Vibrationally and Acoustically Insulated Structure

Hanson, Jeffrey S., Inventor, Department of the Navy, USA; Jan. 27, 1998; 9p; In English; Supersedes US-Patent-Appl-SN-645735

Patent Info.: US-Patent-Appl-SN-645735; US-Patent-5,712,447

Report No.(s): AD-D018979; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A vibrationally and acoustically insulated structure includes a structure housing enclosing a source of internally generated noise and vibrations. The structure further includes a vibration and acoustic insulating device positioned over a portion of the internal surface of the housing and having a vibration damping portion and acoustic absorbing portion. The vibration damping portion, such as a constrained damping layer having a continuous damping layer and a segmented constraining layer of individual rigid segments reduces vibrations transmitted through the structure housing. The acoustic absorbing portion includes an acoustic barrier layer adjacent the constrained damping layer, an acoustic absorption layer adjacent to the acoustic barrier layer and one or more mounts for mounting the acoustic absorption layer and acoustic barrier layer to the constrained damping layer. The acoustic absorption device reduces the reverberating acoustic waves within the structure housing. The mounts typically include an elongated threaded post, such as a snap nut extending from one of the individual rigid segments and a threaded fastener threadably engaged with the elongated threaded post to secure the acoustic absorption layer.

DTIC

Vibration Isolators; Insulation; Vibration

19980213280 Department of the Navy, Washington, DC USA

Acoustic Receiver Array Assembly

Nedderman, William H., Jr., Inventor, Department of the Navy, USA; Jan. 06, 1998; 5p; In English; Supersedes US-Patent-Appl-SN-640579, AD-D018067

Patent Info.: Filed 28 Apr. 1996; US-Patent-Appl-SN-640579; US-Patent-5,706,253

Report No.(s): AD-D018981; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An acoustic receiver array assembly includes an underwater vehicle having a base portion and an acoustic receiver portion. The base portion is provided with a rigid boundary wall defining a first largest diameter. The receiver portion is provided with a flexible boundary wall expandable from a generally cylindrical configuration of no more than the first diameter to an expanded configuration of a second diameter substantially larger than the first diameter, the receiver portion defining a chamber. Expansion means is disposed in the chamber and is operable to expand the receiver portion boundary wall to the second diameter. Acoustic receivers are mounted in the receiver portion and provide an acoustic receiver array which expands commensurately with the expansion of the receiver portion boundary wall.

DTIC

Arrays; Acoustics; Receivers

19980213283 Department of the Navy, Washington, DC USA

Vibrationally Damped Structure

Hanson, Jeffrey S., Inventor, Department of the Navy, USA; Jan. 06, 1998; 7p; In English; Supersedes US-Patent-Appl-SN-645734

Patent Info.: Filed 14 May 1996; US-Patent-Appl-SN-645734; US-Patent-5,705,769
Report No.(s): AD-D018968; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A vibrationally damped structure includes a structure that is susceptible to vibrations and a constrained damping layer positioned over at least a portion of the vibrating structure. The constrained damping layer includes a continuous damping layer bonded to the surface of the structure for providing the first reduction of vibrational energy transmitted through the structure. The constrained damping layer further includes a segmented constraining layer bonded to a portion of the continuous damping layer for providing a second reduction of vibrational energy transmitted through the structure and the continuous damping layer. The continuous damping layer preferably includes a layer of elastomeric material bonded to the structure with an epoxy bonding compound or the lite. The segmented constraining layer includes a plurality of rigid segments. such as aluminum plates. bonded to the continuous damping layer with a bonding compound The constrained damping layer can be placed over the shell structure on its interior surface. exterior surface or both surfaces.
DTIC
Vibration Isolators; Damping; Structures

19980213288 Department of the Navy, Washington, DC USA
Omnidirectional Ultrasonic Microprobe Hydrophone
Moffett, Mark B., Inventor, Department of the Navy, USA; Powers, James M., Inventor, Department of the Navy, USA; Chizhik, Dmitry, Inventor, Department of the Navy, USA; Straw, Timothy B., Inventor, Department of the Navy, USA; Mar. 03, 1998; 11p; In English
Patent Info.: Filed 29 May 1981; US-Patent-5,724,315
Report No.(s): AD-D018983; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An omnidirectional ultrasonic microprobe hydrophone is disclosed. Applications include underwater mine detection, explosive shock testing, high wave number measurements, medical imaging, and therapeutic systems. The apparatus includes at least two lead zirconate titanate (PZT) pressure sensing elements having a plurality of columnar voids formed therein. The pressure sensing elements are deposited on a metallic or nonmetallic substrate which provides mechanical support for the microprobe hydrophone. Electrical connection to the pressure sensing elements is made by deposition of conductors and insulators on the substrate material. Wire bonds are used to attach wire leads for connection to a supporting structure containing a preamplifier. Line arrays and planar arrays of microprobe hydrophone elements are also disclosed.
DTIC
Hydrophones; Microanalysis; Imaging Techniques

19980213290 Department of the Navy, Washington, DC USA
Aircraft Detection System
LaPointe, Kenneth M., Inventor, Department of the Navy, USA; Feb. 24, 1998; 4p; In English
Patent Info.: Filed 5 Aug. 1996; US-Patent-5,721,712
Report No.(s): AD-D018985; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A covert aircraft detection system for a submarine is described which includes an acoustic antenna array and a signal processor to process the acoustic signals to provide the location of the detected aircraft and to classify the detected aircraft. The acoustic antenna array is mounted on the submarine mast and includes a vertically extending rod having a microphone and connected thereto three or more folding legs having microphones connected thereto. The microphones detect the aircraft acoustic signals and these signals are transferred to the signal processor which provides the location of the aircraft and matches the acoustic signal with the database of aircraft acoustic signals to classify the type of aircraft. When the acoustic antenna array is connected to a rotatable mast, such as a periscope, a rotary encoder and mast bearing indicator are utilized to account for the rotation of the acoustic antenna array and the rotation of the mast, respectively.
DTIC
Aircraft Detection; Signal Analyzers; Signal Processing; Antenna Arrays; Sound Detecting and Ranging

19980214893 Department of the Navy, Washington, DC USA
Wide-Band Omni Telemetry System
Schmidt, Robert D., Inventor, Department of the Navy, USA; Gannon, James M., Inventor, Department of the Navy, USA; Striffler, Foster L., Inventor, Department of the Navy, USA; Mar. 31, 1998; 11p; In English; Supersedes US-Patent-Appl-SN-744702, AD-D018426
Patent Info.: Filed 31 Oct. 1996; US-Patent-Appl-SN-744,702; US-Patent-5,734,624
Report No.(s): AD-D018960; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The present invention comprises a wide-band omni telemetry system adapted for increasing the signal transmission bandwidth of an existing tactical array having a single shared transmission line. In accordance with one embodiment of the invention electronic elements are provided for conditioning and converting a wide-band analog data signal, received from an underwater acoustic sensing device, to an appropriate wide-band digital signal. Timing elements provide a carrier wave signal interface with telemetry elements for modulating the carrier wave signal with the wide-band digital signal wherein the carrier wave is quadrature phase shift key modulated. In this way two separate carrier waves are created that are shifted in phase by about 90 deg relative to one another. Coupling elements are employed to couple the two carrier waves to the tactical array wherein at least two diplexors interface with the carrier waves so as to couple the wide-band digital signal with a plurality of acoustic and environmental data gathered by the tactical array. The coupled carrier waves are then transmitted over the single shared transmission line. Command decoding elements provide a communication link to the tactical array so as to synchronize generation of the wide-band analog data signal by the underwater acoustic sensing device with the operation of the telemetry elements.
DTIC
Broadband; Signal Transmission

19980214895 Army Topographic Engineering Center, Alexandria, VA USA
Field Calibration Procedures for Multibeam Sonar Systems, *Oct. 1995 - Sep. 1997*
Mann, Robert, Army Topographic Engineering Center, USA; Jun. 1998; 19p; In English
Report No.(s): AD-A349408; TEC-0103; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Multibeam sonar systems are the latest advancement in hydrographic surveying technology. These systems consist of a transducer, motion sensor, gyrocompass, and navigation system. Reliable data can only be acquired after proper calibration has been performed on the system as a whole. This calibration begins with the alignment and static offsets of the sensors referenced to the centerline of the vessel and the transducer. The alignment will reduce the static corrections of each sensor and can be performed with either GPS receivers or a total station geodetic instrument. After the static offsets are determined, a patch test is performed. This test is designed to reveal the following residual biases: (1) pitch offset, (2) roll offset, (3) positioning time delay, and (4) azimuthal offset. The test consists of a small survey of several lines that are evaluated for inconsistencies and then corrected using software designed for multibeam surveys. There are several mathematical equations developed for analyzing these biases that are incorporated into the processing software for the patch test. The performance test is the final check of the offsets and biases to verify whether the data meet accuracy requirements for the survey. This test is a series of parallel and cross lines with significant overlap to give redundant data.
DTIC
Transducers; Procedures; Calibrating; Sonar; Hydrography; Gyrocompasses; Performance Tests

19980214903 Department of the Navy, Washington, DC USA
Acoustical Cavitation Suppressor for Flow Fields
Ruffa, Anthony A., Inventor, Department of the Navy, USA; Feb. 10, 1998; 9p; In English; Supersedes US-Patent-Appl-SN-682880
Patent Info.: Filed 24 Jun. 1996; US-Patent-Appl-SN-682880; US-Patent-5,717,657
Report No.(s): AD-D018918; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A cavitation suppressor using acoustic energy to suppress flow field cavitation is provided. The suppressor system has a plurality of pressure transducers located along the outer surface of a sonar dome. These transducers are powered through a controller which receives flow data, that is, pressure fluctuations in the flow field and in response operates acoustic arrays located aft of the pressure transducers. The controller provides a sonic impulse having frequency and pulse duration selectant to reduce cavitation in the flow field around the sonar dome.
DTIC
Cavitation Flow; Acoustic Emission; Acoustic Measurement; Suppressors; Flow Distribution

19980214910 Department of the Navy, Washington, DC USA
Apparatus for Acoustic Near Field Scanning Using Conformal Arrayal
Clark, Joseph A., Inventor, Department of the Navy, USA; Sartori, Michael A., Inventor, Department of the Navy, USA; Cho, Moon H., Inventor, Department of the Navy, USA; Dozier, Daniel F., Inventor, Department of the Navy, USA; Mar. 03, 1998; 27p; In English; Supersedes US-Patent-Appl-SN-497591
Patent Info.: Filed 30 Jun. 1995; US-Patent-Appl-SN-497591; US-Patent-5,724,305
Report No.(s): AD-D018932; No Copyright; Avail: US Patent and Trademark Office, Microfiche

Acoustic near field measurement apparatus uniquely featuring mechanical economy, in terms of placement and motion of one or more acoustic measurement devices, which is accorded by the geometric character of a structure having indicia of symmetry. One or more devices are arrange, and/or caused to move with up to three degrees of freedom, so as to manifest conformance with respect to the surface of the structure. If desired, virtually complete acoustic near field mapping of the structure can be effectuated. Examples of the various embodiments of this invention include: (1) circumferentially conformal arrayal of devices in combination with longitudinal movement of the arrayal; (2) longitudinally conformal arrayal of devices in combination with circumferential movement of the arrayal; (3) movement of one or more devices in a path or paths which are circumferentially conformal; (4) movement of one or more devices in a path or paths which are longitudinally conformal; and (5) movement of one or more devices in a path or paths which are radial. For some embodiments a single device can be caused to move circumferentially, longitudinally and radially, and thus is provided three degrees of freedom. The apparatus according to this invention is more feasible and reliable than previous apparatus, especially for larger structures.
DTIC
Acoustic Measurement; Near Fields

72
ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure, electron properties, and molecular spectra.

19980210871 Stanford Linear Accelerator Center, Menlo Park, CA USA
Symmetry tests in polarized Z(sup 0) decays to b(anti b)g
Abe, K., Nagoya Univ., Japan; Abe, K., Tohoku Univ., Japan; Akagi, T., Stanford Univ., USA; Jun. 1997; 25p; In English; 18thLepton Photon Interactions, 28 Jul. - 1 Aug. 1997, Hamburg, Germany
Contract(s)/Grant(s): DE-AC03-76SF-00515; DE-FG02-91ER-40676; DE-FG03-91ER-40618; DE-FG03-92ER-40689; DE-FG03-93ER-40788; DE-FG02-91ER-40672; DE-FG02-91ER-40677; DE-AC03-76SF-00098; DE-FG02-92ER-40715; DE-FG02-91ER-40627; DE-FG02-95ER-40896; DE-FG02-92ER-40704; NSF PHY-91-13428; NSF PHY-89-21320; NSF PHY-92-04239; NSF PHY-95-10439; NSF PHY-88-19316; NSF PHY-92-03212
Report No.(s): SLAC-PUB-7570; CONF-970787-3; DE97-007969; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Angular asymmetries have been measured in polarized Z(sup 0) decays to b(anti b)g collected by the SLD experiment at the SLC. A high purity b(anti b)g event sample is selected utilizing lifetime information given by the SLD CCD pixel vertex detector and the stable micron-size SLC beams, and the b- and (anti b)-jets are identified using lifetime information and momentum-weighted track charge. The forward-backward asymmetry is observed in the b-jet polar angle distribution, and the parity-violation parameter is measured to test the Standard Model. Two angular correlations between the three-jet plane and the Z(sup 0) polarization are studied. The CP-even and T-odd angular asymmetry, and the CP-odd and T-odd angular asymmetry are sensitive to physics beyond the Standard Model. The authors measure the expectation values of these quantities to be consistent with zero and set limits on the correlations.
DOE
Asymmetry; Angular Correlation; Invariance; Standard Model (Particle Physics); Optical Polarization

19980210872 Argonne National Lab., IL USA
HVEM-Tandem and EELS study of radiation damage in zirconolite
Smith, K. L., Australian Nuclear Science and Technology Organisation, Australia; Lumpkin, G. R., Australian Nuclear Science and Technology Organisation, Australia; Zaluzec, N. J., Argonne National Lab., USA; Mar. 1997; 4p; In English; Microscopy and Microanalysis ’97, 10-14 Aug. 1997, Cleveland, OH, USA
Contract(s)/Grant(s): W-31-109-ENG-38
Report No.(s): ANL/MSD/CP-92835; CONF-970834-27; DE97-008374; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Zirconolite (CaZrTi2O7) is the major host phase for actinides in Synroc, a promising waste form for the immobilization of high-level radioactive waste. The effect of radiation damage on the structure and durability of zirconolite are important to predictive modeling of zirconolite’s behavior in the repository environment and risk assessment. In this study, radiation damage effects in zirconolite were investigated by irradiating samples with 1.5 MeV Kr(+) ions using the HVEM-Tandem at Argonne National Laboratory (ANL) and energy loss electron spectroscopy (EELS). The HVEM-Tandem consists of a modified AEI high voltage transmission electron microscope interfaced to a 2 MV tandem ion accelerator. EELS spectra were collected using a Philips 420

TEM, operated at 120 kV, fitted with a Gatan Model 607 Serial EELS. EELS data were recorded at resolutions of (approximately) 1.0 eV and at a dispersion of about (approximately) 0.25 eV. Selected area diffraction patterns (SADs) of individual grains of various zirconolites were monitored as a function of dose to establish the critical dose for amorphization (D(sub c)). The authors found that (1) D(sub c)(zirconolite) is independent of the atomic weight of dopants in zirconolite and the mean atomic weight of the sample and that (2) the Bragg reflections in SAD patterns which persist to the highest doses are firstly those resulting from the fluorite sublattice and secondly the four (110)-type reflections which lie on the innermost of the two diffuse rings representative of amorphous zirconolite.
DOE
Radiation Damage; Zirconium Compounds; Radioactive Wastes

19980210894 Fermi National Accelerator Lab., Batavia, IL USA
Leptoquarks and r-parity violating supersymmetry search at CDF
Wu, X., Fermi National Accelerator Lab., USA; Dec. 1997; 8p; In English; High Energy Physics, 19 - 26 Aug. 1997, Jerusalem, Israel
Contract(s)/Grant(s): DE-AC02-76CH-03000
Report No.(s): FNAL/C-97/400-E; CONF-970870; DE98-051436; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We present results from direct searches for leptoquarks and R-parity violating SUSY particles by the CDF experiment. These results strongly constrain the interpretation of the recently reported high Q(sup 2) event excess at HERA as leptoquark or R-parity violating SUSY production.
DOE
Q Factors; Supersymmetry

19980210895 Fermi National Accelerator Lab., Batavia, IL USA
Color coherence in W + jet events
Abbott, B., Fermi National Accelerator Lab., USA; Nov. 1997; 13p; In English; 18th; Lepton Photon Interactions, 28 Jul. - 1 Aug. 1997, Hamburg, Jerusalem, Germany, Israel
Contract(s)/Grant(s): DE-AC02-76CH-03000
Report No.(s): FNAL/C-97/372-E; CONF-970787-; CONF-970870; DE98-051277; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

We report on preliminary studies of color coherence effects in p(anti p) collisions, based on data collected by the D0 detector during the 1994-1995 run of the Fermilab Tevatron collider, at a center of mass energy (radical)s = 1.8 TeV. Color interference effects are studied by examining particle distribution patterns in W + Jet events. The data are compared to Monte Carlo simulations with different color coherence implementations and to a recent analytic Modified-Leading-Log perturbative calculation based on the Local Parton-Hadron Duality hypothesis. Soft particle radiation is enhanced in the event plane relative to the transverse plane, in agreement with calculations in which the effects of color coherence are fully included.
DOE
Center of Mass; Hadrons; Monte Carlo Method; Partons

19980210897 Fermi National Accelerator Lab., Batavia, IL USA
QCD aspects of W/Z production at the Tevatron
Guglielmo, G., Fermi National Accelerator Lab., USA; Jul. 1997; 18p; In English; 17th; Physics In Collisions (Pic 97), 25-27 Jun. 1997, Bristol, UK
Contract(s)/Grant(s): DE-AC02-76CH-03000
Report No.(s): FNAL/C-97/235-E; CONF-9706196; DE98-051395; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Hadron colliders are providing valuable opportunities for studying the influence of the strong force on electroweak interactions in both the perturbative and non-perturbative regions. At the Fermilab Tevatron, analysis by CDF and D0 of p(anti p) (yields) W/Z + X events at (radical)s = 1.8 TeV have been used to test a variety of leading order and next-to-leading order QCD predictions. Among the many promising benefits are improvements of parton distribution functions at high Q(sup 2) , demonstration of soft gluon radiation patterns which survive hadronization, and tests of perturbative QCD and resummation calculations.
DOE
Antenna Radiation Patterns; Distribution Functions; Electroweak Interactions (Field Theory); Quantum Chromodynamics

19980210912 Fermi National Accelerator Lab., Batavia, IL USA

Recent Results from Fermilab E690

Berisso, M. C., Massachusetts Univ., USA; Christian, D. C., Guanajuato Univ., Mexico; Felix, J., Guanajuato Univ., Mexico; Gara, A., Columbia Univ., USA; Gottschalk, E., Columbia Univ., USA; Gutierrez, G., Massachusetts Univ., USA; Hartouni, E.P., Massachusetts Univ., USA; Knapp, B. C., Columbia Univ., USA; Kreisler, M. N., Massachusetts Univ., USA; Lee, S., Massachusetts Univ., USA; Markianos, K., Massachusetts Univ., USA; Moreno, G., Guanajuato Univ., Mexico; Reyes, M. A., Guanajuato Univ., Mexico; Sosa, M., Massachusetts Univ., USA; Wang, M. H. L. S., Massachusetts Univ., USA; Wehmann, A., Massachusetts Univ., USA; Wesson, D., Massachusetts Univ., USA; Jan. 1998; 12p; In English; Hadron Spectroscopy, 28-30 Aug. 1997, Upton, NY, USA

Contract(s)/Grant(s): DE-AC02-76CH-03000

Report No.(s): FNAL/C-98/012-E; CONF-970842; DE98-051968; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Partial wave analysis results of centrally produced mesons in the reaction pp (yields) P(sub slow)(X)P(sub fast), with 800 GeV/c protons incident on a liquid hydrogen target are presented. In the reactions considered in this paper the (X) system decays into: a) K(sup 0)(sub s)K(sup (+-))(pi)(sup (-+)), b) K(sub s)K(sub s), and c) (pi)(sup +)(pi)(sup

DOE

Liquid Hydrogen; Mesons

19980210925 Fermi National Accelerator Lab., Batavia, IL USA

Recent results from Fermilab E687

Lebrun, P., Fermi National Accelerator Lab., USA; Nov. 1997; 12p; In English; 7th; Hadron Spectroscopy, 28-30 Aug. 1997, Upton, NY, USA

Contract(s)/Grant(s): DE-AC02-76CH-03000

Report No.(s): FNAL/C-97/387-E; CONF-970842; DE98-051674; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Recent analyses from Fermilab fixed target photoproduction experiment 687 are summarized. Emphasis is placed on strong interaction studies performed on high statistics samples of Charm decays and light quark states. In particular, semi-leptonic measurements of form factors in Cabibbo suppressed modes are described. A Dalitz analysis of the D(sub s)(exp +) yields (pi)(exp +)(pi)(exp -)(pi)(exp +) has been performed and can be linked to recent results on scalar states decaying to (pi)(exp +)(pi)(exp -). In addition, Charm-Anticharm asymmetries in high energy photoproduction have been measured. Finally, photoproduction of light quark states, such as the vector meson rho(1700) or the f(sub 0)(980) are discussed.

