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DOE New Technology

Support

DOE New Technology is prepared for DOE's Office of Technology Utilization in support of its technology transfer outreach program.

Purpose

The purpose of *DOE New Technology* is to provide information on how to access specific technologies developed through research sponsored by DOE and performed by DOE laboratories or by DOE-contracted researchers. This document describes technologies identified as having potential for commercial applications, in addition to a catalog of current patent applications and patents available for licensing from DOE and DOE contractors.

Content

DOE New Technology is divided into three sections. The first section, "New Technology from DOE," consists of technology assessments which are prepared by DOE laboratories when a research project is judged as having potential for commercial applications. These entries describe each technology and give a point of contact for more information. The second and third sections, "Patents Available for Licensing from DOE," and "Other Patents from Technologies Funded by DOE" include both current technologies' patents and patent applications. Technologies owned by DOE are announced at both the application and the patent stage, while technologies funded-but-not-owned by DOE are announced at patent stage only. Inventor, Subject, Contract Number, and Patent Number Indexes, each preceded by a brief description, are provided.

CAUTION: There are a variety of mechanisms by which others can take title to DOE-funded technologies; therefore, some of these patents may have changed ownership since issuance.

These records are contained in the Energy Science and Technology Database and New Technology from DOE Database. These databases are available online to DOE and its contractors through the DOE Integrated Technology Information System (ITIS).

This issue contains information available from April 1, 1993, to September 30, 1993.

Availability

DOE and DOE contractors who have OSTI deposit accounts may obtain *DOE New Technology* from the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831, Attention: Information Services. For further information call (615) 576-8401. VISA and MasterCard are also accepted.

This publication is available to the public from the U.S. Department of Commerce, Technology Utilization, National Technical Information Service, Springfield, VA 22161.

Requests for additional information regarding "New Technology from DOE" (Section I) should be addressed to the contact shown in the individual citation. A compiled listing of Technology Transfer Contacts at each DOE facility is provided for your convenience beginning on page iv.

Information regarding DOE patents (Section II) and requests for license application forms should be addressed to Assistant General Counsel for Intellectual Property, U.S. Department of Energy, Washington, DC 20585.

Information regarding "Other Patents from Technologies Funded by DOE" (Section III) may be obtained from the appropriate corporate entity shown in the citation header. For licensing contacts, see page iv.

Technical Editor, Amy T. Tamura
Managing Editor, Doris M. Henline

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Subject Contents

The subject content of *DOE New Technology* is arranged as shown below. The two-digit category numbers printed here illustrate the category number assignment used in the database records.* The following list includes all of the 38 first-level categories. There are 313 second-level categories not shown here. Because each issue of *DOE New Technology* publishes citations only for those documents announced since the last publication, some subject categories may not be present in every issue.

Numerical Listing of Categories

01 COAL, LIGNITE, AND PEAT
02 PETROLEUM
03 NATURAL GAS
04 OIL SHALES AND TAR SANDS
05 NUCLEAR FUELS
07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY
08 HYDROGEN
09 BIOMASS FUELS
10 SYNTHETIC FUELS
13 HYDRO ENERGY
14 SOLAR ENERGY
15 GEOTHERMAL ENERGY
16 TIDAL AND WAVE POWER
17 WIND ENERGY
20 FOSSIL-FUELED POWER PLANTS
21 NUCLEAR POWER REACTORS AND ASSOCIATED PLANTS
22 NUCLEAR POWER TECHNOLOGY
24 POWER TRANSMISSION AND DISTRIBUTION
25 ENERGY STORAGE
29 ENERGY PLANNING AND POLICY
30 DIRECT ENERGY CONVERSION
32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION
33 ADVANCED PROPULSION SYSTEMS
35 ARMS CONTROL
36 MATERIALS
40 CHEMISTRY
42 ENGINEERING
43 PARTICLE ACCELERATORS
44 INSTRUMENTATION
45 MILITARY TECHNOLOGY, WEAPONRY, AND NATIONAL DEFENSE
54 ENVIRONMENTAL SCIENCES
55 BIOMEDICAL SCIENCES, BASIC STUDIES
56 BIOMEDICAL SCIENCES, APPLIED STUDIES
57 HEALTH AND SAFETY
58 GEOSCIENCES
66 PHYSICS
70 PLASMA PHYSICS AND FUSION
99 GENERAL AND MISCELLANEOUS

Alphabetical Listing of Categories

33 ADVANCED PROPULSION SYSTEMS
35 ARMS CONTROL
09 BIOMASS FUELS
56 BIOMEDICAL SCIENCES, APPLIED STUDIES
55 BIOMEDICAL SCIENCES, BASIC STUDIES
40 CHEMISTRY
01 COAL, LIGNITE, AND PEAT
30 DIRECT ENERGY CONVERSION
32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION
29 ENERGY PLANNING AND POLICY
25 ENERGY STORAGE
42 ENGINEERING
54 ENVIRONMENTAL SCIENCES
20 FOSSIL-FUELED POWER PLANTS
99 GENERAL AND MISCELLANEOUS
58 GEOSCIENCES
15 GEOTHERMAL ENERGY
57 HEALTH AND SAFETY
13 HYDRO ENERGY
08 HYDROGEN
44 INSTRUMENTATION
07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY
36 MATERIALS
45 MILITARY TECHNOLOGY, WEAPONRY, AND NATIONAL DEFENSE
03 NATURAL GAS
05 NUCLEAR FUELS
21 NUCLEAR POWER REACTORS AND ASSOCIATED PLANTS
22 NUCLEAR POWER TECHNOLOGY
04 OIL SHALES AND TAR SANDS
43 PARTICLE ACCELERATORS
02 PETROLEUM
66 PHYSICS
70 PLASMA PHYSICS AND FUSION
24 POWER TRANSMISSION AND DISTRIBUTION
14 SOLAR ENERGY
10 SYNTHETIC FUELS
16 TIDAL AND WAVE POWER
17 WIND ENERGY

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*The numerical subject category scheme is used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's data systems. Categories and definitions for the complete set of six-digit numbers are given in ETDE/PUB--1-R2, *International Energy: Subject Categories and Scope.*

How To Read a Citation

Following are samples of citations and abstracts, one from Section I and one from Sections II and III. The principal data elements included in each of these samples are shown in the listings with corresponding numbers in the samples.

Sample citation and abstract from Section I.

1. Abstract number
2. Report number
3. Title
4. Technology transfer contact
5. Address
6. Telephone number
7. Abstract

5 ORTA-PETC-00005
Chemical Coal Cleaning
DOWNEY, K.R.
Pittsburgh Energy Technology Center, Box 10940, Pittsburgh, PA 15236
(412) 892-6029

Upon combustion of coal, sulfur found in the coal forms sulfur dioxide, which in combination with atmospheric moisture can form sulfuric acid, a component of acid rain. The current approach to this problem is to scrub the flue gas. One alternative to cleaning flue gas is . . . .

Sample citation and abstract from Sections II and III.

1. Abstract number
2. Title
3. Author(s). First 10 names in the data record are printed, then "et al." is listed.
4. Patent assignee
5. Published date
6. Patent application number
7. Number of pages or page range
8. Contract or grant number
9. Order number. The "DE" prefix order number may be used for ordering at NTIS or OSTI, as appropriate. The "TI" prefix order number is valid only at OSTI.
10. Sources of availability from which a copy of document may be obtained; usually appear as abbreviations. (See information on page x.)
11. Abstract

72 **Bacterio-electric leaching of metals.** Lazaroff, N.; Dugan, P.R. To Dept. of Energy. 27 Feb 1990 USA Patent Application 7-486,039. 25p. Sponsored by USDOE, Washington, DC (USA). DOE Contract AC07-76ID01570. Order Number DE91011689. Source: OSTI; NTIS; GPO Dep.

The present invention relates to the biological beneficiation of an ore body or fossil fuel utilizing an applied electrical field in conjunction with living microorganisms and/or their metabolic by-products to effect the release of metallic ions or mineral components from the ore body. 8 figs. 2 tabs.

How To Obtain a Report

Sources listed normally as abbreviations are shown below. The corresponding addresses are provided at right from which documents with these abbreviations may be ordered. When "OSTI" is given **DOE and DOE contractors may order these documents from OSTI.** (However, check with your library or information organization which may require that orders go through them to OSTI.) Prices are normally based on total pages unless special pricing applies. The order numbers provide quicker access for report ordering and should be used where possible.

OSTI U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831

GPO Superintendent of Documents
Government Printing Office
Washington, DC 20402

GPO Dep. Available for inspection or interlibrary loan at Government Printing Office regional depository libraries.

NTIS U.S. Department of Commerce
Technology Administration
National Technical Information Service
Springfield, VA 22161

ESTSC Energy Science and Technology Software Center
P.O. Box 1020
Oak Ridge, TN 37831-1020