DOE

Photoproduction; Targets; Quarks; Charm (Particle Physics)

19980210931 Los Alamos National Lab., NM USA

Los Alamos Science, No. 25, Celebrating the neutrino

Cooper, N. G., Editor, Los Alamos National Lab., USA; 1997; 195p; In English

Contract(s)/Grant(s): W-7405-ENG-36

Report No.(s): LA-UR-97-2534-No-25; DE98-003279; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This issue is devoted to the neutrino and its remaining mysteries. It is divided into the following areas: (1) The Reines-Cowan experiment -- detecting the poltergeist; (2) The oscillating neutrino -- an introduction to neutrino masses and mixing; (3) A brief history of neutrino experiments at LAMPF; (4) A thousand eyes -- the story of LSND (Los Alamos neutrino oscillation experiment); (5) The evidence for oscillations; (6) The nature of neutrinos in muon decay and physics beyond the Standard Model; (7) Exorcising ghosts -- in pursuit of the missing solar neutrinos; (8) MSW -- a possible solution to the solar neutrino problem; (9) Neutrinos and supernovae; and (10) Dark matter and massive neutrinos.

DOE

Solar Neutrinos; Particle Decay; Detection

19980210942 Stanford Linear Accelerator Center, Menlo Park, CA USA

A preliminary improved test of the flavor independence of strong interactions

Abe, K., Nagoya Univ., Japan; Akagi, T., Stanford Univ., USA; Jun. 1997; 18p; In English; 18th; Lepton Photon Interactions, 28 Jul. - 1 Aug. 1997, Hamburg, Germany; Prepared in cooperation by Yale Univ., New Haven, CT. Additional contract DE-FG02-92ER-40704

Contract(s)/Grant(s): DE-AC03-76SF-00515; DE-FG02-91ER-40676; DE-FG03-91ER-40618; NSF PHY-91-13428; NSF PHY-89-21320; NSF PHY-92-04239; NSF PHY-95-10439; NSF PHY-88-19316; NSF PHY-92-03212; DE-FG03-92ER-40689; DE-FG03-93ER-40788; DE-FG02-91ER-40672; DE-FG02-91ER-40677; DE-AC03-76SF-00098; DE-FG02-92ER-40715; DE-FC02-94ER-40818; DE-FG03-96ER-40969; DE-FG02-91ER-40627; DE-FG02-95ER-40896
Report No.(s): SLAC-PUB-7573; CONF-970787-5; DE97-007263; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The authors present an improved comparison of the strong couplings of gluons to light (u, d, and s), c, and b quarks, determined from multijet rates in flavor-tagged samples of hadronic Z(sup 0) decays recorded with the SLC Large Detector at the SLAC Linear Collider between 1993 and 1995. Flavor separation on the basis of lifetime and decay multiplicity differences among hadrons containing light, c, and b quarks was made using the SLD precision tracking system, yielding tags with high purity and low bias against (ge) 3-jet final states. They find: (alpha)(sub s)(sup uds)/(alpha)(sub s)(sup all) = 0.997 (+/-) 0.011(stat) (+/-) 0.011(syst) (+/-) 0.005(theory), (alpha)(sub s)(sup c)/(alpha)(sub s)(sup all) = 0.984 (+/-) 0.042 (+/-) 0.053 (+/-) 0.022, (alpha)(sub s)(sup b)/(alpha)(sub s)(sup all) = 1.022 (+/-) 0.019 (+/-) 0.023 (+/-) 0.012.
DOE
Gluons; Quarks; Couplings; Quantum Chromodynamics; Strong Interactions (Field Theory)

19980210955 Fermi National Accelerator Lab., Batavia, IL USA
Computing Models of CDF and D0 in Run 2
Lammel, S., Fermi National Accelerator Lab., USA; May 1997; 8p; In English; Computing In High Energy Physics, 7 - 12 Apr. 1997, Berlin, Germany
Contract(s)/Grant(s): DE-AC02-76CH-03000
Report No.(s): FNAL/C-97/126; CONF-970410; DE98-051390; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The next collider run of the Fermilab Tevatron, Run 2, is scheduled for autumn of 1999. Both experiments, the Collider Detector at Fermilab (CDF) and the D0 experiment are being modified to cope with the higher luminosity and shorter bunchspacing of the Tevatron. New detector components, higher event complexity, and an increased data volume require changes from the data acquisition systems up to the analysis systems. In this paper we present a summary of the computing models of the two experiments for Run 2.
DOE
Data Acquisition; Detection

19980210956 Fermi National Accelerator Lab., Batavia, IL USA
Next to leading order three jet production at hadron colliders
Kilgore, W. B., Fermi National Accelerator Lab., USA; May 1997; 8p; In English; Rencontres De Moriond: Qcd and High Energy Hadronic Interactions Meeting, 23 - 30 Mar. 1996, Les Arcs, France
Contract(s)/Grant(s): DE-AC02-76CH-03000
Report No.(s): FNAL/C-97/141-T; CONF-9603173; DE98-051389; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

I present results from a next-to-leading order event generator of purely gluonic jet production. This calculation is the first step in the construction of a full next-to-leading order calculation of three jet production at hadron colliders. Several jet algorithms commonly used in experiments are implemented and their numerical stability is investigated. A numerical instability is found in the iterative cone algorithm which makes it inappropriate for use in fixed order calculations beyond leading order.
DOE
Construction; Numerical Stability

19980210966 Los Alamos National Lab., NM USA
Prospects for quantum computation with trapped ions
Hughes, R. J., Los Alamos National Lab., USA; James, D. F. V., Los Alamos National Lab., USA; [1997]; 12p; In English; Fundamental Problems In Quantum Theory Conference, 4 - 7 Aug. 1997, College Park, MD, USA
Contract(s)/Grant(s): W-7405-ENG-36
Report No.(s): LA-UR-97-3967; CONF-9708135; DE98-001602; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

Over the past decade information theory has been generalized to allow binary data to be represented by two-state quantum mechanical systems. (A single two-level system has come to be known as a qubit in this context.) The additional freedom

introduced into information physics with quantum systems has opened up a variety of capabilities that go well beyond those of conventional information. For example, quantum cryptography allows two parties to generate a secret key even in the presence of eavesdropping. But perhaps the most remarkable capabilities have been predicted in the field of quantum computation. Here, a brief survey of the requirements for quantum computational hardware, and an overview of the in trap quantum computation project at Los Alamos are presented. The physical limitations to quantum computation with trapped ions are discussed.
DOE
Trapped Particles; Binary Data; Quantum Mechanics

19980210975 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Validation of the Biological Radiation Dosimeter ***Final Report Validatie van de Biologische Stralingsdosimeter***
vanderSchans, G. P., Prins Maurits Lab. TNO, Netherlands; Timmerman, A. J., Prins Maurits Lab. TNO, Netherlands; vanDijk–Knijnenburg, W. C. M., Prins Maurits Lab. TNO, Netherlands; Bruijnzeel, P. L. B., Prins Maurits Lab. TNO, Netherlands; Apr. 1998; 69p; In Dutch; Sponsored in part by DMGB
Contract(s)/Grant(s): A96M427; TNO Proj. 215496154
Report No.(s): TD98-0042; TNO-PML-1998-A2; Copyright; Avail: Issuing Activity (Prins Maurits Lab., PO Box 45, 2280 AA Rijswijk, The Netherlands); US Sales Only, Hardcopy, Microfiche

In order to provide a quantitative basis for diagnosis and therapy of exposure to ionizing radiation a highly sensitive immunochemical assay has been developed to assess the amount of damage in DNA of white blood cells of individuals exposed to ionizing radiation. by applying this method the extent of radiation-induced single-strandedness in DNA is assessed, which results from the partial unwinding of DNA containing single- strand breaks. In this report the first results about the validation of this method are presented. The lower detection limit is about 0.2 Gy when background damage is known. With unknown background damage the lower detection limit increased to about 0.5 Gy due to inter-individual variation. The minimum time required for blood collection and carrying out the analysis was 35 min. In a semi-automated setup tens of samples can be assayed simultaneously. Due to the rapid repair of the detected DNA damage, the method can only be applied on blood collected up to about 1 h after exposure. However, blood samples can be stored under certain circumstances at room temperature (up to 5 h), on ice (1 day) or frozen (unlimited).
Author
Dosimeters; Radiation Dosage; Procedures; Damage; Diagnosis; Proving; Biological Effects

19980210987 Fermi National Accelerator Lab., Batavia, IL USA
Dijets with a central rapidity gap at radical s = 630 and 1800 GeV
Goulianos, K., Rockefeller Univ., USA; Apr. 1998; 7p; In English; Diffractive Physics, 16-20 Feb. 1998, Rio de Janeiro, Brazil
Contract(s)/Grant(s): DE-AC02-76CH-03000
Report No.(s): FNAL/C-98/118-E; CONF-980232; DE98-052829; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Preliminary results on dijet production with a rapidity gap between jets in (anti p)p collisions at (radical)s=630 GeV are presented and compared with published results at (radical)s=1800 GeV.
DOE
Collisions; Radicals

19980211041 Fermi National Accelerator Lab., Batavia, IL USA
A kaon physics program at the Fermilab Main Injector
Cooper, Peter, Fermi National Accelerator Lab., USA; Nov. 1997; 15p; In English
Contract(s)/Grant(s): DE-AC02-76CH-03000
Report No.(s): FNAL-TM-2032; DE98-051235; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

In this paper we describe a triad of kaon experiments which will form the foundation of a kaon physics program at Fermilab in the Main Injector era. These three experiments; KAMI, CKM and CPT, span the range of experiment types discussed above. KAMI will use the existing neutral kaon beam and the KTeV detector as the basis of a search for the Standard Model ultra rare decay K(sub L) yields pi(exp 0) nu(anti nu) decay mode is by far the theoretically cleanest measurement of the Standard Model parameter responsible for CP violation. CKM will measure the analogous charged kaon decay mode. Together these two experiments will determine the Standard Model contribution to CP violation independent of the B meson sector. The Standard Model parameters controlling CP violation must be observed to be the same in the K and B meson sectors in order to confirm the Standard Model as the sole source of CP violation in nature. CPT is a hybrid beam experiment using a high purity K(exp +) beam to produce

a pure K(sub 0) beam in order to search for violation of CPT symmetry at a mass scale up to the Planck mass. CPT also will measure new CP violation parameters to test the Standard Model and search for rare K(sub S) decays. The Fermilab infrastructure for such a physics program largely already exists. The Main Injector will be an existing accelerator by late 1998 with beam properties comparable to any of the previous 'kaon factory' proposals. The KTeV detector and neutral kaon beamline are unsurpassed in the world and were originally designed to also operate with the 120 GeV Main Injector beam as KAMI. The Fermilab Meson laboratory was originally designed as an area for fixed target experiments using 200 GeV proton beams. The charged kaon beam experiments will naturally find a home there. Both charged kaon experiments, CKM and CPT, will share a new high purity RF separated charged kaon beam based on superconducting RF technology which will provide the highest intensity and purity charged kaon beam in the world.
DOE
Kaons; Injectors

19980211050 Fermi National Accelerator Lab., Batavia, IL USA
A small target neutrino deep-inelastic scattering experiment at the first muon collider
Harris, D. A., Rochester Univ., USA; McFarland, K. S., Massachusetts Inst. of Tech., USA; Apr. 1998; 8p; In English; Front End of the Muon Colliders, 6-9 Nov. 1997, Batavia, IL, USA
Contract(s)/Grant(s): DE-AC02-76CH-03000
Report No.(s): FNAL/C-98/119; CONF-971194; DE98-052828; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Several different scenarios for neutrino scattering experiments using a neutrino beam from the muon collider complex are discussed. The physics reach of a neutrino experiment at the front end of a muon collider is shown to extend far beyond that of current neutrino experiments, since the high intensity neutrino beams one would see at the muon collider allow for a large flexibility in choosing neutrino targets. Measurements of quark spin, A-dependence of the structure function xF(sub 3) and neutral current chiral couplings to quarks are outlined.
DOE
Inelastic Scattering; Muons; Neutral Currents; Neutrino Beams; Neutrinos; Quarks

19980211128 National Inst. for Fusion Science, Toki, Japan
Tunneling Electron Trap
Ohkawa, Tihiro, National Inst. for Fusion Science, Japan; Dec. 1997; ISSN 0915-633X; 24p; In English
Report No.(s): NIFS-524; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The use of the field emission as means of filling the electron traps is proposed. Because of the electron tunneling at the cathode tip, the energy of the emitted electrons is lower than the electrostatic potential of the tip surface by the work function of the tip material. Consequently the electrons are trapped by the electrostatic well without requiring the dynamic trapping. The Brillouin density will be reached readily because the injection on the axis of the cylindrical symmetry dictates that the canonical angular momentum of the electrons vanishes. Furthermore the evaporative cooling due to the electrons escaping from the trap over the potential barrier may be able to cool the trapped electrons to cryogenic temperatures. The interesting regimes of the strongly correlated plasma and the quantum mechanical plasma may be obtained.
Author
Electron Tunneling; Trapping; Field Emission; Cryogenic Temperature

19980211136 Lawrence Livermore National Lab., Livermore, CA USA
Probing the Pt-196(n,xn(gamma)) reactions using GEANIE at LANSCE/WNR
Bernstein, L. A., Los Alamos National Lab., USA; Archer, D. E., Los Alamos National Lab., USA; Becker, J. A., Los Alamos National Lab., USA; Drake, D., Los Alamos National Lab., USA; Garrett, P. E., Kentucky Univ., USA; Johns, G. D., Los Alamos National Lab., USA; Nelson, R. O., Los Alamos National Lab., USA; Wilburn, W. S., Kentucky Univ., USA; Yates, S.W., Kentucky Univ., USA; Younes, W., Lawrence Livermore National Lab., USA; Jun. 20, 1997; 8p; In English; Nuclear Data for Science and Technology, 20-24 May 1997, Trieste, Italy
Contract(s)/Grant(s): W-7405-ENG-48; W-7405-ENG-36
Report No.(s): UCRL-JC-127790; CONF-970512; DE98-051140; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

In this paper we will present the results from an experiment studying the Pt-196(n,xn) reactions for n less than 14 at moderate to high angular momentum using the combination of the LANSCE/WNR spallation neutron source and the multi-Ge detector spectrometer, GEANIE.
DOE
Angular Momentum; Platinum Isotopes; Spallation; Neutrons; Neutron Sources

19980211338 Fermi National Accelerator Lab., Batavia, IL USA
From symmetry violation to dynamics: The charm window
Appel, J. A., Fermi National Accelerator Lab., USA; Dec. 1997; 20p; In English; Physics Since Parity Symmetry Breaking, 16-18 Aug. 1997, Nanjing, China
Contract(s)/Grant(s): DE-AC02-76CH-03000
Report No.(s): FNAL/C-97/406; CONF-970845; DE98-052980; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

C.S. Wu observed parity violation in the low energy process of nuclear decay. She was the first to observe this symmetry violation at any energy. Yet, her work taught us about the form and strengths of the couplings of the massive weak boson. Today, we use the same approach. We look for very much higher mass-scale interactions through symmetry violations in the decays of charm quark systems. These charm decays provide a unique window to new physics.
DOE
Particle Decay; Quarks; Bosons; Charm (Particle Physics)

19980211368 Illinois State Univ., Normal, IL USA
Diagnosis of core-shell mixing with absorption and emission spectra of a doped layer ***Final Report***
[1998]; 5p; In English
Contract(s)/Grant(s): DE-FG03-96SF-21016
Report No.(s): DOE/SF/21016-T2; DE98-004775; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We carried out the proposed program as planned. The research work has resulted in several publications, see attachments. The objective of this proposal was to develop a diagnostic method for core-shell mixing, based on the observation of absorption and emission lines of a doped layer, embedded within the shell, and correlate these signatures with nuclear signatures of target performance. We showed the results of a numerical analysis applied to a particular doped target imploded on the OMEGA system as a feasibility demonstration.
DOE
Absorption Spectra; Doped Crystals; Emission Spectra; Numerical Analysis

19980211373 Fermi National Accelerator Lab., Batavia, IL USA
Strong dynamics at the muon collider: Working group report
Bhat, P. C., Fermi National Accelerator Lab., USA; Eichten, E., Fermi National Accelerator Lab., USA; Mar. 1998; 21p; In English; Front End of the Muon Colliders Workshop, 6-9 Nov. 1997, Batavia, IL, USA
Contract(s)/Grant(s): DE-AC02-76CH-03000
Report No.(s): FNAL/C-98/072; CONF-971194; DE98-052808; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

New strong dynamics at the energy scale (approx) 1 TeV is an attractive and elegant theoretical ansatz for the origin of electroweak symmetry breaking. We review here, the theoretical models for strong dynamics, particularly, technicolor theories and their low energy signatures. We emphasize that the fantastic beam energy resolution ((sigma)(sub E)/E (approximately) 10(sup -4)) expected at the first muon collider ((radical)s=100-500 GeV) allows the possibility of resolving some extraordinarily narrow technihadron resonances and, Higgs-like techniscalars produced in the s-channel. Investigating indirect probes for strong dynamics such as search for muon compositeness, we find that the muon colliders provide unparalleled reaches. A big muon collider ((radical)s=3-4 TeV) would be a remarkable facility to study heavy technicolor particles such as the topcolor Z', to probe the dynamics underlying fermion masses and mixings and to fully explore the strongly interacting electroweak sector.
DOE
Electroweak Interactions (Field Theory); Fermions; Muons; Signatures

19980211393 Fermi National Accelerator Lab., Batavia, IL USA

Spectroscopy and decays of charm and bottom

Butler, J. N., Fermi National Accelerator Lab., USA; Oct. 1997; 55p; In English; 1st; 7th; High Energy Physics, 30 Oct. - 6 Nov. 1996, Merida, Merida, Mexico, Mexico

Contract(s)/Grant(s): DE-AC02-76CH-03000

Report No.(s): FNAL/C-97/052; CONF-9610310; DE98-052977; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

After a brief review of the quark model, we discuss our present knowledge of the spectroscopy of charm and bottom mesons and baryons. We go on to review the lifetimes, semileptonic, and purely leptonic decays of these particles. We conclude with a brief discussion B and D mixing and rare decays.

DOE

Baryons; Mesons; Quark Models; Spectroscopy; Leptons

19980211394 Fermi National Accelerator Lab., Batavia, IL USA

Top quark, W-boson and light Higgs

Parke, S., Fermi National Accelerator Lab., USA; Oct. 1997; 7p; In English; 1st; Frontiers In Contemporary Physics, 11-15 May 1997, Nashville, TN, USA

Contract(s)/Grant(s): DE-AC02-76CH-03000

Report No.(s): FNAL/C-97/335-T; CONF-9705200; DE98-052979; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The top quark, the W-boson and the Higgs boson form an interesting triptych of elementary particles. In the Standard Model knowing the mass of two of these particles, usually the top quark and W-boson, we can predict the mass of the third, the Higgs boson. Therefore in this proceedings I will primarily cover the following topics, top quark physics, W-boson mass and the light Higgs boson at the proton-antiproton collider at Fermilab, the Tevatron.

DOE

Elementary Particles; Antiprotons; Bosons; Quarks

19980211419 Oregon Univ., Dept. of Chemistry, Eugene, OR USA

Probing the Intermolecular Hydrogen Bonding of Water Molecules at the CCl4 Water Interface in the Presence of Charged Soluble Surfactant, *1 Jun. 1997 - 31 May 1998*

Gragson, D. E., Oregon Univ., USA; Richmond, G. L., Oregon Univ., USA; Jun. 1998; 18p; In English

Contract(s)/Grant(s): N00014-89-J-1261

Report No.(s): AD-A347139; ONR-TR-26; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The molecular structure and hydrogen bonding of water molecules at the CCl4/water interface in the presence of a charged soluble surfactant has been explored in this study using vibrational sum frequency generation. by examining OH stretching modes that are highly sensitive to the local hydrogen bonding environment it is found that water molecules at the CCl4/water interface both in the presence and absence of a charged soluble surfactant are predominantly in a tetrahedral arrangement much like the structure of ice. Isotopic dilution studies have been employed to further characterize this ice-like interfacial structure. A blue-shift of approximately 120 cm-1 of the ice-like OH stretching mode is observed upon dilution with D2O. The first vibrational spectra of the OH stretching mode from uncoupled HOD molecules at the CCl4/water interface is also reported.