Contents

SECTION I — 1
NEW TECHNOLOGY FROM DOE
24 Power Transmission and Distribution — 1
Fermi National Accelerator Laboratory — 1
32 Energy Conservation, Consumption, and Utilization — 1
Argonne National Laboratory — 1
42 Engineering — 2
Fermi National Accelerator Laboratory — 2
65 Physics II — 3
99 General and Miscellaneous — 3
Argonne National Laboratory — 3
SECTION II — 5
PATENTS AVAILABLE FOR LICENSING FROM DOE
01 Coal, Lignite, and Peat — 5
Preparation — 5
Processing — 5
Waste Management — 6
Combustion — 6
02 Petroleum — 6
Drilling and Production — 6
Processing — 6
Health and Safety — 6
Environmental Aspects — 6
Transport, Handling, and Storage — 6
03 Natural Gas — 7
Drilling, Production, and Processing — 7
Environmental Aspects — 7
Transport, Handling, and Storage — 7
Combustion — 7
05 Nuclear Fuels — 7
Fuels Production and Properties — 7
Spent Fuels Reprocessing — 7
Transport, Handling, and Storage — 7
Waste Management — 7
Health and Safety — 8
Safeguards, Inspection, and Accountability — 9
07 Isotope and Radiation Source Technology — 9
Radiation Sources — 9
09 Biomass Fuels — 10
Processing — 10
Products and By-Products — 10
10 Synthetic Fuels — 11
Production — 11
14 Solar Energy — 11
Solar Energy Conversion — 11
Solar Thermal Utilization — 11
Solar Collectors and Concentrators — 11
Heat Storage — 12
15 Geothermal Energy — 12
Geothermal Exploration and Exploration Technology — 12
Geothermal Engineering — 12
20 Fossil-Fueled Power Plants — 12
Power Plants and Power Generation — 12
Waste Management — 12
21 Nuclear Power Reactors and Associated Plants — 12
Power Reactors, Nonbreeding, Light-Water Moderated, Nonboiling Water Cooled — 12
22 Nuclear Reactor Technology — 12
Components and Accessories — 12
Fuel Elements — 13
Control Systems — 13
Reactor Safety — 14
24 Power Transmission and Distribution — 14
Power System Networks, Transmission and Distribution — 14
25 Energy Storage — 14
Thermal — 14
Batteries — 14
30 Direct Energy Conversion — 15
MHD Generators — 15
Fuel Cells — 15
32 Energy Conservation, Consumption, and Utilization — 15
Transportation — 15
Industrial and Agricultural Processes — 15
Municipalities and Community Systems — 17
33 Advanced Propulsion Systems — 17
Internal Combustion Engines — 17
Electric-Powered Systems — 17
36 Materials — 18
Metals and Alloys — 18
Ceramics, Cermets, and Refractories — 18
Other Materials — 19
40 Chemistry — 21
Analytical and Separations Chemistry — 21
Inorganic, Organic, and Physical Chemistry — 23
Electrochemistry — 24
Photochemistry — 24
Radiochemistry and Nuclear Chemistry — 24
42 Engineering — 25
Facilities, Equipment, and Techniques — 25
Heat Transfer and Fluid Flow — 27
Materials Testing — 28
Combustion Systems — 28
Mining and Underground Engineering — 28
Components, Electron Devices and Circuits — 29
43 Particle Accelerators — 34
Design, Development, and Operation — 34
Auxiliaries and Components — 35
Storage Rings — 35
44 Instrumentation — 35
Radiation Instrumentation — 35
Well Logging Instrumentation — 36
Thermal Instrumentation — 36
Optical Instrumentation — 36
Geophysical and Meteorological Instrumentation — 38
Miscellaneous Instrumentation — 38
45 Military Technology, Weaponry, and National Defense — 39
Chemical Explosions and Explosives — 40
54 Environmental Sciences — 40
Environmental Sciences, Atmospheric — 40

Environmental Sciences, Terrestrial 41
55 Biomedical Sciences, Basic Studies 41
Biochemistry 41
Genetics 42
Medicine 42
Microbiology 43
Pathology 43
56 Biomedical Sciences, Applied Studies 43
Radiation Effects 43
57 Health and Safety 43
58 Geosciences 43
66 Physics 43
Techniques of General Use In Physics 43
Quantum Physics Aspects of Condensed Matter 44
70 Plasma Physics and Fusion 44
Plasma Physics and Fusion Research 44
Fusion Technology 44
99 General and Miscellaneous 44
Mathematics and Computers 44
SECTION III 46
OTHER PATENTS FROM TECHNOLOGIES FUNDED BY DOE
01 Coal, Lignite, and Peat 46
Processing 46
Waste Management 46
02 Petroleum 47
Drilling and Production 47
Processing 47
03 Natural Gas 48
Drilling, Production, and Processing 48
Waste Management 48
05 Nuclear Fuels 48
Transport, Handling, and Storage 48
08 Hydrogen 48
Production 48
09 Biomass Fuels 48
Production 48
Processing 48
Properties and Composition 49
10 Synthetic Fuels 49
Production 49
Products and By-Products 49
14 Solar Energy 49
Solar Energy Conversion 49
22 Nuclear Reactor Technology 50
Fuel Elements 50
Control Systems 50
24 Power Transmission and Distribution 50
Power System Networks, Transmission and Distribution 50
25 Energy Storage 50
Flywheels 50
Batteries 50
29 Energy Planning and Policy 51
Research, Development, Demonstration, and Commercialization 51
30 Direct Energy Conversion 51
Fuel Cells 51
32 Energy Conservation, Consumption, and Utilization 51
Buildings 51
Industrial and Agricultural Processes 51
33 Advanced Propulsion Systems 52
Internal Combustion Engines 52
36 Materials 53
Metals and Alloys 53
Ceramics, Cermets, and Refractories 54
Other Materials 54
40 Chemistry 56
Analytical and Separations Chemistry 56
Inorganic, Organic, and Physical Chemistry 58
Photochemistry 59
Radiochemistry and Nuclear Chemistry 59
42 Engineering 59
Facilities, Equipment, and Techniques 59
Materials Testing 59
Components, Electron Devices and Circuits 60
44 Instrumentation 61
Radiation Instrumentation 61
Well Logging Instrumentation 62
Thermal Instrumentation 62
Optical Instrumentation 63
Miscellaneous Instrumentation 63
45 Military Technology, Weaponry, and National Defense 63
Chemical Explosions and Explosives 63
54 Environmental Sciences 63
Environmental Sciences, Atmospheric 63
Environmental Sciences, Terrestrial 64
55 Biomedical Sciences, Basic Studies 64
Biochemistry 64
Genetics 65
Metabolism 65
Agriculture and Food Technology 65
56 Biomedical Sciences, Applied Studies 65
Radiation Effects 65
Chemicals Metabolism and Toxicology 65
66 Physics 66
Techniques of General Use In Physics 66
Nuclear Techniques In Condensed Matter Physics 66
Quantum Physics Aspects of Condensed Matter 66
99 General and Miscellaneous 67
Mathematics and Computers 67
Information Handling 68