DTIC

Hydrogen Bonds; Water; Carbon Tetrachloride; Molecular Structure; Chemical Bonds

19980211426 California Inst. of Tech., Beckman Inst., Pasadena, CA USA

DURIP97 Instrumentation for Characterization of Two-Photon Absorbing Organic Materials *Final Report, 1 Apr. 1997 - 31 Mar. 1998*

Marder, Seith R., California Inst. of Tech., USA; Perry, Joseph W., California Inst. of Tech., USA; Jun. 05, 1998; 11p; In English

Contract(s)/Grant(s): F49620-97-1-0200; AF Proj. 3484

Report No.(s): AD-A347827; AFRL-SR-BL-TR-98-0514; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

DURIP funds were used to purchase a Spex Model FL112 High Performance Research Grade Fluorimeter and a Nd:YAG-pumped nanosecond Optical Parametric Oscillator Laser System with tunability from 440 nm - 1800 nm. This equipment was used to measure the two-photon absorption spectra for a variety of molecules from different classes and identify promising candidate molecules to meet DoD requirements for a variety of applications. A strategy for the design of molecules with large two-photon absorption cross sections has been developed. The strategy is based on the concept that symmetric charge transfer, from the

ends of a conjugated system to the middle, or vice versa, upon excitation is correlated to enhanced two-photon absorption cross sections. It was shown that newly synthesized bis-styrylbenzene derivatives with donor-acceptor-donor, and acceptor-donor-acceptor structural motifs exhibit exceptionally large two-photon absorption cross sections, up to roughly 400 times that of trans-stilbene.
DTIC
Absorption Spectra; Organic Materials; Photons; Absorbers (Materials)

19980211495 Florida Univ., Inst. for Fundamental Theory, Gainesville, FL USA
Toward the M(F)-theory embedding of realistic free-fermion models
Berglund, P., California Univ., USA; Ellis, J., European Organization for Nuclear Research, Switzerland; Faraggi, A. E., Florida Univ., USA; Mar. 1998; 15p; In English
Contract(s)/Grant(s): DE-FG05-86ER-40272; DE-FG03-95ER-40917; NSF PHY-94-07194
Report No.(s): DOE/ER/40272-296; ACT-4/98; CPT-TAMU-12/98; NSF-ITP-98-29; DE98-005177; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We construct a Landau-Ginzburg model with the same data and symmetries as a Z2 x Z2 orbifold that corresponds to a class of realistic free-fermion models. Within the class of interest, we show that this orbifolding connects between different Z2 x Z2 orbifold models and connects with the mirror symmetry. Our work suggests that duality symmetries previously discussed in the context of specific M and F theory compactifications may be extended to the special Z2 x Z2 orbifold that characterizes realistic free-fermion models.
DOE
Embedding; Fermions

19980211558 Oak Ridge National Lab., TN USA
Studying Atomic Dynamics with Designer Pulses
Reinhold, C. O., Oak Ridge National Lab., USA; Burgdorfer, J., Oak Ridge National Lab., USA; Frey, M. T., Rice Univ., USA; Dunning, F. B., Rice Univ., USA; Sep. 1997; 15p; In English; 20th; International Conference on the Physics of Electronic and Atomic Collisions and Exhibition, 23-29 Jul. 1997, Vienna, Austria
Contract(s)/Grant(s): DE-AC05-96OR-22464
Report No.(s): ORNL/CP-94784; CONF-970710; DE97-008901; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We present a brief review of recent experimental and theoretical progress on the dynamics of Rydberg atoms using short half cycle pulses. We discuss new possibilities in coherent control and non-linear dynamics of atoms which have lately become possible using various superpositions of such pulses.
DOE
Atoms; Pulses; Dynamics

19980211669 Los Alamos National Lab., NM USA
Extended pseudo-screen migration with multiple reference velocities
Huang, Lian–Jie, Los Alamos National Lab., USA; Fehler, M. C., Los Alamos National Lab., USA; Nov. 1997; 6p; In English; 67th; Annual Meeting and Expo of the Society of Exploration Geophysicists (SEG), 2-7 Nov. 1997, Dallas, TX, USA
Contract(s)/Grant(s): W-7405-eng-36
Report No.(s): LA-UR-97-1545; CONF-971111; DE97-007364; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The pseudo-screen propagator is a kind of one way wave propagation based on the local Born approximation. The problem of the propagator is that it is difficult to calculate the scattered fields when the velocity perturbation is large; not to mention the accuracy of the propagator. We develop an extended pseudo-screen propagator by introducing different reference velocities in different regions of a medium to ensure the condition of small perturbation. The exploding reflector data for a 2D slice of the SEG/EAEG 3D salt model is generated by a finite difference scheme to test the feasibility of the method. The migration result demonstrates that the method can handle severe lateral velocity variations and provides high quality images for complex structures.
DOE
Migration; Wave Propagation; Velocity

19980211716 Sandia National Labs., Albuquerque, NM USA

Exponential Discontinuous Solution of the Multispecies Relativistic Heavy Ion Transport Equations

Dandini, Vincent J., Sandia National Labs., USA; Prinja, Anil K., Sandia National Labs., USA; Jun. 1997; 8p; In English; 1997 American Nuclear Society (ANS) Winter Meeting, 16-20 Nov. 1997, Albuquerque, NM, USA

Contract(s)/Grant(s): DE-AC04-94AL-85000

Report No.(s): SAND-97-1483C; CONF-971125; DE97-006883; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Linear schemes applied to charged particle transport problems demonstrate high order accuracy but under certain conditions can also produce negative solutions. On the other hand, the recently developed nonlinear exponential discontinuous (ED) method has been shown to produce accurate strictly positive solutions, for positive sources, in neutral particle transport applications. We have applied this method to the solution, in space and energy, of the multispecies transport equations for relativistic heavy ions. The solution may be useful as a treatment planning tool for the irradiation of certain cancers using heavy ions. Collisions between projectile ions and atoms in the target medium can result in ion fragments different from the original species. The solution includes these projectile fragments. The primary ion and all fragments are treated using the straight ahead approximation under which the fragments continue on with the same velocity as the original projectile.

DOE

Heavy Ions; Charged Particles; Neutral Particles

19980211717 Los Alamos National Lab., NM USA

Status of electron transport in MCNP(trademark)

Hughes, H. G., Los Alamos National Lab., USA; Oct. 1997; 13p; In English; Joint International Conference on Mathematical Methods and Supercomputing In Nuclear Applications, 6-10 Oct. 1997, Saratoga Springs, NY, USA

Contract(s)/Grant(s): W-7405-eng-36

Report No.(s): LA-UR-97-1368; CONF-971005; DE97-007195; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The latest version of MCNP, the Los Alamos Monte Carlo transport code, has now been officially released. A variety of new features are available in MCNP4B. Among these are differential operator perturbations, cross section plotting capabilities, enhanced diagnostics for transport in repeated structures and lattices, improved efficiency in distributed memory multiprocessing, corrected particle lifetime and lifespan estimators, and expanded software quality assurance procedures and testing, including testing of the multigroup Boltzmann Fokker Planck capability. New and improved cross section sets in the form of ENDF/B-VI evaluations have also been recently released and can be used in MCNP4B. Perhaps most significant for the interests of this special session, the electron transport algorithm has been improved, especially in the collisional energy loss straggling and the angular deflection treatments. In this paper, I shall concentrate on a fairly complete documentation of the current status of the electron transport methods in MCNP.

DOE

Electron Transfer; Multiprocessing (Computers)

19980213331 Department of the Navy, Washington, DC USA

Method and Apparatus for Determining Both Density and Atomic Number of a Material Composition Using Compton Scattering

Ham, Young S., Inventor, Department of the Navy, USA; Poranski, Chester F., Inventor, Department of the Navy, USA; Mar. 17, 1998; 9p; In English; Supersedes US-Patent-Appl-SN-656528, AD-D018216

Patent Info.: Filed 31 May 1996; US-Patent-Appl-SN-656528; US-Patent-5,729,582

Report No.(s): AD-D018963; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An x ray backscatter tomography system includes a collimated x ray source for directing a collimated beam towards a target at a select position and orientation a first detector array for measuring photons scattered at a selected first angle and a second detector array for measuring photons scattered at a selected second angle different from the first angle. The system is also responsive to the first and second detectors for calculating the density and atomic number of the target.

DTIC

Density; Tomography; Atomic Structure; Backscattering; Compton Effect; Electron Scattering; Equipment

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NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory. For space radiation see 93 Space Radiation.

19980210959 Fermi National Accelerator Lab., Batavia, IL USA
Phase transitions: An overview with a view
Gleiser, M., Dartmouth Coll., USA; Oct. 1997; 24p; In English; Fundamental Physics at the Birth of the Universe 2, 19-24 May 1997, Rome, Italy
Contract(s)/Grant(s): DE-AC02-76CH-03000
Report No.(s): FNAL/C-97/324-A; CONF-9705201; DE98-051234; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The dynamics of phase transitions plays a crucial role in the so- called interface between high energy particle physics and cosmology. Many of the interesting results generated during the last fifteen years or so rely on simplified assumptions concerning the complex mechanisms typical of nonequilibrium field theories. After reviewing well-known results concerning the dynamics of first and second order phase transitions, I argue that much is yet to be understood, in particular in situations where homogeneous nucleation theory does not apply. I present a method to deal with departures from homogeneous nucleation, and compare its efficacy with numerical simulations. Finally, I discuss the interesting problem of matching numerical simulations of stochastic field theories with continuum models.
DOE
Stochastic Processes; High Energy Interactions; Continuum Modeling; Cosmology

19980211033 Texas Univ., Inst. for Fusion Studies, Austin, TX USA
Transport theory in the collisionless limit
Hazeltine, R. D., Texas Univ., USA; Apr. 14, 1998; 14p; In English
Contract(s)/Grant(s): DE-FG03-96ER-54346
Report No.(s): DOE/ER/54346-820; IFSR-820; DE98-004878; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Traditional transport theory provides a closure of fluid equations that is valid in the collisional, short mean-free-path limit. The possibility of extending an analogous closure to long mean-free path is examined here. An appropriate kinetic equation, using a model collision operator, is solved rigorously for arbitrary collisionality but weak, Maxwellian source terms. The corresponding particle and heat flows are then expressed in terms of the density and temperature profiles. The transport matrix is found to be symmetric even at vanishing collision frequency; in the collisionless limit it takes the form of nonlocal operators. The operator corresponding to thermal conductivity agrees with one found previously by Hammett and Perkins. However particle diffusion, which turns out to satisfy a local Fick's law for any finite collision frequency, becomes singular at vanishing collisionality, where the pressure gradient vanishes. We conclude that the fluxes can generally be expressed in terms of particle and energy sources, but not always in terms of pressure and temperature profiles.
DOE
Transport Theory; Collisions; Collision Rates; Collisionless Plasmas

19980211042 Lawrence Livermore National Lab., Livermore, CA USA
Modeling electron heat transport during magnetic field buildup in SSPX
Hua, D. D., Lawrence Livermore National Lab., USA; Hooper, E. B., Lawrence Livermore National Lab., USA; Fowler, T. K., Lawrence Livermore National Lab., USA; Oct. 1997; 17p; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-ID-128656; DE98-051261; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A model for spheromak magnetic field buildup and electron thermal transport, including a thermal diffusivity associated with magnetic turbulence during helicity injection is applied to a SSPX equilibrium, with a maximum final magnetic field of 1.3 T. Magnetic field-buildup times of 1.0x10-3, 5.0x10-4 and 1.0x10-4 s were used in the model to examine their effects on electron thermal transport. It is found that at transport run time of 4x10-3 s, the fastest buildup-time results in the highest final temperature profile, with a core temperature of 0.93 kev while requiring the lowest input energy at 140 KJ. The results show that within the

model the most rapid buildup rate generates the highest electron temperature at the fastest rate and at the lowest consumption of energy. However, the peak power requirements are large greater than 600 MW for the fastest buildup case examined.
DOE
Heat Transfer; Electron Transfer; Magnetic Fields; Spheromaks; Injection; Turbulence

19980211072 Lawrence Livermore National Lab., Livermore, CA USA
High energy beam lifetime analysis
Howell, R. H., Lawrence Livermore National Lab., USA; Sterne, P. A., Lawrence Livermore National Lab., USA; Hartley, J., Lawrence Livermore National Lab., USA; Cowan, T. E., Lawrence Livermore National Lab., USA; May 01, 1997; 6p; In English; 11th; Positron Annihilation, 25-30 May 1997, Kansas City, MO, USA
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-126768; CONF-9705156; DE98-052016; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We have developed a positron lifetime defect analysis capability based on a 3 MeV electrostatic accelerator. The high energy beam lifetime spectrometer is operational with a 60 mCi Na-22 source providing a current of 7 10(exp 5) positrons per second. Lifetime data are derived from a thin plastic transmission detector providing an implantation time and a BaF2 detector to determine the annihilation time. Positron lifetime analysis is performed with a 3 MeV positron beam on thick sample specimens at counting rates in excess of 2000 per second. The instrument is being used for bulk sample analysis and analysis of samples encapsulated in controlled environments for in situ measurements.
DOE
Barium Fluorides; Annihilation Reactions; Particle Accelerators; Positrons; Electrostatics; Measuring Instruments

19980211565 Naval Research Lab., Fundamental Plasma Processes, Washington, DC USA
Back to the Future: The Historical, Scientific, Naval, and Environmental Case for Fission Fusion
Manheimer, Wallace M., Naval Research Lab., USA; Apr. 02, 1998; 28p; In English
Report No.(s): AD-A347302; NRL/MR/6707--98-8151; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

It is proposed that a return to fission fusion, and especially the development of the thorium cycle could be a means to revitalize magnetic fusion research. This work analyzes recent history, attempts to find the reason magnetic fusion research is in the shape it is in, and argues that an embrace of the hybrid could improve its prospects. Then it analyzes recent Tokamak results, concluding that a research Tokamak reactor, which could generate significant amounts of nuclear fuel could be built now. Finally it discusses both whether the Navy could be involved, and the environmental issues.
DTIC
Fission; Histories; Navy; Thorium; Tokamak Devices; Plasma Physics

19980211715 Oak Ridge National Lab., TN USA
Signatures of Absorption Mechanisms for J/psi and psi' Production in High Energy Heavy-Ion Collisions
Wong, Cheuk–Yin, Oak Ridge National Lab., USA; Jun. 1997; 15p; In English; 6th; International Conference on Nucleus-nucleus Collisions (Nn-6), 2-6 Jun. 1997, Gatlinburg, TN, USA
Contract(s)/Grant(s): DE-AC05-96OR-22464
Report No.(s): CONF-970622-1; DE97-005179; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

J/psi and psi' produced in high-energy heavy-ion collisions are absorbed by their collisions with nucleons and produced soft particles, leading to two distinct absorption mechanisms. The signature of absorption by produced soft particles, as revealed by psi' production data, consists of a gap and a change of the slope in going from the pA line to the nucleus-nucleus line when we make a semi-log plot of the survival probability as a function of the path length. Using this signature, we find from the J/psi production data in pA, O-Cu, O-U, and S-U collisions that the degree of J/psi absorption by produced soft particles is small and cannot account for the J/psi data in Pb-Pb collisions. The anomalous suppression of J/psi production in Pb-Pb collisions can be explained as due to the occurrence of a new phase of strong J/psi absorption, which sets in when the local energy density exceeds about 3.4 GeV/fm3. to probe the chemical content of the new phase, we propose to study the abundance of open-charm mesons and charm hyperons which depends sensitively on the quark chemical potential.
DOE
Signatures; Heavy Ions; Nucleons; Ionic Collisions

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OPTICS

Includes light phenomena; and optical devices. For lasers see 36 Lasers and Masers.

19980210885 Lawrence Livermore National Lab., Livermore, CA USA
A new reflective optical extensometer (ROX) system for geomechanical deformation measurements
Blair, S. C., Lawrence Livermore National Lab., USA; Sweider, D., Lawrence Livermore National Lab., USA; Trettenero, S., Lawrence Livermore National Lab., USA; Boro, C., Lawrence Livermore National Lab., USA; Mar. 01, 1997; 11p; In English; 36th; USA Rock Mechanics, 29 Jun. - 2 Jul. 1997, New York, NY, USA
Contract(s)/Grant(s): W-7405-eng-48
Report No.(s): UCRL-JC-125628; CONF-970617; DE98-050230; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We have developed an extensometer for measurement of distance and displacements in geotechnical and civil engineering applications. This is an optical extensometer that measures distance using a modulated laser beam. In this design, reflecting targets are placed at desired measurement locations, and distances between each target and an optical head are measure repeatedly using the modulated laser beam. Moreover, all electronic and moving parts are located outside of the hostile or difficult environment as the optical head is connected to the laser, switching and signal analysis hardware using optical fibers. A reference beam is utilized to provide direct correction of system behavior. The system also utilizes movable reflective anchors that can be repositioned if desired. We have installed the system in a field experiment currently being conducted for the Yucca Mountain Site characterization Project, and report preliminary results.
DOE
Optical Fibers; Extensometers; Geotechnical Engineering; Deformation; Structural Engineering

19980210905 New Mexico Univ., Albuquerque, NM USA
Synchronously Pumped Optical Parametric Oscillator with Intracavity Difference Frequency Mixing
Dearborn, Michael E., New Mexico Univ., USA; Jun. 29, 1998; 175p; In English
Report No.(s): AD-A348615; Rept-98-012D; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

In this work we experimentally investigate a singly resonant optical parametric oscillator (OPO) with an intracavity crystal that mixes the signal and idler waves, enhancing the power conversion efficiency of the idler radiation. Optical parametric oscillators provide a method for producing coherent tunable radiation from a coherent fixed-frequency pump source. The pump frequency Wp 15 converted to the signal and idler frequencies Ws and Wi, respectively, in the OPO interaction, Wp = Ws + Wi, Ws > Wi. Since the signal and idler frequencies sum to the incident pump frequency, they are always lower than the pump frequency. Extra-cavity difference-frequency mixing (DFM) of the signal and idler from an OPO was demonstrated in some early experiments and recently a number of investigators have examined mixing the signal and idler waves generated from a synchronously pumped OPO to produce long-wavelength difference-frequency radiation. Here the difference-frequency Wd is produced in the DFM interaction, Wd = Ws - Wi. The DFM process not only produces long-wavelength radiation at the difference frequency, but for each difference-frequency photon produced, another idler photon is produced. Thus, this technique also increases the idler-frequency conversion efficiency. Production of the long-wavelength difference-frequency photons may not be possible in a single-step OPO process, due to transmission bands and phase-matching limitations of available crystals and available pump wavelengths.
DTIC
Energy Conversion Efficiency; Coherent Radiation; Crystals; Phase Matching; Radiation Sources

19980210998 EMR-Photoelectric, Schlumberger Wireline and Testing, Princeton, NJ USA
NEAR Gamma Ray Spectrometer Characterization and Repair ***Final Report No. 3***
Groves, Joel Lee, EMR-Photoelectric, USA; Vajda, Stefan, EMR-Photoelectric, USA; Jun. 1998; 48p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS5-32486
Report No.(s): NASA/CR-1998-206875; NAS 1.26:206875; JLG:98-09; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report covers the work completed in the third year of the contract. The principle activities during this period were (1) the characterization of the NEAR 2 Gamma Ray Spectrometer using a neutron generator to generate complex gamma ray spectra and a large Ge Detecter to identify all the major peaks in the spectra; (2) the evaluation and repair of the Engineering Model Unit

of the Gamma Ray Spectrometer for the NEAR mission; (3) the investigation of polycapillary x-ray optics for x-ray detection; and (4) technology transfer from NASA to forensic science.
Author
Near Ultraviolet Radiation; X Ray Optics; Gamma Ray Spectrometers; X Ray Diffraction

19980211001 Department of the Navy, Washington, DC USA
Fiber Optic Infrared Cone Penetrometer System
Bucholtz, Frank, Inventor, Department of the Navy, USA; Nau, Gregory, Inventor, Department of the Navy, USA; Aggarwal, Ishwar D., Inventor, Department of the Navy, USA; Sanghera, Jasbinger S., Inventor, Department of the Navy, USA; Ewing, Kenneth J., Inventor, Department of the Navy, USA; Apr. 14, 1998; 16p; In English; Supersedes US-Patent-Appl-SN-572389
Patent Info.: Filed 14 Dec. 1995; US-Patent-Appl-SN-572389; US-Patent-5,739,536
Report No.(s): AD-D018913; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A system for the in-situ detection of chemicals, including water, in soil comprises: (1) a penetrometer for penetrating the soil, the penetrometer including interior and exterior surfaces, and a window for allowing infrared radiation to be transmitted between the interior and exterior surfaces of the penetrometer; (2) a driver for driving the penetrometer into the soil to a plurality of different depths; (3) a source for providing infrared radiation which passes through the window to irradiate the soil adjacent to the window; (4) an infrared transmitting chalcogenide optical fiber; (5) an optical system disposed within the penetrometer adjacent to the window for transmitting infrared radiation from the source through the window into the soil and for collecting infrared radiation reflected from the soil back through the window into a first end of the chalcogenide fiber; and (6) a spectrometer coupled to a second end of the infrared transmitting chalcogenide optical fiber for receiving and analyzing the reflected infrared radiation passing through the chalcogenide optical fiber to obtain information on chemicals present at various depths of the soil through which the penetrometer passes.
DTIC
Fiber Optics; Penetrometers; Infrared Instruments; Optical Fibers; SOIls

19980211038 Lawrence Livermore National Lab., Livermore, CA USA
NIF optics phase gradient specification
Williams, W., Lawrence Livermore National Lab., USA; Auerbach, J., Lawrence Livermore National Lab., USA; Hunt, J., Lawrence Livermore National Lab., USA; Lawson, L., Lawrence Livermore National Lab., USA; Manes, K., Lawrence Livermore National Lab., USA; Orth, C., Lawrence Livermore National Lab., USA; Sacks, R., Lawrence Livermore National Lab., USA; Trenholme, J., Lawrence Livermore National Lab., USA; Wegner, P., Lawrence Livermore National Lab., USA; May 02, 1997; 27p; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-ID-127297; DE98-050716; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A root-mean-square (rms) phase gradient specification seems to allow a good connection between the NIP optics quality and focal spot requirements. Measurements on Beamlet optics individually, and as a chain, indicate they meet the assumptions necessary to use this specification, and that they have a typical rms phase gradient of approx. 80 angstrom/cm. This may be sufficient for NIP to meet the proposed Stockpile Stewardship Management Program (SSMP) requirements of 80% of a high-power beam within a 200-250 micron diameter spot. Uncertainties include, especially, the scale length of the optics phase noise, the ability of the adaptive optic to correct against pump-induced distortions and optics noise, and the possibility of finding mitigation techniques against whole-beam self-focusing (e.g. a pre-correction optic). Further work is needed in these areas to better determine the NIF specifications. This memo is a written summary of a presentation on this topic given by W. Williams 24 April 1997 to NIP and LS&T personnel.
DOE
Gradients; Adaptive Optics; Optics; Specifications

19980211039 Lawrence Livermore National Lab., Livermore, CA USA
Efficient polishing of aspheric optics
Taylor, J. S., Lawrence Livermore National Lab., USA; Piscotty, M. A., Lawrence Livermore National Lab., USA; Nguyen, N. Q., Lawrence Livermore National Lab., USA; Landram, C. S., Lawrence Livermore National Lab., USA; Ng, L. C., Lawrence Livermore National Lab., USA; Apr. 15, 1997; 36p; In English
Contract(s)/Grant(s): W-7405-ENG-48

Report No.(s): UCRL-ID-127008; DE98-051054; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The objectives of this project are to develop, evaluate, and optimize novel designs for a polishing tool intended for ultra-precise figure corrections on aspheric optics with tolerances typical of those required for use in extreme ultraviolet (EUV) projection lithography. This work may lead to an enhanced US industrial capability for producing optics for EUV, x-ray and, other high precision applications. LLNL benefits from developments in computer-controlled polishing and the insertion of fluid mechanics modeling into the precision manufacturing area. Our accomplishments include the numerical estimation of the hydrodynamic shear stress distribution for a new polishing tool that directs and controls the interaction of an abrasive slurry with an optical surface. A key milestone is in establishing a correlation between the shear stress predicted using our fluid mechanics model and the observed removal footprint created by a prototype tool. In addition, we demonstrate the ability to remove 25 nm layers of optical glass in a manner qualitatively similar to macroscopic milling operations using a numerically-controlled machine tool. Other accomplishments include the development of computer control software for directing the polishing tool and the construction of a polishing testbed.

DOE

Polishing; Aspheric Optics; Correction; Lithography; Optical Materials; Machine Tools; Hydrodynamics

19980211053 Minnesota Univ., Dept. of Electrical and Computer Engineering, Minneapolis, MN USA

A.S.E. Source at 1550nm for IFOG Application ***Quarterly Report No. 5, 5 Mar. 1998 - 5 Jun. 1998***

Gopinath, Anand, Minnesota Univ., USA; Ellerbusch, Benjamin, Minnesota Univ., USA; Berglund, William, Minnesota Univ., USA; Jun. 1998; 4p; In English

Report No.(s): AD-A348054; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The report summarizes the results of loss measurements of the undoped alumina waveguides for both the 1550nm and 980nm wavelengths.

DTIC

Optical Waveguides; Measurement

19980211061 Texas Technological Univ., Optical Systems Lab., Lubbock, TX USA

Noise Characterization of Devices for Optical Computing ***Final Report, 1 Jun. 1995 - 31 May 1998***

Walkup, John, Texas Technological Univ., USA; Krile, Thomas F., Texas Technological Univ., USA; Mehrl, David J., Texas Technological Univ., USA; Jun. 1998; 61p; In English

Contract(s)/Grant(s): F49620-95-1-0402; AF Proj. 3484

Report No.(s): AD-A347745; AFRL-SR-BL-TR-98-0507; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The major objective of the research effort is to investigate the noise characteristics of advanced optical Sources, spatial light modulators, and other devices which are candidates for applications in optical computers. In the past three years we have made progress in two main areas: developed and refined a Volterra Series-based nonlinear model for optical devices, and additional measurements on real optical spatial light modulators.

DTIC

Light Modulators; Noise Measurement; Optical Data Processing; Noise (Sound)

19980211462 Southampton Univ., Optoelectronics Research Centre, UK

Optically Tuned Fiber Gratings ***Final Report***

Grudinin, Anatoly, Southampton Univ., UK; Mar. 1998; 12p; In English

Contract(s)/Grant(s): F61708-97-C-0001

Report No.(s): AD-A346708; EOARD-SPC-97-4023; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking University of Southampton as follows: The contractor will investigate two areas: (1) explore optically tuned fiber grating written in birefringent fiber; and (2) study photorefractive and relevant nonlinear characteristics of glasses with enhanced non-linearity. In accordance with the specification, a fiber grating should be tuned within the range of 1 nanometer and dynamic rise-time shorter than 100 picosecond. The most straightforward way to achieve such a tuning ability is to use high intensity pulses in order to be above to change refractive index difference between core and cladding. In order to be able to do so one has to produce pulse intensities in order of 10(exp 11) W/sq cm. The main activity within the project was concentrated around development of a diode-pumped, reliable source of high intensity pulse and has successfully demonstrated optically-tuned fiber grating.

DTIC

Birefringence; Cladding; Nonlinearity; Refractivity

19980211614 Pennsylvania Univ., Dept. of Physics and Astronomy, Philadelphia, PA USA

High Performance Graded Index Polymer Optical Fibers ***Final Report, 15 Oct. 1994 - 14 Oct 1997***

Garito, Anthony F., Pennsylvania Univ., USA; May 11, 1998; 81p; In English

Contract(s)/Grant(s): F49620-94-1-0468; AF Proj. C139

Report No.(s): AD-A346542; F-AFG-523761; AFRL-SR-BL-TR-98-0495; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Experimental and theoretical studies of the optical properties of large core step index (SI) plastic optical fibers (POF) and graded index (GI) POFs are reported. A set of criteria and analyses of physical parameters are developed in context to the major issues of POF applications in short-distance communication systems. Analyses are presented to show how the measured POF optical attenuation affects the overall performance in wavelength division multiplexing (WDM) and how use of perfluorinated polymers can overcome limitation inherent to current POF materials. Results of POF optical bandwidth measurements by direct picosecond time domain methods are reported and their relationship to refractive index profiles theoretically analyzed by the WKB and finite-element methods. Two high-resolution optical techniques of refracted near-field and transverse interferometric methods are presented and used to measure the index profiles of large core POFs. Results reveal that the index profile of current GI POF is not parabolic, but consists of two markedly different regions. Analysis of the index profile reveals that strong mode coupling increases the GI POF bandwidth from its profile-determined value of 0.43 GHz to its measured value of 3.0 GHz for 100m. We further study mode coupling effect inside POFs through various experimental techniques, including pulse broadening-length dependence measurements and far-field radiation pattern measurements.

DTIC

Fiber Optics; Optical Communication; Coupled Modes; Finite Element Method; Optical Properties; Wavelength Division Multiplexing

19980211704 Texas Technological Univ., Optical Systems Lab., Lubbock, TX USA

Performance Enhancement in Optical Computing ***Final Report, 15 Jan. 1995 - 31 May 1998***

Walkup, John F., Texas Technological Univ., USA; Krile, Thomas F., Texas Technological Univ., USA; Jun. 1998; 108p; In English

Contract(s)/Grant(s): F49620-95-1-0140; AF Proj. 2305

Report No.(s): AD-A347627; AFRL-SR-BL-TR-98-0506; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The major objectives of this research effort were (1) to develop multi-level, multi-error-correcting codes suitable for both the binary and non-binary operation of optical matrix-vector multipliers including efficient decoding techniques, and (2) to investigate accuracy issues associated with optical memory technologies, including photon echoes, and multiplexed holography.

DTIC

Optical Computers; Optical Data Processing; Optical Memory (Data Storage); Multipliers; Computation; Decoding; Error Correcting Codes

19980213227 Department of the Navy, Washington, DC USA

Excited State Polarization Altering Optical Filter

Billmers, Richard I., Inventor, Department of the Navy, USA; Squicciarini, Martin F., Inventor, Department of the Navy, USA; Gayen, Swapan K., Inventor, Department of the Navy, USA; Feb. 24, 1998; 10p; In English; Supersedes US-Patent-Appl-SN-521195

Patent Info.: Filed 30 Aug. 1995; US-Patent-Appl-SN-521195; US-Patent-5,721,632

Report No.(s): AD-D018965; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An excited state polarization altering optical filter includes a vapor cell having a population of electrons with a plurality of energy levels that receive light and transmit light according to the received light. A first pulsed dye laser applies a beam of light by way of a circular polarizer to provide a first beam of light having a first polarization to the vapor cell. The first beam of light causes transitions of the electrons from one energy level to another energy level. A second pulsed dye laser applies a second beam of light with a second, differing, linear polarization to the vapor cell. The vapor cell differentially transmits the first and second beams of light in accordance with the differing polarizations. A delay path is provided for delaying the second beam of light before the second beam of light is applied to the vapor cell. The delay path is tuned by adjusting the length. A third laser applies a beam of light to the first and second lasers. The third laser may be an Nd:YAG laser.

DTIC

Optical Filters; Linear Polarization; Polarizers

19980213256 Dartmouth Coll., Office of Grants and Contracts, Hanover, NH USA
Signal Processing for Optical Networks ***Final Report, 30 Sep. 1993 - 1 Jan. 1998***
Healy, Dennis M., Jr., Dartmouth Coll., USA; May 01, 1998; 34p; In English
Contract(s)/Grant(s): F49620-93-1-0567
Report No.(s): AD-A346217; AFRL-SR-BL-TR-98-0484; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this report, we present a summary of research and transitions performed in the context of our study of the application of advanced signal processing concepts and techniques to various issues associated with optical fiber communication systems. We describe theoretical, simulation, and experimental studies of novel lightwave communication schemes and protocols addressed to challenges posed by extremely fast signaling rates, nonlinearities, dispersion, and attenuation. We describe analysis and design of all optical hardware for modulation, demodulation, and matched filtering. Exciting progress is reported in the areas of source and channel coding (compression and error correcting codes) for communication systems. Finally we describe interesting extensions and generalizations of matched filtering and detection algorithms and studied applications in several areas beyond communications.
DTIC
Signal Processing; Fiber Optics; Optical Communication; Light Modulation; Optical Fibers

19980213287 Department of the Navy, Washington, DC USA
Apparatus and Process for Making Fiber Optic Bragg Gratings
Perez, Ignacio M., Inventor, Department of the Navy, USA; Tyagi, Som D., Inventor, Department of the Navy, USA; Jan. 13, 1998; 9p; In English
Patent Info.: Filed 5 Mar. 1996; US-Patent-Appl-SN-611045; US-Patent-5,708,738
Report No.(s): AD-D018973; No Copyright; Avail: US Patent and Trademark Office, Microfiche

At least a part of a first coherent beam of monochromatic light is incident obliquely on the reflecting surface of a mirror to produce a reflected beam in a direction different from that of the first beam. An interference pattern is produced within a volume defined by the intersection of the reflected beam with the first beam. A part of an optical fiber is positioned in the volume containing the interference pattern and a grating is photo-induced in the optical fiber by exposure of the optical fiber to the interference pattern. A desired Bragg period in the grating can be selected by tilting the mirror to change the interference pattern.
DTIC
Fiber Optics; Bragg Gratings; Optical Fibers

19980213294 Department of the Navy, Washington, DC USA
Variable Angle Reflectometer Employing an Integrating Sphere and a Light Concentrator
Snail, Keith A., Inventor, Department of the Navy, USA; Hanssen, Leonard, Inventor, Department of the Navy, USA; Chenault, David, Inventor, Department of the Navy, USA; Apr. 28, 1998; 9p; In English; Supersedes US-Patent-Appl-SN-509480
Patent Info.: US-Patent-Appl-SN-509480; US-Patent-5,745,234
Report No.(s): AD-D018989; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A reflectometer and a method for measuring the reflectance and transmittance of material using an integrating sphere and a light concentrator. The reflectance and transmittance measurements are performed as a function of the angle of incidence of a beam of light onto a sample and reference material. In a preferred embodiment, a CHC-lens concentrator having a high f/# and a low index of refraction is used.
DTIC
Concentrators; Reflectance; Angles (Geometry); Reflectometers; Spheres; Luminaires

19980213309 Maryland Univ., Computer Vision Lab., College Park, MD USA
Site Model Based Image Registration and Change Detection ***Annual Report No. 3, Sep. 1994 - Sep 1995***
Chellappa, R., Maryland Univ., USA; Burlina, P., Maryland Univ., USA; Lin, C. L., Maryland Univ., USA; Davis, L. S., Maryland Univ., USA; Rosenfeld, A., Maryland Univ., USA; Mar. 1998; 29p; In English
Contract(s)/Grant(s): DACA76-92-C-0024
Report No.(s): AD-A346125; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The University of Maryland (UMD) is one of the BAA contractors performing research on aerial image understanding for the RADIUS project. UMD is contributing model-based and context-based change detection (CD) and monitoring algorithms. The principal accomplishments for this third annual report are the following: (1) improvements to detecting and counting of vehicles on parking lots as well as along roads; (2) monitoring vehicle formations, such as convoys and railroad cars, and (3) inte-

grating the vehicle detector within the RCDE platform. UMD used geometric and context information derived from site models to accomplish these tasks.
DTIC
Aerial Photography; Image Processing; Pattern Registration

19980213310 University of Southern California, Inst. for Robotics and Intelligent Systems, Los Angeles, CA USA
Research in Model-Based Change Detection and Site Model Updating ***Final Report, Jul. 1993 - Jul 1996***
Nevatia, R., University of Southern California, USA; Huertas, A., University of Southern California, USA; Mar. 1998; 74p; In English
Contract(s)/Grant(s): DACA76-93-C-0014
Report No.(s): AD-A346153; TEC-TEC-0106; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

USC's major research project deals with change detection and site model updating. A system was developed to validate building models and detect changes, i.e. in the dimensions of a building. The system uses the site model to predict the location and position of structures in the image. The comparison between model and image features gives an indication of the changes to the structures. Updating the model by adding descriptions of new structures requires site construction techniques. CMU has developed two systems for site model construction with focus on building structures. These systems implement perceptual grouping techniques to detect and describe the buildings in the scene by means of 3-D models. One system uses a single image to derive a model with the aid of 3-D clues, such as shadows and visible walls. Results from more than one image are combined to reinforce detection confidence and attempt to complete partial detection. This system also incorporates facilities for user interaction that help construct high quality site models with minimal interaction. The second system uses multiple images at all levels of processing and uses shadows and visible wall information to hypothesize and verify buildings and construct 3-D models. Results from RADIUS model board are presented.
DTIC
Pattern Recognition; Photointerpretation; Target Recognition; Three Dimensional Models

19980214887 Department of the Navy, Washington, DC USA
Method and Apparatus for Photobleaching Patterns in Irradiated Optical Waveguides
Patton, Scott L., Inventor, Department of the Navy, USA; Jan. 13, 1998; 10p; In English; Supersedes US-Patent-Appl-SN-708422 , AD-D018195
Patent Info.: Filed 9 Sep. 1996; US-Patent-Appl-SN-708422; US-Patent-5,708,739
Report No.(s): AD-D018934; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A method and apparatus for photobleaching predetermined patterns in an optical waveguide. The apparatus irradiates the optical waveguide generally held in a fixture. The irradiation includes a selected region or regions of the optical waveguide Or the entire optical waveguide. The radiation interacts with radiation sensitive constituents in the optical waveguide to induce a light transmission loss. After the irradiation is completed. the optical waveguide is allowed to age whereby the light transmission recovers to an equilibrium less value. Light beams photobleach predetermined patterns into the previously irradiated region or regions. The patterns may take the form of Bragg gratings in the waveguide.
DTIC
Optical Waveguides; Irradiation

19980214889 Department of the Navy, Washington, DC USA
Ultra-High Sensitivity Transducer with Chirped Bragg Grating Reflector
Kersey, Alan D., Inventor, Department of the Navy, USA; Jan. 06, 1998; 13p; In English; Supersedes , US-Patent-Appl-SN-536028, AD-D017781
Patent Info.: Filed 29 Sep. 1995; US-Patent-Appl-SN-536028; US-Patent-5,706,079
Report No.(s): AD-D018936; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A transducer and measurement system includes a fiber Bragg grating which has a regular variation of spacing of partially reflecting surfaces. known as a chirp. either formed or induced therein and which is capable of reflecting energy having a predetermined wavelength. When the fiber Bragg grating is subjected to a strain. such as by a change in dimension or shape of a transducing element to which it is attached with change of a physical parameter to which the transducing element or the fiber Bragg grating is exposed. the location within the fiber Bragg grating which effectively reflects the predetermined wavelength will be formed (e.g. when the chirp is induced) or altered as the strain alters spacing of partially reflecting surface within the fiber Bragg grating

allowing long optical fibers. such as are used in magnetometers and hydrophones. to be simulated with short optical fibers including a fiber Bragg grating.
DTIC
Fiber Optics; Sensitivity; Transducers; Bragg Gratings; Chirp

19980214891 Department of the Navy, Washington, DC USA
Method for Producing Core/Clad Glass Optical Fiber Preforms Using Hot Isostatic Pressing
Sanghera, Jasbinder, Inventor, Department of the Navy, USA; Pureza, Pablo, Inventor, Department of the Navy, USA; Aggarwal, Ishwar, Inventor, Department of the Navy, USA; Miklos, Robert, Inventor, Department of the Navy, USA; Apr. 07, 1998; 12p; In English
Patent Info.: Filed 28 Jun. 1996; US-Patent-Appl-SN-672771; US-Patent-5,735,927
Report No.(s): AD-D018958; No Copyright; Avail: US Patent and Trademark Office, Microfiche

Core/clad glass optical fiber preforms free of bubbles and soot at the core/clad interface are fabricated by inserting a glass core rod into a cladding glass tube sized so that space remains between them, sealing the top and bottom of the tube onto the core rod to form a seated space between them which is relatively soot free and under a vacuum and then hot isostatically pressing the seated composite to collapse the tube onto the rod and also collapse bubbles In the glass. Soot formation is avoided or minimized by purging the space with inert gas while the bottom of the tube is collapsed onto the rod and by seating the top under a dynamic vacuum and at the lowest possible temperature to avoid soot formation without cracking the glass. The space is vacuum outgassed before the second seal is made. Chalcogenide fiber drawn from a preform made in this fashion exhibits very low transmission losses.
DTIC
Fiber Optics; Glass Fibers; Cladding; Optical Fibers; Hot Isostatic Pressing

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see90 Astrophysics.

19980210893 Ecole Polytechnique, Lab. pour l'Utilisation des Lasers Intenses, Palaiseau, France
LULI 1997: Plasma Physics on LULI Facilities ***Annual Report, Jan. - Dec. 1997 Laboratoire pour l'Utilisation des Lasers Intenses: Rapport Scientifique 1997***
Amiranoff, F., Ecole Polytechnique, France; Jun. 1998; 158p; In French
Report No.(s): PB98-152515; CNRS/LULI-1997; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Work performed at LULI during the year 1997 is described in a set of 46 original contributions covering topics such as: laser-matter interaction, shocks, hydrodynamics, equations of states, atomic physics, X-ray lasers and laser developments.
NTIS
Plasma Physics; Atomic Physics; Hydrodynamics; X Ray Lasers

19980210916 Los Alamos National Lab., NM USA
Relevant ion time scales for electron impact processes of atoms in dense plasmas
Murillo, M. S., Los Alamos National Lab., USA; [1997]; 9p; In English; Strongly Coupled Coulomb Systems, Aug. 1997, Boston, MA, USA
Contract(s)/Grant(s): W-7405-ENG-36
Report No.(s): LA-UR-97-3978; CONF-9708136; DE98-001601; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

In this paper a new model for treating collisional atomic processes has been presented. This model simultaneously and self-consistently treats electron and ion processes. For transitions frequencies above the ion plasma frequency, it is argued that little ion motion occurs although the interaction is still strong; the ion microfield perturbs the atom. The electron impact processes may still be described by a DSF between levels of the perturbed atoms, suggesting the name Microfield Stochastic Model (MSM) for

this method. Future work will be directed towards refining some of the approximations used here for application to realistic systems.
DOE
Ion Motion; Electron Impact; Atomic Physics; Dense Plasmas; Plasma Density

19980210926 Lawrence Livermore National Lab., Livermore, CA USA
Spheromak Physics Development
Hooper, E. B., Lawrence Livermore National Lab., USA; Jan. 27, 1997; 21p; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-ID-126179; DE98-051587; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The spheromak is a Magnetic Fusion Energy (MFE) configuration, which is a leading alternative to the tokamak. It has a simple geometry which offers an opportunity to achieve the promise of fusion energy if the physics of confinement, current drive, and pressure holding capability extrapolate favorably to a reactor. Recent changes in the US MFE program, taken in response to budget constraints and programmatic directions from Congress, include a revitalization of an experimental alternative concept effort. Detailed studies of the spheromak were consequently undertaken to examine the major physics issues which need to be resolved to advance it as a fusion plasma, the optimum configuration for an advanced experiment, and its potential as a reactor. As a result of this study, we conclude that it is important to evaluate several physics issues experimentally. Such an experiment might be appropriately be named the Sustained Spheromak Physics Experiment (SSPX). It would address several critical issues, the solution to which will provide the physics basis to enable an advanced experiment. The specific scientific goals of SSPX would be to: * Demonstrate that electron and ion temperatures of a few hundred electron volts can be achieved in a steady-state spheromak plasma sustained by a magnetic dynamo (''helicity injection''). * Relate energy confinement quantitatively to the magnetic turbulence accompanying the dynamo and use this knowledge to optimize performance. * Measure the magnetic field profiles and magnetic turbulence in the plasma and relate these to the science of the magnetic dynamo which drives the current in the plasma. * Examine experimentally the pressure holding capability (beta limit) of the spheromak. * Understand the initial phases of the transition of the plasma from an equilibrium supported by a magnetic-flux conserving wall to one supported by external coils. These goals could be achieved in an experiment with duration of a few milliseconds, and can consequently be addressed at a relatively low cost. There are additional goals which would be addressed in a larger, follow-up experiment, the Advanced Spheromak Physics Experiment. These include the achievement of temperatures in the multi-kev range, the control of low mode-number instabilities (perhaps with a feedback system), and the technology of long-pulse current drive. This document reviews past work in the field and describes a number of new results. Recent publications which complement this report are also referenced. These publications also describe the characteristics of an experiment to examine the important spheromak physics issues.
DOE
Spheromaks; Magnetic Fields; Electron Energy; Solar Wind

19980210953 Tennessee Univ., Dept. of Electrical Engineering, Knoxville, TN USA
Scattering of Microwaves by Steady-State Plasma Slabs, Columns, and Layers at Atmospheric Pressure ***Final Report, 1 Apr. 1995 - 31 Mar. 1998***
Laroussi, Mounir, Tennessee Univ., USA; Mar. 1998; 143p; In English
Contract(s)/Grant(s): F49620-95-1-0277; AF Proj. 2301
Report No.(s): AD-A348638; UTK-MPL-98-B1; AFRL-SR-BL-TR-98-0519; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This document describes research activities at the UTK Microwave and Plasma Laboratory. Our research concentrates on the generation of air plasmas and the study of their interactions with electromagnetic waves. The work supported by this contract led to the publication of archival papers, the invention of a novel microwave detector, and to contributions to AFOSR's Air Plasma Ramparts Program. Also the understanding of atmospheric pressure plasmas gained during this project helped advance our work on the use of air plasmas for decontamination applications.
DTIC
Atmospheric Pressure; Electromagnetic Radiation; Microwaves; Plasma Slabs; Plasmas (Physics)