INVENTOR INDEX 70
SUBJECT INDEX 78
CONTRACT NUMBER INDEX 94
PATENT NUMBER INDEX 97

Section I
New Technology from DOE

24 POWER TRANSMISSION AND DISTRIBUTION

Fermi National Accelerator Laboratory

1 ORTA-FERMI-00671
Captured Key Electrical Safety Lockout System
VENARD, J.
Fermi National Accelerator Laboratory, P.O. Box 500, Batavia, IL 60510
(708)840-3333

Users of high-power electrical and mechanical equipment enclosures can work in safety with the Fermilab-developed Captured Key Electrical Safety Lockout System. The Captured Key system interrupts electrical power to the enclosures prior to entry, providing a measure of protection against electrical or mechanical mishap in hazardous work areas. The system will not allow the key to be removed unless the switch is in the off state. The Captured Key Electrical Safety Lockout System improves on existing technology by including common control of every locked access door. A spring-loaded control button is incorporated into the system to inhibit unintended operation of the key, which activates an auxiliary contact set. Dual auxiliary electrical contacts are also incorporated into the device.

Available for licensing.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

Argonne National Laboratory

2 ORTA-ANL-00068
Recovering Plastic from Automobiles
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9700 South Cass Avenue, Argonne, IL 60439
(708)252-5361

Ten to 12 million cars and trucks are recycled each year in the United States, producing about 10 million metric tons of scrap metal. For each ton of steel that is recovered, 500 pounds of residue, called "fluff", remain. The continued economic and environmental value of recycling vehicles is partly dependent on solving disposal problems. Argonne scientists are attacking these disposal problems by developing a way to separate thermoplastics and other recyclable materials from the fluff of shredded automobiles. Fluff is the mostly nonmetallic material left over from recycled cars and trucks, which includes glass, fibers, foams and other plastics, as well as some dirt and sand. It is also contaminated with automotive fluids. About 25% of this fluff is plastics. With the trend toward lighter, more fuel-efficient cars, manufacturers will be using even more plastic and the percentage will go up further. Separation and recycling could reduce the mass and volume of fluff going into landfills by over 80%. Earlier research to reduce automobile shredder residue focused mainly in two areas: incineration, both with and without heat recovery, and reuse of scrap plastics. Incineration is relatively costly and can produce high concentrations of chlorine-bearing compounds such as hydrogen chloride, which requires scrubbing techniques to clean the discharge. Argonne researchers have developed a procedure to dissolve and recover thermoplastics from fluff. Called the separation–extraction process, it consists of three basic steps: (1) mechanical separation of the auto shredder residue into three portions (polyurethane foam (PUF), fines, and a plastic-rich stream) using screens and a variable-output air blower for agitation; (2) extraction of the thermoplastics (polypropylene, polyethylene, polyvinyl chloride (PVC), and acrylonitrile-butadiene styrene (ABS)) from the plastics-rich stream using organic solvents; and (3) regeneration of the solvents and recovery of the plastics. The long-term goal of this research is to separate compatible plastics. Separated plastics have a greater economic value and a wider market for reuse than mixed plastics. Researchers have already successfully separated fluff plastics into combinations of polypropylene and polyethylene, and of PVC and ABS, and are now developing ways to more thoroughly clean these plastics. Argonne researchers are now installing a pilot model of their separation process that will handle 100-lb loads.

42 ENGINEERING

Fermi National Accelerator Laboratory

3 ORTA-FERMI-00659
Controlled-Temperature Heat Exchanger for Cryogenic Transfer Lines
VENARD, J.
Fermi National Accelerator Laboratory, P.O. Box 500, Batavia, IL 60510
(708)840-3333

The need to supply constant-temperature cooling gas to an experimental test arrangement led to the evolution of a controlled-temperature transfer line heat exchanger. Installed in a 500-L helium storage dewar, this unit provides a steady stream of cold gas at a constant temperature by controlling the temperature of the exhaust gas exiting the dewar. A heater in the gas stream provides the capability of producing constant-temperature exhaust gas in the region between 10 and 50 K and eliminates the need for continual monitoring. Using the heat exchanger also results in a slower flow rate than does using the transfer line alone, decreasing the helium consumption rate. This technology is available without a license.

4 ORTA-FERMI-00661
Void Fraction Meter for Two-Phase Liquid Helium
VENARD, J.
Fermi National Accelerator Laboratory, P.O. Box 500, Batavia, IL 60510
(708)840-3333

Measuring the two-phase (mixed vapor and liquid) flow of cryogens is important to the efficient operation of cryogenic systems. A prototype device has been developed at Fermilab that indicates the volume fraction of vapor, called the void fraction, by measuring the capacitance across two metallic plates between which the two-phase fluid flows. Mechanical features of the Void Fraction Meter permit easy point-of-use installation and removal and allow for improved calibration and upkeep. Because of the meter's ease of removability, maintenance on the device can be performed without shutting down the system being monitored. Built-in pressure and temperature sensors augment this rugged, easily installed device. The Void Fraction Meter improves on the state of installation and calibration in existing designs and shows that void fraction measurement by capacitive means is practical. The device could be adapted for industrial or research applications involving refrigeration, cryogenics, or flow characterization in which ease of installation and removal of the meter are important considerations. Void Fraction Meter technology is publicly available without a license.

5 ORTA-FERMI-00666
Gas Tungsten Arc Welding Camera System
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Fermilab has designed and installed a four-camera Gas Tungsten Arc Welding (GTAW) vision system that overcomes space limitations and challenging working conditions while providing superior control over the welding process during the manufacture of 16.7-m-long superconducting magnets at the laboratory. The image obtained during the welding process is superior to that provided by any commercially available device because of the small physical size of the unit and a unique filtering system developed at the laboratory. The system incorporates several innovations, including four small, water-cooled cameras that use a filtering scheme consisting of a variable polarizing lens combination and a neutral density center spot. Joystick control of wire feed tips and torch is also included.

Publicly available.

6 ORTA-FERMI-00668
Remote Pipe Inspection and Leak Repair Apparatus
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Leaking pipes located deep underground can now be repaired without excavation using the Fermilab-built Internal Pipe Repair Apparatus. This device is a multifunction pipe crawler capable of operating 100 meters below ground. It includes a video camera for inspection, a rotating metal brush to clean metal pipes, a freon spray cleaner, an epoxy application system that includes an expander to push the epoxy against the pipe, and a 500-W heat treatment lamp. The system can be pulled through a metal pipe of up to 914-m in length using cables attached to both ends of the device. The video camera allows the damaged portion of the pipe to be located, after which the inside of the pipe is brushed to remove dirt and corrosion from the area that is to be repaired. A freon spray cleaner then removes any fine particulate from the damaged area, and an expandable hydraulic cylinder forcibly and evenly applies an epoxy patch to the surface. The epoxy curing process is accelerated using the heat lamp, enabling the pipe crawler to be removed in about two hours.

Publicly available.

7 ORTA-FERMI-00675
Fabrication Method for an Improved Multilayer Insulation Blanket
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A novel fabrication method for improved multilayer insulation (MLI) blankets has been developed at Fermilab. MLI blankets insulate large cryogenic structures that operate at very low temperatures and are typically comprised of alternating layers of reflective sheets and spacer layers. Past methods for fabricating blankets included stacking layers of insulation on a long, flat table—a time-consuming process. In the new fabrication method the insulation materials are wrapped onto a large winding mandrel, and the mandrel is rotated until the desired thickness is achieved. A significant benefit of the new fabrication method is the reduction in the amount of time required to assemble the many individual layers. At a wrapping rate of one revolution per minute, a 30-layer blanket is completed in as little as 30 minutes.

Available for licensing.

65 PHYSICS II

Fermi National Accelerator Laboratory

8 ORTA-FERMI-00663
EPICURE: Fixed Target Control System
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Fermilab recently commissioned a control system for fixed-target, high-energy physics experiments called EPICURE for Experimental Physics Interactive Controls User Resource Enhancement. EPICURE consists of multiple layers of interfaces for communication between logical tasks. The use of multiple layers will allow specific portions of the system to be upgraded without impact or dependency on the surrounding layers, providing flexibility and expandibility. Another way of thinking of EPICURE is as a network of cooperating processors.

Available for licensing.

99 GENERAL AND MISCELLANEOUS

Argonne National Laboratory

9 ORTA-ANL-00067
ENPEP: Graphical User Interface
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A new, graphically oriented computer interface technology developed by the DOE Environmental Issues Division (EID) is being adapted to make an already popular EID software package easier to use. The new graphical interface will be provided by the Application Interface Engine (AIE), a general interface technology that was developed for several U.S. Government agencies over the last five years. It will be applied to the Energy and Power Evaluation Program (ENPEP), a widely accepted package that is being used by energy planners in more than 60 countries. Development of ENPEP began in 1984, when DOE commissioned EID to develop and integrate a set of energy planning models into a personal-computer-based package for distribution in developing countries. The ENPEP package covers the wide range of issues and tasks that energy planners must face: economic development, energy demand projection, supply-and-demand balancing, electric system expansion, and environmental impact analysis. ENPEP was designed with menus and forms that guide users through the package. This interface has worked well for presenting ENPEP users with input forms and output reports; however, a number of tasks within ENPEP were not supported effectively by a text-based interface. With the new graphical interface, several aspects of energy analysis will be much easier to perform. The interface will allow ENPEP users to easily access numerical, textual, and graphical (pictorial) data on energy facilities; to design and modify energy networks graphically; and to display the results of energy analysis (e.g., environmental impacts) on a map of the region under consideration. Making sophisticated energy analysis methodologies like ENPEP easier to use encourages wider application, with a resulting improvement in the energy decision process. The geographic display of information will allow for the identification of significant regional and local issues that affect energy decisions. The ENPEP upgrade is a good example of how new capabilities and technologies like AIE can be used in an efficient and cost-effective manner to benefit other EID programs.