19980211030 Texas Univ., Inst. for Fusion Studies, Austin, TX USA
Cluster plasma and its dispersion relation
Tajima, T., Texas Univ., USA; Downer, M. C., Texas Univ., USA; Kishimoto, Y., Japan Atomic Energy Research Inst., Japan; Feb. 13, 1998; 13p; In English

Contract(s)/Grant(s): DE-FG03-96ER-54346
Report No.(s): DOE/ER/54346-813; IFSR-813; DE98-004875; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

It is shown that unlike a gas plasma or an electron plasma in a metal, an ionized cluster material 'cluster plasma' permits propagation below the plasma cut-off of electromagnetic (EM) waves whose phase velocity is close to but below the speed of light. Its unique properties allow a variety of applications, including direct acceleration of particles with its EM fields and the phase matching of waves of high harmonic generation (HHG).
DOE
Electron Plasma; Wave Dispersion

19980211032 Texas Univ., Inst. for Fusion Studies, Austin, TX USA
On the robustness of the localized spatiotemporal structures in electron-positron-ion plasmas
Mahajan, S. M., Texas Univ., USA; Berezhiani, V. I., Texas Univ., USA; Miklaszewski, R., Institute of Plasma Physics and Laser Microfusion, Poland; Apr. 1998; 23p; In English
Contract(s)/Grant(s): DE-FG03-96ER-54346
Report No.(s): DOE/ER/54346-818; IFSR-818; DE98-004877; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

It is shown that, in an electron-positron plasma with a small fraction of ions, large-amplitude localized spatiotemporal structures (light bullets) can be readily generated and sustained. These light bullets are found to be exceptionally robust: they can emerge from a large variety of initial field distributions and are remarkably stable.
DOE
Robustness (Mathematics); Electron-Positron Plasmas

19980211043 Lawrence Livermore National Lab., Livermore, CA USA
Model development for transport studies in negative shear modes
Spang, M. C., Lawrence Livermore National Lab., USA; Casper, T. B., Lawrence Livermore National Lab., USA; Thomassen, K. I., Lawrence Livermore National Lab., USA; May 1997; 19p; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-ID-127642; DE98-051266; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This study develops a simple transport model which can be used predictively for tokamak negative central shear (NCS) modes, with the assistance of Lawrence Livermore National Laboratory's core plasma simulation code, CORSICA. The results show that the the Rebut-Lallia-Watkins Critical Electron Temperature Gradient Model, coupled with an NCS transport model and TRANSP data, renders a reasonably close match to experimental temperature profiles. Additionally, this research offers the first benchmark calculation indicating that the CORSICA code itself, when given transport coefficients from the analysis of experimental data, replicates the experimental profiles, indicating that both TRANSP and CORSICA together are consistent in their analysis of the plasma evolution. This means CORSICA is working properly and has no known major internal flaws.
DOE
Computerized Simulation; Electron Energy; Plasmas (Physics); Temperature Gradients; Tokamak Devices

19980211139 Lawrence Livermore National Lab., Livermore, CA USA
Empirical evaluation of the radiative cooling coefficient for krypton gas in the FTU plasma
Fournier, K. B., Energia Nucleare e Delle Energie Alternative, Italy; Pacella, D., Energia Nucleare e Delle Energie Alternative, Italy; Gregory, B. C., Energia Nucleare e Delle Energie Alternative, Italy; May, M. J., Johns Hopkins Univ., USA; Mazzitelli, G., Energia Nucleare e Delle Energie Alternative, Italy; Gabellieri, L., Energia Nucleare e Delle Energie Alternative, Italy; Leigheb, M., Energia Nucleare e Delle Energie Alternative, Italy; Finkenthal, M., Johns Hopkins Univ., USA; Stutman, D., Johns Hopkins Univ., USA; Soukanovskii, V., Johns Hopkins Univ., USA; Goldstein, W. H., Lawrence Livermore National Lab., USA; Nov. 18, 1997; 17p; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-ID-129078; DE98-051340; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

For future fusion reactors, a careful balance must be achieved between the cooling of the outer plasma via impurity radiation and the deleterious effects of inevitable core penetration by impurity ions. We have injected krypton gas into the Frascati Tokamak Upgrade (FTU) plasma. The measured visible bremsstrahlung and bolometric signals from krypton have been inverted and the

resulting radial impurity density profile and power loss profile for krypton gas are extracted. Using the measured electron density and temperature profiles, the radiative cooling coefficient for krypton is derived. The level of intrinsic impurities (Mo, Cr, Mn and Fe) in the plasma during the krypton puffing is monitored with a VUV SPRED spectrometer. Models for krypton emissivity from the literature are compared to our measured results.
DOE
Krypton; Tokamak Devices; Temperature Profiles; Gas Injection; Fusion Reactors; Bremsstrahlung; Radiant Cooling; Plasma Cooling

19980211296 Idaho Univ., Coll. of Engineering, Moscow, ID USA
Magnetically controlled deposition of metals using gas plasma ***Final Report***
Apr. 02, 1998; 38p; In English
Contract(s)/Grant(s): DE-FG07-93ID-13220
Report No.(s): DOE/ID/13220-T13; DE98-005144; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This is the first phase of a project that has the objective to develop a method of spraying materials on a substrate in a controlled manner to eliminate the waste and hazardous material generation inherent in present plating processes. The project is considering plasma spraying of metal on a substrate using magneto-hydrodynamics to control the plasma/metal stream. The process being developed is considering the use of commercially available plasma torches to generate the plasma/metal stream. The plasma stream is collimated, and directed using magnetic forces to the extent required for precise control of the deposition material. The project will be completed in phases. Phase one of the project, the subject of this grant, is the development of an analytical model that can be used to determine the feasibility of the process and to design a laboratory scale demonstration unit. The contracted time is complete, and the research is still continuing. This report provides the results obtained to date. As the model and calculations are completed those results will also be provided. This report contains the results of the computer code that have been completed to date. Results from a ASMEE Benchmark problem, flow over a backward step with heat transfer, Couette flow with magnetic forces, free jet flow are presented along with several other check calculations that are representative of the cases that were calculated in the course of the development process. The final cases that define a velocity field in the exit of a plasma spray torch with and without a magnetic field are in process. A separate program (SPRAY) has been developed that can track the plating material to the substrate and describe the distribution of the material on the substrate. When the jet calculations are complete SPRAY will be used to compare the distribution of material on the substrate with and without the effect of the magnetic focus.
DOE
Procedures; Spraying; Mathematical Models; Computer Programs; Magnetic Fields; Metals; Substrates; Plasma Spraying; Plasma Torches

19980211391 National Inst. for Fusion Science, Toki, Japan
Realization and Classification of Symmetric Stellarator Configurations through Plasma Boundary Modulations
Yokoyama, M., National Inst. for Fusion Science, Japan; Nakajima, N., National Inst. for Fusion Science, Japan; Okamoto, M., National Inst. for Fusion Science, Japan; Dec. 1997; ISSN 0915-633X; 50p; In English; Original contains color illustrations
Report No.(s): NIFS-522; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The basic roles of several principle modulations of plasma boundary shape on magnetohydrodynamic (MHD) equilibria are investigated. The appropriate combination of principle helical modulations for elimination of bumpy field component to realize the quasi-axisymmetric (QAS) and quasi-helically symmetric (QHS) configurations is explained by considering the variation of area of magnetic surface cross sections. The triangular modulation is effectively utilized to form the magnetic well by shifting the magnetic axis outward compared to the center of mass of magnetic surface cross section. The spatialization of the magnetic axis or the bumpy modulations of plasma boundary is rather important to reduce the toroidicity in the magnetic field, which can lead to QHS configurations. Some stellarator magnetic configurations under design activity or in the existing experimental device are mentioned from the point of views of plasma boundary modulations. Based on these principle understandings of plasma boundary modulations, examples of essential approach to QAS and QHS configurations are demonstrated step by step. The possibility of quasi-bumpy (or poloidally) symmetric (QBS) configuration is also mentioned.
Author
Plasmas (Physics); Stellarators; Classifications; Modulation; Magnetohydrodynamics

19980211559 Los Alamos National Lab., NM USA
Non-thermal plasmas as gas-phase advanced oxidation processes
Rosocha, L. A., Los Alamos National Lab., USA; Aug. 1997; 9p; In English; 2nd; International Symposium on Non-thermal

Plasma Technology for Pollution Control, 11-15 Aug. 1997, Salvador, Brazil
Contract(s)/Grant(s): W-7405-eng-36
Report No.(s): LA-UR-97-2142; CONF-970895; DE97-008890; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Non-thermal plasmas are useful for generating reactive species (free radicals) in a gas stream. Because radical attack reaction rate constants are very large for many chemical species, entrained pollutants are readily decomposed by radicals. Such plasmas can generate both oxidative and reductive radicals; therefore, they show promise for treating a wide variety of pollutants.
DOE
Thermal Plasmas; Gas Streams; Oxidation; Free Radicals

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SOLID-STATE PHYSICS

Includes superconductivity. For related information, see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

19980210913 National Renewable Energy Lab., Golden, CO USA
workshop on the role of impurities and defects in silicon device processing
Aug. 1997; 243p; In English; 7th, 11-13 Aug. 1997, Vail, CO, USA
Contract(s)/Grant(s): DE-AC36-83CH-10093
Report No.(s): NREL/CP-520-23386; CONF-970875; DE97-008527; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This workshop is the latest in a series which has looked at technological issues related to the commercial development and success of silicon based PhotoVoltaic (PV) modules. PV modules based on silicon are the most common at present, but face pressure from other technologies in terms of cell performance and cell cost. This workshop addresses a problem which is a factor in the production costs of silicon based PV modules.
DOE
Conferences; Impurities; Crystal Defects; Silicon Transistors

19980210948 Arizona State Univ., Dept. of Physics, Tempe, AZ USA
Correlations Between Micromagnetic, Microstructural and Microchemical Properties in Ultrathin Epitaxial Magnetic Structures. Magnetic Microstructure Observed With Electron Holography in STEM ***Annual Report***
Scheinfein, M. R., Arizona State Univ., USA; Hembree, G. G., Arizona State Univ., USA; Jun. 10, 1998; 138p; In English
Contract(s)/Grant(s): N00014-93-0099; N00014-95-1-0891
Report No.(s): AD-A348621; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Partial contents: Summary of Selected Research Topics Years 4-6; Room-Temperature Dipole- Ferromagnetism In Linear-Self- Assembling Mesoscopic Fe Particle Arrays; Growth of Self-Organized Mesoscopic Magnetic Structures; Magnetic Coupling In Self-Organized Narrow-Spaced Fe Nanowire Arrays; Quantitative Magnetometry Using Electron Holography: Fields Near Magnetic Force Microscope Tips; Magnetic Nanostructures Produced by Electron Beam Patterning Of Direct Write Transition Metal Fluoride Resists; Defect Induced Lowering Of Activation Energies At Step Bands In Co/Cu(100); Co on Stepped Cu(100) Surfaces: A Comparison of Experimental Data With Growth Simulations; Scientific Publications For Years 4-6: January 1996-July 1998 Conference Proceedings And Extended Abstracts For Years 4-6: January 1996-July 1998 Invited Conference Talks For Years 4-6: January 1996-July 1998 Degrees; Granted and Students/Post-Does Supervised For Years 4-6: January 1996-July 1998; C.V. For Michael R. Scheinfein.
DTIC
Magnetic Field Configurations; Magnetic Measurement; Activation Energy; Metal Fluorides

19980210992 Lawrence Livermore National Lab., Livermore, CA USA
Microtechnology
Mariella, R. P., Lawrence Livermore National Lab., USA; Feb. 01, 1997; 44p; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-ID-125472; DE98-050271; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Research reported in the thrust area of microtechnology includes: advanced plasma etch processes for high-aspect-ratio, submicron-feature-size applications; integration of PCR amplification and capillary electrophoresis in a DNA analysis device; micro-

actuators for optical interferometry; thin silicon windows; eutectic bonding and fusion bonding; solid-source MBE-grown GaAs/AlGaAs ridge-waveguide semiconductor optical amplifiers; large area lithography; phase-shift lithography; thermally robust optical semiconductor devices using AlGaInAs grown by molecular beam epitaxy; and porous silicon formation and characterization.
DOE
Plasmas (Physics); Electrophoresis; Eutectics; Semiconductor Devices; Semiconductors (Materials); Lithography; Phase Shift; Porous Silicon

19980211073 Lawrence Livermore National Lab., Livermore, CA USA
Accurate atomistic simulations of the Peierls barrier and kink-pair formation energy for <111 screw dislocations in bcc-Mo
Xu, W., Lawrence Livermore National Lab., USA; Moriarty, J. A., Lawrence Livermore National Lab., USA; May 23, 1997; 23p; In English, 17-21 Mar. 1997, Kansas City, MO, USA; Sponsored by American Physical Society, USA
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-JC-126647; CONF-9703106; DE98-052022; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Using multi-ion MGPT interatomic potentials derived from first- principles generalized pseudopotential theory, we have performed accurate atomistic simulations on the energetic of dislocation motion in the bcc transition metal Mo. Our calculated results include the (110) and (211) generalized stacking fault (gamma) energy surfaces, the Peierls stress required to move an ideal straight <111 screw dislocation, and the kink-pair formation energy for nonstraight screw dislocations. Many-body angular forces, which are accounted for in the present theory through explicit three- and four-ion potentials, are quantitatively important to such properties for the bcc transition metals. This is demonstrated explicitly through the calculated gamma surfaces, which are found to be 10-50% higher in energy than those obtained with pure radial-force models. The Peierls stress for an applied <111/{112} shear is computed to be about 0.025 mu, where mu is the bulk shear modulus. For zero applied stress, stable kink pairs are predicted to form for kink lengths greater than 4b, where b is the magnitude of the Burgers vector. For long kinks greater than 15b, the calculated asymptotic value of the kink-pair formation energy is 2.0 eV.
DOE
Body Centered Cubic Lattices; Molybdenum; Screw Dislocations; Bulk Modulus; Shear Properties; Stacking Fault Energy; Interatomic Forces; Potential Energy; Simulation

19980211106 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
Solid State Research ***Quarterly Report, 1 Nov. 1997 - 31 Jan. 1998***
Shaver, David C., Massachusetts Inst. of Tech., USA; Jun. 19, 1998; 55p; In English
Contract(s)/Grant(s): F19628-95-C-0002
Report No.(s): AD-A347651; ESC-TR-97-105; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report covers in detail the research work of the Solid State Division at Lincoln Laboratory for the period 1 November 1997-31 January 1993. The topics covered are Quantum Electronics, Electro-optical Materials and Devices, Submicrometer Technology, High Speed Electronics, Microelectronics, Analog Device Technology, and Advanced Silicon Technology. Funding is provided by several DoD organizations - including the Air Force, Army, BMDO, DARPA, Navy, NSA, and OSD - and also by the DOE, NASA, and NIST.
DTIC
Quantum Electronics; Research and Development; Optoelectronic Devices; Technology Assessment; High Speed; Semiconductors (Materials)

19980211140 Lawrence Livermore National Lab., Livermore, CA USA
Upconversion-pumped luminescence efficiency of rare-earth-doped hosts sensitized with trivalent ytterbium
Page, R. H., GemFire Corp., USA; Schaffers, K. I., GemFire Corp., USA; Waide, P. A., GemFire Corp., USA; Tassano, J. B., GemFire Corp., USA; Payne, S. A., GemFire Corp., USA; Kruplce, W. F., GemFire Corp., USA; Bischel, W. K., GemFire Corp., USA; Jul. 26, 1997; 33p; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): UCRL-CR-128099; DE98-051341; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We discuss the upconversion luminescence efficiencies of phosphors that generate red, green, and blue light. The phosphors studied are single crystals and powders co-doped with Er(3+) and Yb(3+), and with Tm(3+) and Yb(3+). The Yb ions are pumped

near 980 nm; transfers of two or three quanta to the co-doped rare earth ion generate visible luminescence. The main contribution embodied in this work is the quantitative measurement of this upconversion efficiency, based on the use of a calibrated integrating sphere, determination of the fraction of pump light absorbed, and careful control of the pump laser beam profile. The green phosphors are the most efficient, yielding efficiency values as high as 4 %, with the red and blue materials giving 1 - 2%. Saturation was observed in all cases, suggesting that populations of upconversion steps of the ions are maximized at higher power. Quasi-CW modeling of the intensity- dependent upconversion efficiency was attempted; input data included level lifetimes, transition cross sections, and cross-relaxation rate coefficients. The saturation of the Yb,Er:fluoride media is explained as the pumping of Er(3+) ions into a bottleneck (long-lived state)- the I-4(sub 13/2) metastable level, making them unavailable for further excitation transfer.
DOE
Rare Earth Elements; Luminescence; Optical Pumping; Doped Crystals; Laser Beams; Metal Ions; Single Crystals; Continuous Radiation

19980211425 Harvard Univ., Dept. of Chemistry and Chemical Biology, Cambridge, MA USA
Nanowire Thermoelectrics: An Approach for Enhancing ZT
Lieber, Charles M., Harvard Univ., USA; 1998; 9p; In English
Contract(s)/Grant(s): N00014-98-1-0499
Report No.(s): AD-A347972; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The overall objectives of the AASERT project are to develop an approach for the controlled synthesis of single crystal, one-dimensional (1D) nanowires of the Bi2Te3 family of thermoelectric materials, and to characterize the potentially unique electronic properties of these 1D systems. to achieve these goals we will (1) develop synthetic procedures, which were initiated as part of our current ONR project on nanorod- superconductor composites, to prepare Bi2Te3 nanowires and (2) exploit existing scanning tunneling microscopy facilities and expertise to characterize the nanowire density of electronic states. The combination of systematic synthesis with high-resolution structural and electronic characterization will elucidate the basic factors that control the diameter, aspect ratio, and crystallographic growth direction of Bi2Te3 nanowires, and define the variation and potential enhancements in valence and conduction band edge density of states with nanowire diameter. These studies will thus provide a critical assessment of the possibility of obtaining enhanced thermoelectric figures of merit through material dimensional control.
DTIC
Bismuth Tellurides; Quantum Wires; Thermoelectric Materials; Thermoelectricity; Single Crystals

19980211431 Brimrose Corp. of America, Baltimore, MD USA
Development of Novel, Band-Gap Engineered Photorefractive Semiconductors CdMnTe:V For Real Time Optical Processing *Final Report, Jul. 1995 - Jul 1996*
Trivedi, S. B., Brimrose Corp. of America, USA; Jagannathan, G. V., Brimrose Corp. of America, USA; Kutcher, S. W., Brimrose Corp. of America, USA; Grasza, K., Brimrose Corp. of America, USA; Yu, Z., Brimrose Corp. of America, USA; Rosemeier, R. D., Brimrose Corp. of America, USA; Scheerer, R., Brimrose Corp. of America, USA; Jun. 1998; 34p; In English
Contract(s)/Grant(s): F30602-95-C-0154; AF Proj. 4600
Report No.(s): AD-A347785; AFRL-SN-RS-TR-1998-104; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
During this project, we have developed and produced application quality photorefractive Cd(1-x)Mn(x)Te:V crystals with compositions x= 0.15, 0.45, and 0.60. These crystals are useful for applications in the wavelength range of 0.7 to 1.3 mm. These crystals were obtained through the following material processing steps: (1) extensive purification of the starting elements (cadmium, manganese and tellurium) and purification if the compound (Cd(1-x)Mn(x)Te); (2) crystal growth from the melt under controlled conditions of heat and mass transfers; and (3) in situ annealing of the crystals after growth. The optimal temperature profile required to produce a favorable growth interface and minimal stress for crystals grown by the Bridgman- Stockbarger method was determined. From computational models, the temperature distribution within the solid and melt in the growth ampoule was calculated and used to construct an improved experimental system for growth of high quality Cd(1-x)Mn(x)Te:V single crystals.
DTIC
Single Crystals; Vanadium; Manganese; Product Development; Semiconductors (Materials); Procedures; Photorefractivity; Cadmium Tellurides

19980211439 Illinois Univ., Dept. of Materials Science and Engineering, Urbana, IL USA
Proceedings of the 1997 Williamsburg Workshop on Ferroelectrics
Feb. 1997; 464p; In English, 2-5 Feb. 1997, Williamsburg, VA, USA; Sponsored by Office of Naval Research, USA

Contract(s)/Grant(s): N00014-96-1-1102
Report No.(s): AD-A342335; No Copyright; Avail: CASI; A20, Hardcopy; A04, Microfiche

Enclosed are four (4) copies of the Proceedings from the Williamsburg Conference on Ferroelectrics that was supported by the subject grant. These copies are being submitted as the final report in accordance with the terms of the grant. The support provided by ONR is sincerely appreciated.

DTIC

Ferroelectricity; Dielectric Properties

19980211498 Pennsylvania State Univ., Center for Advanced Materials, University Park, PA USA

Fundamental studies of passivity and passivity breakdown ***Final Report***

Abou–Zeid, K., Pennsylvania State Univ., USA; Ellerbrock, D., Pennsylvania State Univ., USA; Haruna, T., Pennsylvania State Univ., USA; Dec. 1997; 78p; In English
Contract(s)/Grant(s): DE-FG02-91ER-45461
Report No.(s): DOE/ER/45461-T2; DE98-005193; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

During the past 12-month reporting period, we continued our studies on the roles of alloying elements in passivity breakdown, on exploring electronic structures of passive oxide films by means of photoelectrochemical impedance spectroscopy, on assessing the crystallographic defect structure of oxide films by positron annihilation spectroscopy, and on exploring the kinetics of localized attack. We applied the Point Defect Model, which has now been developed to the extent that it can account for a wide range of phenomena associated with the growth and breakdown of passive films formed on metal and alloy surfaces, in order to interpret the experimental data. In particular, we are now able to determine vacancy diffusivities from the analysis of Mott-Schottky data and to interpret the effectiveness of photoinhibition of passivity breakdown in terms of the electronic and crystallographic defect structures of the film. Positron annihilation spectroscopy has also been used to depth-profile passive films on titanium exposed to bromide containing solutions to detect and quantify the distribution of crystallographic defects (cation vacancies) through the film. Finally, models for passivity breakdown (Point Defect Model) and corrosion cavity growth have been combined to produce the first fully-deterministic theory for predicting corrosion damage due to localized corrosion. The algorithms have been used to predict corrosion damage in a variety of practical systems, including: pitting corrosion in condensing heat exchangers (Gas Research Institute), cracking of low pressure steam turbine disks (this project), pitting of nickel CVD detector tubes in the US/Canada neutrino detection experiment (LANL), cracking of stainless steel components in the coolant circuits of Boiling Water Reactors-(BWRs) (various utilities and EPRI), pitting of boiler tubes in fossil power plants (EPRI), and pitting/cracking of high strength steel ball bearings in marine-based helicopters (ONR).

DOE

Passivity; Oxide Films; Spectroscopy; Crystallography; Positron Annihilation; Kinetics; Photoelectrochemistry

19980211568 American Chemical Society, Washington, DC USA

Symposium on Dynamics and Chemistry of Thin Film Growth ***Final Report, 15 Nov. 1997 - 31 Oct. 1998***

Palmstrom, C. J., American Chemical Society, USA; Jun. 30, 1998; 4p; In English; Dynamics and Chemistry of Thin Film Growth, 11-15 Nov. 1997, Cancun, Mexico
Contract(s)/Grant(s): N00014-98-1-0153
Report No.(s): AD-A349046; Rept-98PR02331-00; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Symposium on Dynamics and Chemistry of Thin-Film Growth was held during the Fifth Chemical Congress of North America in Cancun, Mexico, from November 11-15, 1997. The symposium consisted of primarily invited talks with a few contributed papers and posters. Presentations were given by university, industry, and national laboratory researchers from the USA, Canada, Mexico, UK, Germany, and Finland. No proceedings of the symposium will be published.

DTIC

Conferences; Thin Films; Epitaxy

19980211723 Oak Ridge National Lab., TN USA

Pseudogap and Incommensurate Magnetic Fluctuations in YBa2Cu3O(6.6)

Dai, P., Oak Ridge National Lab., USA; Mook, H. A., Oak Ridge National Lab., USA; Dogan, F., Washington Univ., USA; Jul. 24, 1997; 11p; In English; Neutron Scattering, 17-21 Aug. 1997, Toronto, Canada
Contract(s)/Grant(s): DE-AC05-96OR-22464
Report No.(s): CONF-970814-13; DE97-008435; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Unpolarized inelastic neutron scattering is used to study the temperature and wave vector dependence of the dynamical magnetic susceptibility, (xi)' (q, omega), of a well characterized single crystal YBa2Cu3O(6.6) (T(sub c) = 62.7 K). We find that a pseudogap opens in the spin fluctuation spectrum at temperatures well above T(sub c). We speculate that the appearance of the low frequency incommensurate fluctuations is associated with the opening of the pseudogap. to within the error of the measurements, a gap in the spin fluctuation spectrum is found in the superconducting state.
DOE
Magnetic Permeability; Neutron Scattering

19980211725 Argonne National Lab., IL USA
Modeling forces in high-temperature superconductors
Turner, L. R., Argonne National Lab., USA; Foster, M. W., Argonne National Lab., USA; Nov. 1997; 4p; In English; 11th; Compumag Conference, 3-6 Nov. 1997, Rio de Janeiro, Brazil
Contract(s)/Grant(s): W-31109-eng-38
Report No.(s): ANL/ET/CP-93060; CONF-971159; DE97-008615; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We have developed a simple model that uses computed shielding currents to compute the forces acting on a high temperature superconductor (HTS). Results show the expected hysteretic variation of the force as the HTS moves first toward and then away from a permanent magnet, including the reversal of the sign of the force. Optimization of the shielding currents is now carried out through a simulated annealing algorithm in a C++ program that repeatedly calls a commercial electromagnetic software code.
DOE
High Temperature Superconductors; Force

19980214905 Department of the Navy, Washington, DC USA
High Temperature, High Rate, Epitaxial Synthesis of Diamond in a Laminar Plasma
Snail, Keith A., Inventor, Department of the Navy, USA; Jan. 06, 1998; 9p; In English; Supersedes US-Patent-Appl-SN-697060
Patent Info.: Filed 8 May 1991; US-Patent-Appl-SN-697060; US-Patent-5,704,976
Report No.(s): AD-D018923; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A method for synthesizing large, single crystal diamond comprising mixing carbon source and a hydrogen source to form a mixture. The mixture is excited and reacted to form a reactive species in a laminar plasma plume. A substrate having a diamond seed crystal is disposed in the laminar plasma plume while maintaining the diamond seed crystal at a growth temperature between 1100 and 1700 degrees C. for the deposition of diamond; thereby inducing deposition of single crystal diamond on the diamond seed crystal. An apparatus for synthesizing diamond comprising a plasma torch for producing a laminar plasma plume. A carbon source (CH4) and a hydrogen source (H2CH4) are excited and reacted in the laminar plasma plume so as to form a reactive species in the laminar plasma plume. A positioning device is used to dispose a substrate having a diamond seed crystal in the laminar plasma plume, while a temperature maintaining device is used to maintain the diamond seed crystal at a temperature between 1100 and 1700 degrees C., thereby inducing deposition of single crystal diamond on the diamond seed crystal mounted on substrate.
DTIC
Diamonds; High Temperature; Epitaxy; Plasmas (Physics); Single Crystals

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THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics. For related information see also 25 Inorganic and Physical Chemistry and 34 Fluid Mechanics and Heat Transfer.

19980211337 Florida Univ., Dept. of Physics, Gainesville, FL USA
A family-universal anomalous U(1) in string models as the origin of supersymmetry breaking and squark degeneracy
Faraggi, A. E., Florida Univ., USA; Pati, J. C., Maryland Univ., USA; Dec. 1997; 45p; In English
Contract(s)/Grant(s): DE-FG05-86ER-40272
Report No.(s): DOE/ER/40272-293; UFIFT-HEP-97-29; UMD-PP-98-54; HEP-PH-9; DE98-005174; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Recently a promising mechanism for supersymmetry breaking that utilizes both an anomalous U(1) gauge symmetry and an effective mass term m (approx) 1TeV of certain relevant fields has been proposed. In this paper we examine whether such a mechanism can emerge in superstring derived free fermionic models. We observe that certain three generation string solutions, though

not all, lead to an anomalous U(1) which couples universally to all three families. The advantages of this three-family universality of U(1)(sub A), compared to the two-family case, proposed in earlier works, in yielding squark degeneracy, while avoiding radiative breaking of color and charge, are noted. The root cause of the flavor universality of U(1)(sub A) is the cyclic permutation symmetry that characterizes the Z(sub 2) x Z(sub 2) orbifold compactification with standard embedding, realized in the free fermionic models by the NAHE set. It is shown that nonrenormalizable terms which contain hidden-sector condensates, generate the required suppression of the relevant mass term m, compared to the Planck scale. While the D-term of the family universal U(1)(sub A) leads to squark degeneracy, those of the family dependent U(1)'s, remarkably enough, are found to vanish for the solutions considered, owing to minimization of the potential.
DOE
Supersymmetry; Quarks; Broken Symmetry

19980211494 Florida Univ., Inst. for Fundamental Theory, Gainesville, FL USA
Family universal anomalous U(1) in realistic superstring derived models
Faraggi, A. E., Florida Univ., USA; Jan. 1998; 16p; In English
Contract(s)/Grant(s): DE-FG05-86ER-40272
Report No.(s): DOE/ER/40272-295; UFIFT-HEP-98-5; HEP-PH-9801409; DE98-005176; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

An important issue in supersymmetry phenomenology is the suppression of squarks contributions to Flavor Changing Neutral Currents (FCNC). Recently it was noted that in some free fermionic three generation models the anomalous U(1) is family universal. It was further shown that if the D-term of the U(1)(sub A) is the dominant source of supersymmetry breaking, the squark masses are indeed approximately degenerate. In this paper the author discusses the properties of the superstring models that give rise to the flavor universal anomalous U(1). The root cause for the universal U(1)(sub A) is the cyclic permutation symmetry, the characteristic property of the Z(sub 2) X Z(sub 2) orbifold compactification, realized in the free fermionic models by the NAHE set of boundary condition basis vectors. The properties of the three generation models that preserve this cyclic permutation symmetry in the flavor charges are discussed. The cyclic permutation symmetry of the Z(sub 2) x Z(sub 2) orbifold compactification is proposed to be the characteristic property, of phenomenological interest, that distinguishes it from other classes of superstring compactifications.
DOE
Phenomenology; Supersymmetry

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

19980211132 General Accounting Office, National Security and International Affairs Div., Washington, DC USA
Report to the Chairman and Ranking Minority Member, Committee on Science, House of Representatives. Managing for Results: Observations on NASA's Fiscal Year 1999 Performance Plan
Jun. 1998; 28p; In English
Report No.(s): GAO/NSIAD-98-181; B-279979; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

As requested, this report conveys the results of our review of the National Aeronautics and Space Administration's (NASA) performance plan for fiscal year 1999. Under the Government Performance and Results Act of 1993, also known as 'the Results Act," NASA was required to submit to Congress its first performance plan, for fiscal year 1999, along with the President's fiscal year 1999 budget request. According to NASA officials, the plan was provided to Congress on March 27, 1998. NASA views its performance plan as the third component of its 'trilogy of Results Act-supporting' documents, the other two being the annual budget justification and the strategic plan.
Derived from text
Congressional Reports; NASA Programs

19980211435 General Accounting Office, Washington, DC USA
High-Risk Areas: Actions Needed to Solve Pressing Management Problems. Statement of Gene L. Dodaro, Assistant Comptroller General, Accounting and Information Management Division
Mar. 05, 1997; 26p; In English
Report No.(s): PB98-154941; GAO/T/AIMD/GGD-97-60; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

GAO's mission is helping the Congress in its efforts to improve management of our national government. This list helps focus attention of the administration and the Congress on critical management problems. Sections in this report outline actions needed to solve high-risk management problems. Fixing these problems can result in the government: (1) saving billions of dollars, (2) making better investments in information technology, (3) managing the cost of government more effectively, and (4) improving performance and service to the public.
NTIS
Problem Solving; Management Planning; Information Systems; Congressional Reports; Cost Reduction; Effectiveness

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DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see 61 Computer Programming and Software.

19980210869 Department of Energy, Office of Procurement, Assistance and Program Management, Washington, DC USA
USA Department of Energy Information Management Strategic Plan: Partners for progress in corporate management
Sep. 1997; 18p; In English
Report No.(s): DOE/HR-0179; DE98-000638; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche
This plan establishes a shared vision for the information management community. The plan provides overall direction for management information, reflects a strong customer focus, seeks an increased understanding of of DOE business lines and missions, and fosters a corporate collaborative approach to information management.
DOE
Information Management; Information Dissemination; Data Base Management Systems

19980210918 Centers for Disease Control, Atlanta, GA USA
Year 2000 and Standard Administrative Codes Revision Project, Standards and Procedures Guide
Aug. 05, 1997; 73p; In English
Report No.(s): AD-A346412; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The purpose of this guide is to record the methodology, the processes, and the specific revisions necessary to accomplish the Year 2000 (Y2K) and Standard Administrative Code (SAC) implementation for CDC/IS Administrative Systems. The Y2KSAC development team uses this guide as a reference document, and updates it, on an ongoing basis.
DTIC
Information Systems; Public Health; Methodology

19980210928 Department of Energy, Washington, DC USA
Corporate information management guidance
Aug. 1997; 47p; In English
Report No.(s): DOE-98004283; DE98-004283; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche
At the request of the Department of Energy's (DOE) Information Management (IM) Council, IM representatives from nearly all Headquarters (HQ) organizations have been meeting over the past year as the Corporate Guidance Group (CGG) to develop useful and sound corporate information management (IM) guidance. The ability of the Department's IM community to develop such unified guidance continues to be critical to the success of future Departmental IM planning processes and the establishment of a well-coordinated IM environment between Headquarters and field organizations. This report, with 26 specific corporate IM guidance items documented and unanimously agreed to, as well as 12 items recommended for further development and 3 items deferred for future consideration, represents a highly successful effort by the IM community. The effort has proven that the diverse DOE organizations can put aside individual preferences and work together towards a common and mutually beneficial goal. In examining most areas and issues associated with information management in the Department, they have developed specific, far-reaching, and useful guidance. The IM representatives recommend that the documented guidance items provided in this report and approved by the DOE IM Council be followed by all IM organizations. The representatives also strongly recommend that the guidance process developed by the CGG be the single process for developing corporate IM guidance.
DOE
Information Management; Organizations

19980210957 Lawrence Livermore National Lab., Livermore, CA USA

DOE integrated safeguards and security (DISS) system a nation-wide distributed information system for personnel security

Block, B., Lawrence Livermore National Lab., USA; Jun. 05, 1997; 9p; In English; 13th; Adpa/nsia Annual Security Technology Symposium, 9 - 12 Jun. 1997, Virginia Beach, VA, USA

Contract(s)/Grant(s): W-7405-ENG-48

Report No.(s): UCRL-JC-126230; CONF-9706109; DE98-051352; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

DISS uses secure client-server and relational database technology across open networks to address the problems of security clearance request processing and tracking of security clearances for the Department of energy. The system supports the entire process from data entry by the prospective clearance holders through tracking of all DOE clearances, and use of standard DOE badges in automated access control systems throughout the DOE complex.

DOE

Relational Data Bases; Information Systems; Access Control; Automatic Control

19980210960 Lawrence Livermore National Lab., Livermore, CA USA

Model primary content type for multipurpose internet mail extensions

Nelson, S., Lawrence Livermore National Lab., USA; Parks, C., Lawrence Livermore National Lab., USA; Jan. 1997; 37p; In English

Contract(s)/Grant(s): W-7405-eng-48

Report No.(s): UCRL-ID-123343; DE98-050886; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The purpose of this memo is to propose an update to Internet RFC 2045 to include a new primary content-type to be known as 'model'. RFC 2045 [1] describes mechanisms for specifying and describing the format of Internet Message Bodies via content-type/subtype pairs. We believe that 'model' defines a fundamental type of content with unique presentational, hardware, and processing aspects. Various subtypes of this primary type are immediately anticipated but will be covered under separate documents.

DOE

Internets; Computers; Messages

19980211018 Army War Coll., Carlisle Barracks, PA USA

Strategic Leadership's Role in Information Warfare

Walter, Kevin R., Army War Coll., USA; May 19, 1998; 50p; In English

Report No.(s): AD-A348139; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study examines the appropriate role of strategic leadership in the development of a National Information Strategy and supporting policies. It examines current policy and evaluates its reliance on information technology as a means to implement the policy. It offers a history of the Internet, a look at its accelerated growth, and its relevance to national interest. It concludes by arguing for a coherent, effective National Information Strategy and supporting policies to carry the country into a new millennium.

DTIC

Leadership; Information Systems; Warfare

19980211065 Air Force Research Lab., Wright-Patterson AFB, OH USA

Extending the Library to the Desktop; Using GoldenGate at Wright Laboratory Technical Library ***Final Report, 1 Oct. 1995 - 30 Sep. 1996***

Rohmiller, Thomas D., Air Force Research Lab., USA; Jun. 1998; 10p; In English

Report No.(s): AD-A347716; AFRL-WS-WP-TM-1998-9001; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper was presented at the 40th Military Librarians Workshop, Annapolis, MD, 19-22 Nov 96. Discusses end-user searching of desktop reference services. Such as uncover and GoldenGate at Wright Laboratory, Wright-Patterson AFB, OH. Paper reveals that the number of Librarian Assisted Reference services was not significantly impacted by end-user searching.

DTIC

Libraries; Information Management; Bibliographies

19980211092 Central Research Inst. of Electric Power Industry, Tokyo, Japan

Evaluation of user-friendly document retrieval systems which use 2-dimensional arrangement of keywords ***Keyword wo nijigen heimen ni haichisuru bunsho kensaku system no hyoka***

Tsutsumi, F., Central Research Inst. of Electric Power Industry, Japan; Shinohara, Y., Central Research Inst. of Electric Power Industry, Japan; Mar. 1997; 25p; In Japanese

Report No.(s): CRIE-R-96007; DE98-736456; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Two types of new retrieval systems are developed, 'Visual Weight' which shows importance of keywords on an image and 'Search Space' which allows vagueness of spellings, and are compared for their effectiveness with 3 types of existing systems, 'Extract Request' which extracts keywords, the conventional AND-OR retrieval system and 'WAIS-J' as an internet type system. The databases used for comparison are 50,000 news paper articles issued in 1993 and the questions in the text BMIR-JI edited by Society of Information Processing for assessing information retrieval systems. It is found that a retrieval system that shows priority of keywords by buttons is more effective than the conventional one involving logical expressions. The functions related to vague spellings and keyword extractions are sometimes inefficient, most of the reasons for which have been elucidated.

DOE

Data Processing; Information Retrieval; Texts; Data Bases

19980211138 Pacific Northwest National Lab., Richland, WA USA

Federal Emergency Management Information System (FEMIS). Data management guide, 1.4

Burnett, R. A., Pacific Northwest National Lab., USA; Downing, T. R., Pacific Northwest National Lab., USA; Gaustad, K. L., Pacific Northwest National Lab., USA; Nov. 21, 1997; 172p; In English

Contract(s)/Grant(s): DE-AC06-76RL-01830

Report No.(s): PNL-10611-Ver-1.4; DE98-051173; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The Federal Emergency Management Information System (FEMIS) is an emergency management planning and analysis tool that is being developed under the direction of the U.S. Army Chemical and Biological Defense Command. This Data Management Guide provides the background, operations, and procedures needed to generate and maintain the data resources in the system. Information required to manage the data files and database used to support the administrative, user-environment, database management, and operational capabilities of the system are provided. This document provides a description of the relational and spatial information present in FEMIS. It describes how the data was assembled, how it is loaded, and how it is managed while the system is in operation.

DOE

Data Base Management Systems; Information Systems; Emergencies

19980211416 Georgia Inst. of Tech., School of Textile and Fiber Engineering, Atlanta, GA USA

Develop and Implement an Integrated Enterprise Information System for a Computer-Integrated Apparel Enterprise (CIAE) ***Final Report, 14 Sep. 1996 - 4 Nov. 1997***

Jayaraman, Sundaresan, Georgia Inst. of Tech., USA; Jan. 24, 1998; 76p; In English

Contract(s)/Grant(s): SPO100-95-D-1003/0005

Report No.(s): AD-A347171; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Research has been carried out to design, develop and implement an Information System for defense apparel manufacturers using the building blocks from the Apparel Manufacturing Architecture (AMA), a generic architecture for an apparel enterprise. ARN-AIMS consists of three modules - Order Processing, Order Tracking and Shipping & Invoicing. The Order Processing Module is designed to facilitate the entry of customer orders for stock and special measurements for both military and commercial products. The Order Tracking Module helps the defense apparel manufacturer (DAM) track the status of an order in any part of the enterprise - from order entry through invoicing and identify bottlenecks in the system. It helps the DAM respond easily to inquiries from the customer (e.g., the Defense Personnel Support Center, DPSC). The Shipping and Invoicing Module generates an invoice (e.g., DD250) based on the order information entered in the system. ARN-AIMS runs on IBM compatible machines in Microsoft Access for Windows 95. ARN-AIMS has been successfully implemented at three DAM sites. The ensuing benefits to the DAMs have been quantified. The advantages of the architectural approach to information systems development over an ad hoc approach have been assessed quantitatively.

DTIC

Information Systems; Modules; Product Development; Design Analysis; Manufacturing

19980211417 Logicon Technical Services, Inc., Dayton, OH USA

Situation Awareness Information Dominance and Information Warfare ***Interim Report, Jan. 1996 - Jan 1997***

Endsley, Mica, Logicon Technical Services, Inc., USA; Jones, William M., Logicon Technical Services, Inc., USA; Feb. 1997; 94p; In English

Contract(s)/Grant(s): AF Proj. 7184

Report No.(s): AD-A347166; AL/CF-TR-1997-0156; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Information warfare and its primary objective of achieving information dominance over enemy forces have arisen as a major area of emphasis for future military actions. The concept of information dominance and the issues involved in attaining it are explored through a model of situation awareness within the context of the type of complex, distributed crews (or military units) envisioned in future military operations. Achieving information dominance involves far more than having more data than the enemy. It will require that available data be transformed into relevant information in a timely manner for a multitude of forces, each with varied and dynamically changing but inter-related information needs. Further, the information must be properly understood by each within the context of a joint mission. The difficulty of accomplishing this task is not to be underestimated, however. This is exactly where an understanding of situation awareness and the factors that impact it are essential. by examining what is known about how people access, assimilate and interpret information to develop situation awareness as well as how this fits within the decision making and action cycle, clear directions for the development of systems to support the goal of information dominance can be established.