10 ORTA-ANL-00069
Simulation Technology
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Argonne scientists have created a software application called General Purpose Simulator (GPS) for DOE and the Air Force for the design and analysis of space nuclear power and propulsion systems. GPS provides a general framework for modeling complex systems that can be represented as arbitrary configurations of component models interconnected by information flows. For example, a space propulsion system simulation might be assembled from components such as pumps, valves, nozzles, etc., interconnected by fluid or gas flows. The GPS modeling framework is very general and makes no assumptions about the nature of the problem being simulated. Since the physical nature of the problem is contained in the component models, which are contained in software libraries, handling problems in different technology areas is simply a matter of changing component libraries. An important feature of GPS is its handling of system constraints—conditions imposed on certain system variables to, for example, achieve an energy balance over a closed loop or maximize the thrust of a propulsion device while keeping other system parameters within safe operating ranges. With GPS, a user can include arbitrary system constraints over part or all of the system under consideration. These may be linear or nonlinear, equality or inequality constraints. This capability permits one to perform an almost endless variety of system simulations and to perform sophisticated system analyses and optimizations. To facilitate devising new simulation systems, GPS takes a prototyping approach based on object technology. In this approach, simulation systems are assembled from standard, validated software parts (objects) representing component models; data; and procedures (equation solvers, plotters, optimizers). A powerful feature of the object-oriented approach is that multiple instances of an object may be created, each with distinct attributes but inheriting the underlying behavior of the object. The object nature of GPS provides a powerful way to exploit software reuse, permitting a wide variety of complex systems to be simulated from existing component models. However, the user can readily add new models to the component libraries if necessary. The GPS executive—the underlying control language used to define systems and control their execution—is interpreted rather than compiled, thus saving compilation and load times on the computer and allowing very rapid cycle times when new systems are prototyped. To exploit the object nature of GPS and its interpreted executive, an X-Windows-based graphical user interface, GPSTool, has been developed that provides a point-and-click environment to set up and run system simulations. A high level of user interaction with a simulation is possible, including the ability to interrupt, query, modify, and then resume a simulation.

Section II
Patents Available for Licensing from DOE

For further information regarding this section, contact Robert J. Marchick, GC-42; 1000 Independence Ave., S.W.; Washington, DC 20585; (202) 586-4792

01 COAL, LIGNITE, AND PEAT

Preparation

11 **Process for treating moisture laden coal fines.** Davis, B.E.; Henry, R.M.; Trivett, G.S.; Albaugh, E.W. To Energy International Corp., Pittsburgh, PA (US). USA Patent 5,231,797/A/. 3 Aug 1993. Filed date 19 Apr 1991. USA Patent Application 7-687,816. Int. Cl. C10L 5/00; C10L 9/00. [10] DOE Contract AC22-90PC90167. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A process is described for making free flowing granules comprising: mixing caked fines of high rank coal having a free moisture content of about 5-60% by weight with an amount of an oil using a mixing force which is effective to produce a plurality of free flowing granules each comprised of an admixture of at least one particle of said coal, moisture and said oil whereby substantially all of said free moisture is incorporated within said granules.

Processing

12 **Two-stage fixed-bed gasifier with selectable middle gas off-take point.** Strickland, L.D.; Bissett, L.A. To Dept. of Energy. 1991. Filed date 8 May 1991. USA Patent Application 7-697,033. 21p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93012006. Source: OSTI; NTIS; GPO Dep.

A two-stage fixed bed coal gasifier wherein an annular region is in registry with a gasification zone underlying a devolatilization zone for extracting a side stream of high temperature substantially tar-free gas from the gasifier. A vertically displaceable skirt means is positioned within the gasifier to define the lower portion of the annular region so that vertical displacement of the skirt means positions the inlet into the annular region in a selected location within or in close proximity to the gasification zone for providing a positive control over the composition of the side stream gas.