DTIC

Decision Making; Information Systems; Warfare

19980211478 Energia Nucleare e Delle Energie Alternative, Funzione Centrale Informatica, Rome, Italy

The ENET WAN of ENEA'S geographical network: Present situation and optimization ***La rete geografica ENET dell'ENEA: Situazione attuale e proposte di ottimizzazione***

Bongiovanni, Giancarlo, Rome Univ., Italy; DiMarco, Roberto Antonio, Energia Nucleare e Delle Energie Alternative, Italy; Marocco, Glaudio, Energia Nucleare e Delle Energie Alternative, Italy; Oct. 1997; ISSN 0393-3016; 167p; In Italian

Report No.(s): ENEA-RT-GEN-97-02; DE98-732713; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The wide area networks for data transmission are submitting to evolution process by technological progress and unrelated process to the network. The evolution process can be originated by the bottom up integration of different networks that were born to solve specific problems (i.e.: scientific calculations and business administration). The ENET WAN of ENEA had been submitted to the same evolution progress. In this thesis the author analyze all the problems about WAN with emphasis in ENET WAN. The purpose of this research is the analysis of the present situation in particularly links, efficiency, expenses and throughput. The goal is to suggest alternative solutions to optimized the network and to amplify the throughput by new technology. The research suggests in particularly two new wide area networks: ENET(sub C)-LAN95 e ENET(sub S)ERV96. The first one is a mix interconnection solution, that is basis on the public network C-LAN, with the transportation protocol Frame Relay, and on the private links Numerical Direct Channels (CDN). The second one is also a mix interconnection solution, but it is based on two new network services that are supplied by two new public networks just introduce in Italian telecommunications market since 1996. Frame Relay and ATM are the transportation protocol employed.

DOE

Wide Area Networks; Protocol (Computers); Optimization

19980211587 Army Research Lab., Aberdeen Proving Ground, MD USA

Methodology of Spread-Spectrum Image Steganography ***Final Report, Feb. 1997 - Feb 1998***

Marvel, Lisa M., Army Research Lab., USA; Boncelet, Charles G., Jr., Delaware Univ., USA; Retter, Charles T., Army Research Lab., USA; Jun. 1998; 37p; In English

Contract(s)/Grant(s): DAAL01-96-2-002

Report No.(s): AD-A349102; ARL-TR-1698; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report presents a new method of digital steganography, entitled Spread-Spectrum Image Steganography (SSIS). Steganography, which means "covered writing" in Greek, is the science of communicating in a hidden manner. Following a brief history of this art and a discussion of steganographic communication theory, the new method, SSIS, is introduced. This system hides and recovers messages of substantial length within digital imagery while maintaining the original image size and dynamic range. The hidden messages can be recovered using appropriate keys without any knowledge of the original image. Image processing, error control coding, and spread-spectrum techniques utilized are described, and the performance of the technique is illustrated. A message embedded by this method can be in the form of text, imagery, or any other digital signal. Applications for such data-hiding

scheme include in-band captioning, covert communication, image tamperproofing, authentication, embedded control, and revision tracking.
DTIC
Image Processing; Cryptography; Procedures; Computer Information Security

19980211691 Central Research Inst. of Electric Power Industry, Tokyo, Japan
Development of research activity support system, 3, Automatic link generation/maintenance on self-evolving database ***Kenkyu katsudo shien system no kaihatsu, 3, Jiko zoshokugata database deno bunsho link no jido sakusei/shufuku***
Shimada, T., Central Research Inst. of Electric Power Industry, Japan; Futakata, A., Central Research Inst. of Electric Power Industry, Japan; Apr. 1997; 22p; In Japanese
Report No.(s): CRIE-R-96008; DE98-745986; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

For a coordinated task to be accomplished in an organization, documents, charts, and data produced by plural workers need to be shared by the plural workers. This information sharing setup will function more effectively when the meanings and purposes of documents, etc., are arranged in good order relative to the other documents and when they are managed as a group of documents organically linked with each other and properly updated as the task approaches completion. In the self-evolving databases proposed so far, five types of document links representing the relations between documents are automatically generated and the documents are unifiedly managed for the documents yielded by coordinated work to be arranged in a proper order. A procedure for automatically generating document links are established on the basis of information received from the document retrieval system and Lotus Notes application. In a self-evolving database, the document on either side of a link is apt to be lost due to users' moving or deleting documents. An automatic procedure is developed in this report which will enable such document links to correctly restore themselves without loss of semantic relations.
DOE
Information Retrieval; Information Dissemination; Documents

19980211692 Central Research Inst. of Electric Power Industry, Tokyo, Japan
Techniques for cost-effective electric information sharing ***Cost balance wo koryoshita denshi joho kyoyuka gijutsu***
Shinohara, Y., Central Research Inst. of Electric Power Industry, Japan; Apr. 1997; 22p; In Japanese
Report No.(s): CRIE-R-96023; DE98-745989; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The key technology that can effectively support the sharing of each information such as documents, data, and know-how was rearranged to clarify how to utilize it for constructing an electronic information sharing system. The key technology that supports the sharing of electronic information was rearranged from the viewpoint of information gathering, information rearrangement, and information utilization. The reduction in cost for information gathering and rearrangement is indispensable to the promotion of much information sharing. However, each automation method presently causes the deterioration in quality of the rearranged information and the increase in cost for information utilization. To realize a practical electronic information sharing system, it is important to combine the key technologies properly so that the total cost balance of information gathering and information utilization is improved. Therefore, the combination of character recognition by OCR and unpreciseness retrieval, and the complementary combination of automatic document sorting, based on multiple incomplete rearrangement systems, and multiple sorting menus were proposed.
DOE
Information Systems; Data Processing; Microelectronics; Data Acquisition

19980211718 Los Alamos National Lab., NM USA
An object-based methodology for knowledge representation
Kelsey, R. L., Los Alamos National Lab., USA; Hartley, R. T., New Mexico State Univ., USA; Webster, R. B., Los Alamos National Lab., USA; Nov. 1997; 15p; In English; 6th; International Association for Computing Machinery (ACM) Conference on Information and Knowledge Management, 1-14 Nov. 1997, Las Vegas, NV, USA
Contract(s)/Grant(s): W-7405-eng-36
Report No.(s): LA-UR-97-1598; CONF-971161; DE97-007330; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

An object based methodology for knowledge representation is presented. The constructs and notation to the methodology are described and illustrated with examples. The 'blocks world,' a classic artificial intelligence problem, is used to illustrate some of the features of the methodology including perspectives and events. Representing knowledge with perspectives can enrich the

detail of the knowledge and facilitate potential lines of reasoning. Events allow example uses of the knowledge to be represented along with the contained knowledge. Other features include the extensibility and maintainability of knowledge represented in the methodology.
DOE
Knowledge Representation; Artificial Intelligence; Knowledge Bases (Artificial Intelligence)

19980211720 Los Alamos National Lab., NM USA
An object-based methodology for knowledge representation in SGML
Kelsey, R. L., Los Alamos National Lab., USA; Hartley, R. T., New Mexico State Univ., USA; Webster, R. B., Los Alamos National Lab., USA; Nov. 1997; 19p; In English; 9th; IEEE Tools with Artificial Intelligence, 4-7 Nov. 1997, Newport Beach, CA, USA
Contract(s)/Grant(s): W-7405-eng-36
Report No.(s): LA-UR-97-1828; CONF-971153; DE97-008299; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

An object-based methodology for knowledge representation and its Standard Generalized Markup Language (SGML) implementation is presented. The methodology includes class, perspective domain, and event constructs for representing knowledge within an object paradigm. The perspective construct allows for representation of knowledge from multiple and varying viewpoints. The event construct allows actual use of knowledge to be represented. The SGML implementation of the methodology facilitates usability, structured, yet flexible knowledge design, and sharing and reuse of knowledge class libraries.
DOE
Document Markup Languages; Knowledge Representation; Knowledge Bases (Artificial Intelligence)

19980213329 Central Research Inst. of Electric Power Industry, Tokyo, Japan
Survey of current technologies of security management for distributed information systems ***Bunsangata joho system no security iji kanri hoshiki no genjo***
Matsui, S., Central Research Inst. of Electric Power Industry, Japan; May 1997; 20p; In Japanese
Report No.(s): CRIE-R-96020; DE98-745988; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The latest situation of the security management for a distributed information system was examined and systematically summarized to indicate the management design in future. This paper describes the threat of the distributed information system to security, the risk for confidentiality, integrity, and availability due to the threat, and the measures to be taken. The basic technology of security management is classified into the 'user certification to prevent an incorrect access' and the 'encipherment to prevent data from being used incorrectly.' The technology for certification has been almost completed. It can be securely done using an expendable password or IC card system. In Internet, multiple enciphering technologies for constructing a virtual private network that can secure the almost the same security as for a private network can be used. In an electronic mail, the enciphering technology can also be used easily. The tool that manages the security of very many servers, clients, and networks is in the initial stage.
DOE
Information Systems; Computer Networks; Computer Information Security; Management Information Systems

19980214930 Naval Postgraduate School, Monterey, CA USA
Conceptual Design of a Cybernetic Information System for Command and Control
Oluvic, N. Michael, Naval Postgraduate School, USA; Sep. 1997; 196p; In English
Report No.(s): AD-A347310; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

This thesis argues a case for focusing command and control efforts more towards conflict deterrence vice conflict resolution and proposes a conceptual design for a command and control system to accomplish this paradigm shift. It also addresses the issue of shortening the Observe, Orient, Decide, Act (OODA) Loop of a decision-maker to enhance control while disrupting an adversary's control of a situation. Accomplishing these goals requires some method to handle the overabundance of data available for processing and analysis. The proposed system would use advanced, but existing, information technology, incorporating cybernetic models, to enhance a decision-maker's control process. It does this by collecting, processing, and fusing all-source data for presentation to a decision-maker. Natural Language Processors categorize, filter, and fuse relevant data while advanced visualization engines display that data in a way that improves a decision-maker's ability to rapidly assimilate information, and increase knowledge and understanding. This thesis shows that using cybernetic models, and advanced Artificial intelligence tools, a design

exists that could help increase understanding and control by improving the decision-making process and shortening the decision-maker's OODA Loop.
DTIC
Information Systems; Systems Engineering; Cybernetics; Command and Control

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ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

19980211352 Cleveland State Univ., Economic Development Program, Cleveland, OH USA
The NASA Lewis Research Center's Expendable Launch Vehicle Program: An Economic Impact Study
Austrian, Ziona, Cleveland State Univ., USA; Sep. 11, 1996; 40p; In English
Contract(s)/Grant(s): NAG3-1705
Report No.(s): NASA/CR-96-208227; NAS 1.26:208227; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study investigates the economic impact of the Lewis Research Center's (LeRC) Expendable Launch Vehicle Program (ELVP) on Northeast Ohio's economy. It was conducted by The Urban Center's Economic Development Program in Cleveland State University's Levin College of Urban Affairs. The study measures ELVP's direct impact on the local economy in terms of jobs, output, payroll, and taxes, as well as the indirect impact of these economic activities when they "ripple" throughout the economy. The study uses regional economic multipliers based on input-output models to estimate the effect of ELVP spending on the Northeast Ohio economy.
Author
Economic Impact; Launch Vehicles; Economic Development

89
ASTRONOMY

Includes radio, gamma-ray, and infrared astronomy, and astrometry.

19980211049 Fermi National Accelerator Lab., Batavia, IL USA
Friction model of the 2.5mts SDSS telescope
Rivetta, Claudio H., Fermi National Accelerator Lab., USA; Hansen, Sten, Fermi National Accelerator Lab., USA; Feb. 1998; 14p; In English; Astronomical Telescopes and Instrumentation, 20-27 Mar. 1998, HI, USA; Sponsored by International Society for Optical Engineering, USA
Contract(s)/Grant(s): DE-AC02-76CH-03000
Report No.(s): FNAL/C-98/070; CONF-980349; DE98-052615; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The 2.5mts telescope designed for the Sloan Digital Sky Survey (SDSS) is a mechanical structure that presents five degree-of-freedom. Azimuth, altitude and the instrument rotator axis are fitted with servo controls. The low frequency dynamic are dominated by the bearing friction. Several mathematical models have been presented in the literature to include its effect into the dynamic model of mechanical structures. The model employed in this paper includes consideration of the Striebeck effect, dynamic behavior at very low velocities and the pre-sliding at near zero-velocity. Results of the parameter estimation of the friction model of the three principal axes are presented as well as the behavior of the structure when different torque stimuli are applied. The mathematical model used to include the friction phenomena into the telescope dynamic model is simple. It does a good job of describing the friction over a wide range of velocities but particularly at or below siderial rate. It is a straight forward process to determine the parameters and, in simulations, does not require large amounts of computer time.
DOE
Degrees of Freedom; Dynamic Characteristics; Dynamic Models; Low Frequencies; Mathematical Models; Servomechanisms

19980211346 Eureka Scientific, Inc., Oakland, CA USA
A Survey of Variable Extragalactic Sources with XTE's All Sky Monitor (ASM) ***Final Report***
Jernigan, Garrett, Eureka Scientific, Inc., USA; Feb. 1998; 5p; In English
Contract(s)/Grant(s): NASA Order S-73037-Z
Report No.(s): NASA/CR-1998-206869; NAS 1.26:206869; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The original goal of the project was the near real-time detection of AGN utilizing the SSC 3 of the ASM on XTE which does a deep integration on one 100 square degree region of the sky. While the SSC never performed sufficiently well to allow the success of this goal, the work on the project has led to the development of a new analysis method for coded aperture systems which has now been applied to ASM data for mapping regions near clusters of galaxies such as the Perseus Cluster and the Coma Cluster. Publications are in preparation that describe both the new method and the results from mapping clusters of galaxies.
Author
Astronomical Maps; Galactic Clusters; Galaxies; Mapping

19980211453 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Spatially Resolved Spectroscopy of the SNR IC443 ***Final Report, 15 Apr. 1994 - 14 Dec. 1995***
Gorenstein, P., Smithsonian Astrophysical Observatory, USA; Jul. 1998; 4p; In English
Contract(s)/Grant(s): NAG5-2568; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

IC 443 is a supernova remnant of intermediate age, i.e. a few thousand years. It is especially interesting because part of its periphery is expanding into a molecular cloud while other sections are expanding into a typical interstellar medium of much lower density. Since the evolution of a supernova remnant through its various phases is affected by the density of the medium it expands into with the reasonable assumption that the supernova explosion was approximately symmetric we have an opportunity to observe a single object in two phases simultaneously. It was observed by ASCA in April, 1993 for a short period during the PV phase and more thoroughly in a 42 ksec exposure in March, 1994. The latter measurement provides most of the results that have been reported. Most of the analysis took place after the grant ended but is included here for completeness. The data was sent simultaneously to US and Japanese Pls. We worked independently. The software set of FTOOLs was used to construct images and spectra. They were judged to be rather unintuitive and not at all user friendly. I found I was using one FTOOL to read the header to obtain information that would only be provided to another FTOOL. The Japanese investigators were more successful. They analyzed the data and published results more rapidly. The scientific results summarized below are based primarily on their publications. Since IC 443 is an interesting example of a middle aged SNR in which a variety of processes are occurring it is one of a class. IC 443 exhibits shell-like emission in hard X-rays and extended soft X-rays with thin thermal spectra. It resembles SN 1006 in these respects. IC 443 contains hard X-rays in a semi-circular shell surrounding the thermal component. The total hard X-ray flux in the ASCA FOV is only a half of the Ginga hard component; which suggests that the hard X-rays are not confined only in the shell but some are extended larger than the ASCA FOV of eq 1 degree diameter. Japanese investigators examined the spatial structure of the thermal component and analyzed the GIS spectra with a non-equilibrium plasma model, and found no systematic variation of the interstellar absorption across the remnant. Evidence for shock acceleration of cosmic rays to high energies (10 TeV) was found by Keohane. X-ray imaging spectroscopy with ASCA reveals two regions of particularly hard emission: an unresolved source embedded in an extended emission region, and a ridge of emission coincident with the southeastern rim. Both features are located on part of the radio shell where the shock wave is interacting with molecular gas, and together they account for a majority of the emission at 7 keV. Though we would not have noticed it a priori, the unresolved feature is coincident with one resolved by the ROSAT HRI. The ASCA measurements were combined with higher energy data from the XTE and GRO missions and with radio and TeV gamma-ray data to produce a nonthermal multiwavelength spectrum for IC 443 which was fit with a cosmic ray interaction model. This model calculates the cynchrotron, bremsstrahlung, invers Compton, and neutral pion decay emission produced by locally accelerated cosmic ray interacting with ambient matter, soft photon fields, and magnetic fields.
Derived from text
Supernova Remnants; Cosmic Rays; Gamma Rays; Plasmas (Physics); Molecular Clouds; Molecular Gases; X Ray Imagery

19980211454 Pennsylvania State Univ., Dept. of Astronomy and Astrophysics, University Park, PA USA
CNO Processing in Massive Algol Binaries ***Final Report, 15 Jul. 1991 - 14 Jul. 1998***
Wade, Richard A., Pennsylvania State Univ., USA; Aug. 10, 1998; 3p; In English
Contract(s)/Grant(s): NAG5-1698; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This program, used ultraviolet observations by the IUE Observatory along with other tools to search for abundance anomalies indicative of CNO processing in the secondary (mass-donating) stars of six interacting binary systems. Related IUE-based activities were also undertaken under this grant. Two Supplements to the grant were awarded. Supplement No. 1 was in connection with the NASA Grant Supplements for Education program, for a workshop for elementary school science teachers. The two sessions of the workshop were held October 24 and November 14, 1992. Eighteen school teachers from central Pennsylvania, grades 1-7, participated in the workshop, for which they received one unit of in-service training credit from their Intermediate Unit. Supplement No. 2 was awarded for additional IUE observations of the Algol stars V342 Aql and TU Mon. Observations of all six candidate stars were made with IUE, and attention was narrowed to TU Mon in particular, for which further IUE observations were made using Director's discretionary time. Observations of TU Mon were also carried out with the Voyager UV spectrometers,

and optical spectroscopy was obtained on several occasions at Penn State's Black Moshannon Observatory. Photometric data on TU Mon were acquired by Dr. Paul Etzel at Mt. Laguna Observatory (MLO). McGouldrick was employed part-time during the Fall academic semester to assist in accessing the IUE Archive, and to correlate data on some cataclysmic variables and related objects that were observed with both IUE and the Voyager Far Ultraviolet Spectrometers. Approximately 21 relevant binary systems were observed with the Voyager UVS over the past decade, and a paper is being prepared for eventual publication that will serve as an index to the UVS data archive on these stars, providing observation dates, mean count rates in far and extreme UV bands, and a discussion of the relevant literature concerning the far UV behavior (including correlative IUE information from the archive and the literature). Much of the activity under the grant was in connection with V342 Aquilae, a 3.39 day Algol system thought to be in a state of rapid mass transfer. The goal was to combine optical and ultraviolet data to arrive at a robust, informative interpretation of this unique binary system. Complete orbital phase coverage of V342 Aql was obtained spectroscopically and photometrically.
Derived from text
Binary Stars; Anomalies; Stellar Mass; Mass Transfer; IUE

19980211457 Ball Aerospace and Technologies Corp., Boulder, CO USA
Sub-arcsec X-Ray Telescope for Imaging The Solar Corona In the 0.25 - 1.2 keV Band ***Final Report***
Gallagher, Dennis, Ball Aerospace and Technologies Corp., USA; Cash, Webster, Colorado Univ., USA; Jelsma, Schuyler, Colorado Univ., USA; Farmer, Jason, Colorado Univ., USA; 1996; 18p; In English
Contract(s)/Grant(s): NAGw-4064; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We have developed an X-ray telescope that uses a new technique for focusing X-rays with grazing incidence optics. The telescope was built with spherical optics for all of its components, utilizing the high quality surfaces obtainable when polishing spherical (as opposed to aspherical) optics. We tested the prototype X-ray telescope in the 300 meter vacuum pipe at White Sands Missile Range, NM. The telescope features 2 degee graze angles with tungsten coatings, yielding a bandpass of 0.25-1.5 keV with a peak effective area of 0.8 sq cm at 0.83 keV. Results from X-ray testing at energies of 0.25 keV and 0.93 keV (C-K and Cu-L) verify 0.5 arcsecond performance at 0.93 keV. Results from modeling the X-ray telescope's response to the Sun show that the current design would be capable of recording 10 half arcsecond images of a solar active region during a 300 second NASA sounding rocket flight.
Author
X Ray Telescopes; Procedures; Product Development; X Rays; Imaging Techniques

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust. For related information see also 75 Plasma Physics.