13 **Grate assembly for fixed-bed coal gasifier.** Notestein, J.E. To Dept. of Energy, Washington, DC (US). USA Patent 5,230,716/A/. 27 Jul 1993. Filed date 14 Jul 1992. USA Patent Application 7-913,095. Int. Cl. C10J 3/42. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A grate assembly is described in combination with a gasifier of carbonaceous material comprising a vertically oriented housing having inner wall regions forming a cylindrical chamber defining a gasification zone with inlet means and outlet means in the upper region of the housing for respectively introducing coal into the housing and removing product gases and with inlet means and outlet means in the lower region of the housing for respectively introducing a stream of reaction supporting gases and discharging solids, the grate assembly comprising: a generally conical grate rotatably supported having upper surface regions with an upward angle of incline from peripheral edge regions toward a central apex thereof facing the gasification zone and a diameter slightly less than the inner diameter of the chamber for defining an annular passageway between the inner wall regions and peripheral edge regions of the grate for the discharge of solid material from the gasification zone; the grate defining a plurality of throughgoing passageways for distributing the stream of reaction supporting gases within the gasification zone; a plurality of elongated vertically oriented first bar means; a plurality of elongated second bar means in a horizontal plane underlying first bar means; and means for rotating the grate in a first direction for contacting and crushing an agglomerate of solid material between the first and second bar means when the agglomerate is of a size larger than the cross section of the annular passageway, and wherein the means for rotating the grate comprises hydraulic motor means, and wherein switch means are arranged to trigger the rotation of the conical grate in an opposite direction sufficient to reposition an agglomerate of solid material on the upper surface region of the grate in response to a preselected pressure increase in the hydraulic motor means due to an agglomerate of solid material inhibiting the rotation of the grate.

14 **Sorbent for use in hot gas desulfurization.** Gasper-Galvin, L.D.; Atimtay, A.T. To Dept. of Energy, Washington, DC (US). USA Patent 5,227,351/A/. 13 Jul 1993. Filed date 13 Mar 1991. USA Patent Application 7-668,521. Int. Cl. B01J 29/16; B01J 20/16; B01J 20/10; B01D 53/34. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A sorbent is described for removing hydrogen sulfide values from a high temperature process gas stream containing such values, consisting essentially of a mixture of copper oxide, molybdenum oxide in a concentration effective to promote the reaction of hydrogen sulfide with the copper oxide, and manganese oxide in a concentration effective to inhibit volatilization of the molybdenum oxide, and a zeolite substrate substantially formed of silicon oxide supporting the mixture.

Waste Management

Refer also to citation(s) 28

15 **NO reduction using sublimation of cyanuric acid.** Perry, R.A. To [Dept. of Energy, Washington, DC (United States)]. USA Patent 5,180,565/A/. 19 Jan 1993. Filed date 12 Mar 1990. Int. Cl. C01B 21/00;B01J 8/00. [10] DOE Contract AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method of reducing the NO content of a gas stream comprises contacting the gas stream with an amount of HNCO at a temperature effective for heat-induced decomposition of HNCO, said amount and temperature being effective for resultant lowering of the NO content of the gas stream, said solid agent being particulate and having a particle size of less than 90 μm.

Combustion

Refer also to citation(s) 189

02 PETROLEUM

Drilling and Production

Refer also to citation(s) 18, 137, 178

Processing

Refer also to citation(s) 109

16 **Cobalt carbonyl catalyzed olefin hydroformylation in supercritical carbon dioxide.** Rathke, J.W.; Klingler, R.J. To Dept. of Energy, Washington, DC (US). USA Patent 5,198,589/A/. 30 Mar 1993. Filed date 28 Apr 1992. USA Patent Application 7-874,897. Int. Cl. C07C 45/50; C07C 29/16. [10] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method of olefin hydroformylation is provided wherein an olefin reacts with a carbonyl catalyst and with reaction gases such as hydrogen and carbon monoxide in the presence of a supercritical reaction solvent, such as carbon dioxide. The invention provides higher yields of n-isomer product without the gas-liquid mixing rate limitation seen in conventional Oxo processes using liquid media.

17 **Crystalline titanate catalyst supports.** Anthony, R.G.; Dosch, R.G. To Dept. of Energy, Washington, DC (US). USA Patent 5,177,045/A/. 5 Jan 1993. Filed date 28 Aug 1991. USA Patent Application 7-751,003. Int. Cl. B01J 31/12. [10] DOE Contract AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A series of new crystalline titanates (CT) are shown to have considerable potential as catalyst supports. For Pd supported catalyst, the catalytic activity for pyrene hydrogenation was substantially different depending on the type of CT, and one was substantially more active than Pd on hydrous titanium oxide (HTO). For 1-hexene hydrogenation the activities of the new CTs were approximately the same as for the hydrous metal oxide supports.

Health and Safety

18 **Oil/gas separator for installation at burning wells.** Alonso, C.T.; Bender, D.A.; Bowman, B.R.; Burnham, A.K.; Chesnut, D.A.; Comfort, W.J. III; Guymon, L.G.; Henning, C.D.; Pedersen, K.B.; Sefcik, J.A.; Smith, J.A.; Strauch, M.S. To Dept. of Energy, Washington, DC (US). USA Patent 5,191,940/A/. 9 Mar 1993. Filed date 22 Aug 1991. USA Patent Application 7-748,586. Int. Cl. A62C 3/00. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An oil/gas separator is disclosed that can be utilized to return the burning wells in Kuwait to production. Advantageously, a crane is used to install the separator at a safe distance from the well. The gas from the well is burned off at the site, and the oil is immediately pumped into Kuwait's oil gathering system. Diverters inside the separator prevent the oil jet coming out of the well from reaching the top vents where the gas is burned. The oil falls back down, and is pumped from an annular oil catcher at the bottom of the separator, or from the concrete cellar surrounding the well.