19980210875 Johns Hopkins Univ., Baltimore, MD USA
The Study of Clusters of Galaxies and Large Scale Structures ***Final Report***
1998; 4p; In English
Contract(s)/Grant(s): NAGw-2508
Report No.(s): NASA/CR-1998-208240; NAS 1.26:208240; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The work on the ROSAT Deep Survey has been successfully completed. A number of interesting results have been established within this joint MPE, Cal Tech, JHU, ST Scl, ESO collaboration. First, a very large fraction, 70-80 percent, of the X-ray background has been directly resolved into point sources. We have derived a new log N-log S for X- ray sources and have measured a source density of 970 sources per square degree at a limiting flux level of 10(exp -15)/erg s sq cm (0.5-2.0 keV). Care was taken in these studies to accurately model and measure the effects of sources confusion. This was possible because of our observing strategy which included both deep PSPC and HRI observations. In the last year we initiated work in the design and development of the Next Generation Space Telescope.
Derived from text
Galactic Clusters; Data Acquisition; Surveys; Background Radiation

19980210933 Associated Universities, Inc., New York, NY USA
Non-equilibrium many body dynamics, Volume 4
Creutz, M., Associated Universities, Inc., USA; Gyulassy, M., Associated Universities, Inc., USA; Sep. 22, 1997; 247p; In Eng-

lish; Non-Equilibrium Many Body Dynamics, 23-25 Sep. 1997, Upton, NY, USA
Contract(s)/Grant(s): DE-AC02-76CH-00016
Report No.(s): BNL-64912-Vol-4; CONF-9709192-Vol-4; DE98-001892; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This Riken BNL Research Center Symposium on Non-Equilibrium Many Body Physics was held on September 23-25, 1997 as part of the official opening ceremony of the Center at Brookhaven National Lab. A major objective of theoretical work at the center is to elaborate on the full spectrum of strong interaction physics based on QCD, including the physics of confinement and chiral symmetry breaking, the parton structure of hadrons and nuclei, and the phenomenology of ultra-relativistic nuclear collisions related to the up-coming experiments at RHIC. The opportunities and challenges of nuclear and particle physics in this area naturally involve aspects of the many body problem common to many other fields. The aim of this symposium was to find common theoretical threads in the area of non-equilibrium physics and modern transport theories. The program consisted of invited talks on a variety topics from the fields of atomic, condensed matter, plasma, astrophysics, cosmology, and chemistry, in addition to nuclear and particle physics. Separate abstracts have been indexed into the database for contributions to this workshop.
DOE
Atomic Physics; Nuclear Particles; Quantum Chromodynamics; Conferences; Strong Interactions (Field Theory); Many Body Problem

19980211151 Massachusetts Univ., Amherst, MA USA
An Investigation of the Cold Interstellar Medium of the Outer Galaxy ***Final Report, 1 Aug. 1995 - 31 Jul. 1997***
Heyer, Mark H., Massachusetts Univ., USA; 1997; 3p; In English
Contract(s)/Grant(s): NAG5-3013
Report No.(s): NASA/CR-1997-112544; NAS 1.26:112544; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The primary objective of this proposal was to determine the relationship between the molecular gas and dust components of the interstellar medium of the Outer Galaxy. It made use of the High Resolution IRAS Galaxy Atlas and the FCRAO CO Survey of the Outer Galaxy. These HIRES images greatly augment the spatial dynamic range of the IRAS Survey data and the ability to discriminate multiple point sources within a compact region. Additionally, the HIRES far infrared images allow for more direct comparisons with molecular line data observed at 45 sec resolution. From funding of this proposal, we have completed two papers for publication in a refereed journal.
Author
Examination; Exploration; Interstellar Matter; Galaxies; Molecular Gases; Dust

19980211451 Smithsonian Astrophysical Observatory, Cambridge, MA USA
OORT-Cloud and Kuiper-Belt Comets ***Final Report, 1 Nov. 1997 - 28 Feb. 1998***
Whipple, Fred L., Smithsonian Astrophysical Observatory, USA; Aug. 1998; 24p; In English
Contract(s)/Grant(s): NAG5-3780; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper follows the broadly accepted theory that Oort-Cloud Comets originated in the Solar Nebula in the general region where the major planets, Jupiter and Saturn, were formed while the Kuiper-Belt Comets originated farther out where the temperatures were lower. The Oort-Cloud Comets are identified orbitally by long periods and random inclinations and, including the Halley-type comets, comets with a Tisserand Criterion less than 2.0. Kuiper-Belt comets are identified by short periods, usually much less than 200 years, and small inclinations to the ecliptic. Here two criteria for comet activity are found to separate the two classes of comets. These quantities NG1 and NG2, were intended to measure theoretical nongravitaional effects on comet orbits. They are only, mildly successful in correlations with observed cases of measured non-gravitational forces. But, in fact, their variations with perihelion distance separate the two classes of comets. The results are consistent with the theory that the activity or intrinsic brightness of Oort-Cloud Comets fall off faster with increasing perihelion distance that does the intrinsic brightness of short-period Kuiper-Belt Comets.
Derived from text
Oort Cloud; Comets; Gravitational Fields; Planets

19980211455 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Mineralogic and Petrologic Studies of Meteorites and Lunar Samples ***Final Report, 1 Feb. 1993 - 30 Sep. 1997***
Wood, John A., Smithsonian Astrophysical Observatory, USA; Feb. 1998; 4p; In English
Contract(s)/Grant(s): NAGw-3451
Report No.(s): NASA/CR-1998-208302; NAS 1.26:208302; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In the period named, P.I. Wood and his Research Associate M.I. Petaev published or submitted for publication the following papers and abstracts, which address the subjects: Simulation of melting-crystallization relationships in chondritic and achondritic igneous systems. METEOMOD: A numerical model for the calculation of melting-crystalyization relationships in meteoritic igneous systems. Secondary Ca-Fe-rich minerals in the Bali-like and Allende-like oxidized CV3 chondrites and Allende dark inclusions. Silica minerals in the Gibeon IVA iron meteorite. Drusy vugs in the Albion iron meteorite: Mineralogy and textures. Search for exsolved ferromagnesian olivines: A meteoritic survey. Cr-bearing minerals in the Gibeon IVA iron: Indicators of sulfur and oxygen fugacities in the parent body. Lunar Planet. Computer modelling of ordinary chondrite melting. Drusy vugs in the Albion iron meteorite: Early speculation on the origin. Also Processing of chondritic and planetary material in spiral density waves in the nebula. Chondrite formation by turbulence and shock in the solar nebula.
CASI
Computerized Simulation; Chondrites; Crystallization; Mathematical Models; Planetary Nebulae; Lunar Geology

91
LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design or space stations see 18 Spacecraft Design, Testing and Performance.

19980211389 Wisconsin Univ., Space Science and Engineering Center, Madison, WI USA
Temporal Evolution of SL-9 Impact Sites on Jupiter and Global Maps of Jupiter from Multi-Observatory Visible and Infrared Images ***Final Report, 1 Jan. - 31 Dec. 1996***
Limaye, Sanjay S., Wisconsin Univ., USA; 1996; 30p; In English
Contract(s)/Grant(s): NAG5-4988
Report No.(s): NASA/CR-1996-207820; NAS 1.26:207820; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The objective of this research was to investigate the temporal behavior of the impact features on Jupiter created by the fragments of the Shoemaker Levy-9 comet that collided with the planet in July 1994. The primary observations used in the study were ground based images of Jupiter acquired from the Swedish Solar Vacuum Tube on the island of La Palma in the Canary Islands. The measurement of position of the impact features in images acquired immediately after the impact over a period of a few days revealed that the apparent drift rates were too high and that a repetitive pattern could be seen in the longitude position on successive rotations. This could be explained only by the fact that the measured longitudes of the impact sites were being affected by parallax due to a significant elevation of the impact debris above the nominal cloud top altitude value used for image navigation. Once the apparent positions are analyzed as a function of the meridian angle, the parallax equation can be used to infer the height of the impact features above the cloud deck, once the true impact position (longitude) for the feature is known. Due to their inherent high spatial resolution, the HST measurements of the impact site locations have been accepted widely. However, these suffer from the parallax themselves since few of them were obtained at central meridian. Ground based imaging have the potential to improve this knowledge as they do observe most of the impact sites on either side of the central meridian, except for the degraded resolution. Measurements over a large number of images enables us to minimize the position error through regression and thus estimate both the actual impact site location devoid of parallax bias, and also of the altitude level of the impact debris above the cloud deck. With rapid imaging there is the potential to examine the time evolution of the altitude level. Several hundred ground based images were processed, navigated and subjected to the impact site location measurements. HST images were also acquired and used to calibrate the results and to improve the sample. The resources available enabled an in-depth study only of impact site A, however, many more images have since become available through the global network observations through Lowell Observatory.
Derived from text
Jupiter (Planet); Maps; Evolution (Development); Comets; Impact Damage

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see 93 Space Radiation.

19980210940 Brookhaven National Lab., Upton, NY USA
Prediction and measurement of direct-normal solar irradiance: A closure experiment
Halthore, R. N., Brookhaven National Lab., USA; Schwartz, S. E., Brookhaven National Lab., USA; Michalsky, J. J., State Univ. of New York, USA; Anderson, G. P., Phillips Lab., USA; Ferrare, R. A., NASA Goddard Space Flight Center, USA; Ten Brink,

H. M., Netherlands Energy Research Foundation, Netherlands; Mar. 1997; 7p; In English; Atmospheric Research Management Science Team Meeting, 4-7 Mar. 1997, San Antonio, TX, USA
Contract(s)/Grant(s): DE-AC02-76CH-00016
Report No.(s): BNL-64443; CONF-970365-3; DE97-008262; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Direct-Normal Solar Irradiance (DNSI), the total energy in the solar spectrum incident on a plane perpendicular to the Sun's direction on a unit area at the earth's surface in unit time, depends only on the atmospheric extinction of sunlight without regard to the details of extinction-whether absorption or scattering. Here the authors describe a set of closure experiments performed in north-central Oklahoma, wherein measured atmospheric composition is input to a radiative transfer model, MODTRAN-3, to predict DNSI, which is then compared to measured values. Thirty six independent comparisons are presented; the agreement between predicted and measured values falls within the combined uncertainties in the prediction (2%) and measurement (0.2%) albeit with a slight bias ((approximately) 1% overprediction) that is independent of the solar zenith angle. Thus these results establish the adequacy of current knowledge of the solar spectrum and atmospheric extinction as embodied in MODTRAN-3 for use in climate models. An important consequence is the overwhelming likelihood that the atmospheric clear-sky absorption is accurately described to within comparable uncertainties.
DOE
Solar Radiation; Predictions; Radiation Measurement; Earth Atmosphere

19980210967 Science Applications International Corp., San Diego, CA USA
The Structure and Dynamics of the Solar Corona ***Progress Report No. 1, 26 Jul. 1996 - 15 Jul. 1997***
Mikic, Zoran, Science Applications International Corp., USA; Jun. 19, 1998; 38p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS5-96081
Report No.(s): NASA/CR-1998-208311; NAS 1.26:208311; SAIC-98/1031:APPAT-202; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report covers technical progress during the first year of the NASA Space Physics Theory contract between NASA and Science Applications International Corporation. Under this contract SAIC, the University of California, Irvine (UCI), and the Jet Propulsion Laboratory (JPL), have conducted research into theoretical modeling of active regions, the solar corona, and the inner heliosphere, using the MHD model. During the period covered by this report we have published 26 articles in the scientific literature. These publications are listed in Section 4 of this report. In the Appendix we have attached reprints of selected articles.
Author
Atmospheric Physics; Solar Corona; Mathematical Models; Heliosphere

19980210968 Science Applications International Corp., San Diego, CA USA
The Structure and Dynamics of the Solar Corona ***Progress Report No. 2, 16 Jul. 1997 - 15 Jun. 1998***
Mikic, Zoran, Science Applications International Corp., USA; Jun. 19, 1998; 110p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS5-96081
Report No.(s): NASA/CR-1998-208312; NAS 1.26:208312; SAIC-98/1032:APPAT-203; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Under this contract SAIC, the University of California, Irvine (UCI), and the Jet Propulsion Laboratory (JPL), have conducted research into theoretical modeling of active regions, the solar corona, and the inner heliosphere, using the MHD model. During the period covered by this report we have published 17 articles in the scientific literature. These publications are listed in Section 4 of this report. In the Appendix we have attached reprints of selected articles.
Author
Mathematical Models; Solar Corona; Magnetohydrodynamics

19980210999 Raytheon STX Corp., Lanham, MD USA
BATSE Solar Flare Spectroscopy ***Final Report***
Schwartz, R. A., Raytheon STX Corp., USA; Mar. 1998; 9p; In English
Contract(s)/Grant(s): NASA Order S-67246-Z
Report No.(s): NASA/CR-1998-206868; NAS 1.26:206868; Rept-98-REP-0187; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This final report describes the progress originally proposed: (1) the continued improvement of a software and database environment capable of supporting all users of BATSE solar data as well as providing scientific expertise and effort to the BATSE

solar community; (2) the continued participation with the PI team and other guest investigators in the detailed analysis of the BATSE detectors' response at low energies; (3) using spectroscopic techniques to fully exploit the potential of electron time-of-flight studies; and, (4) a full search for flare gamma-ray line emission at 2.2 MeV from all GOES X-class flares observed with BATSE.
Author
Solar Flares; Spectroscopy; Gamma Ray Bursts; GOES Satellites; Spaceborne Astronomy

19980211450 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Structure and Dynamics of the Solar Chromosphere ***Final Report, 1 May 1995 - 31 Mar. 1998***
Kalkofen, Wolfgang, Smithsonian Astrophysical Observatory, USA; Jul. 1998; 14p; In English
Contract(s)/Grant(s): NAGw-4658; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The problem of chromospheric dynamics and heating consists of two problems: one, concerning the magnetic network on the boundary of supergranulation cells (CB), where the oscillation period is seven minutes, and the other, concerning the cell interior (CI), where the oscillation period is three minutes. The observational data on the oscillations and the emission of radiation can be used to determine the structure and dynamics of the atmosphere provided answers are known to three critical questions, concerning: the nature of the waves powering the bright points, the origin of the observed oscillation periods and the mechanism of chromospheric heating. The recent modeling of the dynamics of the CI, which combines a sophisticated treatment of gas dynamics and radiative transfer in a one-dimensional model with empirical velocity input from the observations, answered the first of these questions: the waves powering K(sub 2upsilon), bright points are propagating acoustic waves. This firm conclusion declares invalid the model of Leibacher & Stein, which explains the observed period with standing acoustic waves in a chromospheric cavity. On the third question, the heating of the chromosphere in the CI, their model predicts that the temperature in the chromosphere is declining in the outward direction up to a height of at least I Mm most of the time, so even the time-average temperature is dropping monotonically in the outward direction, implying that lines formed in the chromosphere up to a height of at least 1 Mm appear in absorption most of the time and everywhere in the CI. The problem of the CI can be resolved with a two-component model, which combines a model for K(sub 2upsilon), bright points with a model for the background. The bright point model has the same aims as the CS94 model, except that the empirical driving from the LRK93 observations is replaced by impulsive excitation, as suggested by the properties of the Klein-Gordon equation.
Derived from text
Solar Atmosphere; Chromosphere; Dynamic Characteristics; Data Processing; Oscillations; Radiative Transfer

93
SPACE RADIATION

Includes cosmic radiation; and inner and outer earth's radiation belts. For biological effects of radiation see 52 Aerospace Medicine. For theory see 73 Nuclear and High-Energy Physics.

19980211449 Brown Univ., Providence, RI USA
Anisotropy of the Cosmic Microwave Background Radiation on Large and Medium Angular Scales, ***1 Jul. 1994 - 30 Ju. 1997***
Houghton, Anthony, Brown Univ., USA; Timbie, Peter, Brown Univ., USA; Jul. 21, 1998; 4p; In English
Contract(s)/Grant(s): NAG5-2629; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This grant has supported work at Brown University on measurements of the 2.7 K Cosmic Microwave Background Radiation (CMB). The goal has been to characterize the spatial variations in the temperature of the CMB in order to understand the formation of large-scale structure in the universe. We have concurrently pursued two measurements using millimeter-wave telescopes carried aloft by scientific balloons. Both systems operate over a range of wavelengths, chosen to allow spectral removal of foreground sources such as the atmosphere, Galaxy, etc. The angular resolution of approx. 25 arcminutes is near the angular scale at which the most structure is predicted by current models to be visible in the CMB angular power spectrum. The main goal is to determine the angular scale of this structure; in turn we can infer the density parameter, Omega, for the universe as well as other cosmological parameters, such as the Hubble constant.
Derived from text
Background Radiation; Radiation Measurement; Anisotropy; Microwaves; Cosmic Rays

19980211452 Smithsonian Astrophysical Observatory, Cambridge, MA USA

Study of MeV/GeV/Sources. TeV Extension of First CGRO EGRET Catalogue Sources Multiwavelength Blazar Studies: A Search for TeV Emission from Bursts Detected by BATSE ***Final Report, 1 Mar. 1994 - 30 Apr. 1997***

Weekes, Trevor C., Smithsonian Astrophysical Observatory, USA; Jul. 1998; 6p; In English

Contract(s)/Grant(s): NAG5-2513; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Whipple Gamma Ray Collaboration was formed in 1982 with the aim of improving the sensitivity of the ground-based atmospheric Cherenkov technique by the use of imaging cameras on large optical detectors. The approach was successful and the discipline of ground-based TeV astronomy was established. The first confirmed galactic source was discovered by the Whipple Collaboration as were the first two extragalactic sources. The technique has now matured and several new and important astrophysical results have been produced. The gamma-ray group of the Smithsonian Astrophysical Observatory is a key component of the Whipple Gamma Ray Collaboration. With all its members resident in Arizona, all its activities are devoted to research in ground-based gamma-ray astronomy.

Author

Astrophysics; Sensitivity; Optical Measuring Instruments; Imaging Techniques; Gamma Ray Sources (Astronomy)

19980211473 NASA Langley Research Center, Hampton, VA USA

Extraction of In-Medium Nucleon-Nucleon Amplitude From Experiment

Tripathi, R. K., Hampton Univ., USA; Cucinotta, Francis A., NASA Johnson Space Center, USA; Wilson, John W., NASA Langley Research Center, USA; Jul. 1998; 14p; In English

Contract(s)/Grant(s): NCC1-242; RTOP 199-45-16-12

Report No.(s): NASA/TP-1998-208438; NAS 1.60:208438; L-17674; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The in-medium nucleon-nucleon amplitudes are extracted from the available proton-nucleus total reaction cross sections data. The retrieval of the information from the experiment makes the estimate of reaction cross sections very reliable. Simple expressions are given for the in-medium nucleon-nucleon amplitudes for any system of colliding nuclei as a function of energy. Excellent agreement with experimental observations is demonstrated in the ion-nucleus interactions.

Author

Nucleon-Nucleon Interactions; Cross Sections; Quantum Mechanics; Nuclear Chemistry

19980211510 Istituto Nazionale di Fisica Nucleare, Laboratori Nazionali di Frascati, Rome, Italy

Algorithms for correlation analysis between gamma-bursts and gravitational wave data

Modestino, G., Istituto Nazionale di Fisica Nucleare, Italy; Pizzella, G., Istituto Nazionale di Fisica Nucleare, Italy; Oct. 1997; 10p; In English

Report No.(s): INFN-LNF-97-038; DE98-759675; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The problem of searching for possible correlation between the gamma bursts of still unknown origin and the data recorded with gravitational wave antennas is studied. The accuracy that can be obtained by averaging the gravitational wave data obtained in correspondence with gamma-bursts is evaluated.

DOE

Algorithms; Correlation; Gravitational Waves; Gamma Ray Bursts

19980211557 Los Alamos National Lab., NM USA

Energetic particle acceleration at corotating interaction regions: Ulysses results

Desai, M. I., European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands; Marsden, R. G., European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands; Sanderson, T. R., European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands; Balogh, A., Imperial Coll. of Science Technology and Medicine, UK; Forsyth, R. J., Imperial Coll. of Science Technology and Medicine, UK; Gosling, J. T., Los Alamos National Lab., USA; Jul. 1997; 7p; In English; 25th; International Cosmic Ray Conference, Jul. 1997, Durban, South Africa

Contract(s)/Grant(s): W-7405-eng-36

Report No.(s): LA-UR-97-2055; CONF-9707103; DE97-008982; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We present here statistical properties of energetic ions (tilde 1 MeV) accelerated by corotating interaction regions observed at the Ulysses spacecraft. We have correlated the tilde 1 MeV proton intensity measured near the trailing edges of the interaction

regions with their compression ratio. We interpret our results in terms of the plasma conditions experienced at Ulysses and identify a likely source of the low energy seed particles accelerated at the interaction regions.
DOE
Ulysses Mission; Statistical Distributions; Particle Acceleration

19980211726 Los Alamos National Lab., NM USA
The galactic dynamo, the helical force free field and the emissions of AGN
Colgate, S., Los Alamos National Lab., USA; Li, Hui, Los Alamos National Lab., USA; May 1997; 16p; In English; Relativistic Jets In Agns, 26-30 May 1997, Cracow, Poland
Contract(s)/Grant(s): W-7405-eng-36
Report No.(s): LA-UR-97-2523; CONF-9705181; DE97-008885; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

We present a theory relating the central galactic black hole (BH) formation to the galactic dynamo through an accretion disk. The associated AGN emissions and the collimated radio sources are then a result of the dynamo process. A unified theory of quasar and BL-Lac formation (hereafter AGN) starts with the collapse of damped Lyman-alpha clouds, presumably proto-galaxies, which then evolve to a central disk and black hole, (BH). An alpha - omega dynamo forms in this accretion disk where the augmentation of the poloidal field from the toroidal field depends upon star disk collisions. The winding number of the inner most orbit of the disk is so large, tilde 10 to the 11th power that the total gain of the dynamo is semi-infinite, and the original seed field of no consequence. The total magnetic flux produced is tilde 10000 times that of the galaxy, sufficient to explain the much larger flux of clusters. The semi-infinite gain of the dynamo implies that the field saturates at the dynamic stress so that most of the free energy of formation of the BH is carried off as magnetic energy in the form of a magnetic helix. The dissipation of this magnetic energy leads to the unique emission spectrum of AGN as well as the equally startling collimated radio and optical sources.
DOE
Galaxies; Dynamic Loads; Force-Free Magnetic Fields; Emission Spectra; Black Holes (Astronomy); Field Emission

99
GENERAL

19980211362 New Energy and Industrial Technology Development Organization, Tokyo, Japan
Leading research in fiscal 1996: Research study on advanced measurement/analysis technology ***1996 nendo sendo kenkyu: Kodo keisoku bunseki gijutsu ni kansuru chosa kenkyu***
Mar. 1997; 169p; In Japanese
Report No.(s): NEDO-PR-9614; DE98-745399; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

For development of production technologies suitable for environment, safety, and advanced information-oriented society by improving the flexibility of production lines, some new measurement technologies were researched. Problem solution was attempted by combining the in-situ multi-dimensional measurement technology capable of easily obtaining various 3-D information with the non-contact photon measurement technology superior in operability and sensitivity under any environment conditions. This solution requires a compact radiation source with higher brightness and wider spectral range, and a high-sensitive detector. The technology concentrating photon onto minute regions, high-efficiency transmission, and control technology of photon wave front are also necessary. Development and international standardization of a common interface is unavoidable. In addition, its network is essential for advanced use of multimedia,. In the future, the comfortable life surrounded by advanced products and multimedia, comfortable social environment, safety and resource saving will be achieved by this technology.
DOE
In Situ Measurement; Chemical Analysis; Technology Assessment

Subject Term Index

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