Environmental Aspects

19 **Oil/gas collector/separator for underwater oil leaks.** Henning, C.D. To United States Department of Energy, Washington, DC (US). USA Patent 5,213,444/A/. 25 May 1993. Filed date 17 Apr 1992. USA Patent Application 7-870,067. Int. Cl. E02B 15/04. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An oil/gas collector/separator for underwater oil leaks is described comprising: a cylindrical tank; a hollow float member for supporting said tank in a substantially upright position; a skirt assembly secured to said hollow float member and extending in a direction away from said float member opposite said tank; means for removing oil from said tank; and means for removing gas from said tank.

Transport, Handling, and Storage

Refer also to citation(s) 120

03 NATURAL GAS

Drilling, Production, and Processing

Refer also to citation(s) 137

Environmental Aspects

Refer also to citation(s) 19

Transport, Handling, and Storage

Refer also to citation(s) 120

Combustion

Refer also to citation(s) 41

05 NUCLEAR FUELS

Fuels Production and Properties

Refer also to citation(s) 79

Spent Fuels Reprocessing

20 **Plutonium recovery from spent reactor fuel by uranium displacement.** Ackerman, J.P. To Dept. of Energy. 1991. Filed date 21 May 1991. USA Patent Application 7-703,641. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93011998. Source: OSTI; NTIS; GPO Dep.

This report discusses a process for separating uranium values and transuranic values from fission products containing rare earth values when the values which are contained together in a molten chloride salt electrolyte. A molten chloride salt electrolyte with a first ratio of plutonium chloride to uranium chloride is contacted with both a solid cathode and an anode having values of uranium and fission products including plutonium. A voltage is applied across the anode and cathode electrolytically to transfer uranium and plutonium from the anode to the electrolyte while uranium values in the electrolyte electrolytically deposit as uranium metal on the solid cathode in an amount equal to the uranium and plutonium transferred from the anode causing the electrolyte to have a second ratio of plutonium chloride to uranium chloride. Then the solid cathode with the uranium metal deposited thereon is removed and molten cadmium having uranium dissolved therein is brought into contact with the electrolyte resulting in chemical transfer of plutonium values from the electrolyte to the molten cadmium and transfer of uranium values from the molten cadmium to the electrolyte until the first ratio of plutonium chloride to uranium chloride is re-established.

21 **Metal recovery from porous materials.** Sturcken, E.F. To Dept. of Energy. 1991. USA Patent Application 7-723,122. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93015718. Source: OSTI; NTIS; GPO Dep.

The present invention relates to recovery of metals. More specifically, the present invention relates to the recovery of plutonium and other metals from porous materials using microwaves. The United States Government has rights in this invention pursuant to Contract No. DE-AC09-89SR18035 between the US Department of Energy and Westinghouse Savannah River Company.

Transport, Handling, and Storage

Refer also to citation(s) 27

22 **Method and device for frictional welding.** Peacock, H.B. To Dept. of Energy. 1991. USA Patent Application 7-724,660. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93015719. Source: OSTI; NTIS; GPO Dep.

A method for friction welding that produces a seal having essentially no gas porosity, comprises two rotationally symmetric, generally cylindrical members, spaced apart and coaxially aligned, that are rotated with respect to each other and brought together under high pressure. One member is preferably a generally cylindrical cannister that stores uranium within its hollow walls. The other member is preferably a generally cylindrical, hollow weld ring. An annular channel formed in the weld ring functions as an internal flash trap and is uniquely designed so that substantially all of the welding flash generated from the friction welding is directed into the channel's recessed bottom. Also, the channel design limits distortion of the two members during the friction welding, process, further contributing to the complete seal that is obtained.

23 **Fail-safe storage rack for irradiated fuel rod assemblies.** Lewis, D.R. To Dept. of Energy, Washington, DC (US). USA Patent 5,196,161/A/. 23 Mar 1993. Filed date 14 Aug 1991. USA Patent Application 7-744,746. Int. Cl. G21C 19/32. [10] DOE Contract AC11-76PN00014. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A fail-safe storage rack is provided for interim storage of spent but radioactive nuclear fuel rod assemblies. The rack consists of a checkerboard array of substantially square, elongate receiving tubes fully enclosed by a double walled container, the outer wall of which is imperforate for liquid containment and the inner wall of which is provided with perforations for admitting moderator liquid flow to the elongate receiving tubes, the liquid serving to take up waste heat from the stored nuclear assemblies and dissipate same to the ambient liquid reservoir. A perforated cover sealing the rack facilitates cooling liquid entry and dissipation.

Waste Management

Refer also to citation(s) 87

24 **Actinide metal processing.** Sauer, N.N.; Watkin, J.G. To Dept. of Energy. 5 Apr 1991. USA Patent Application 7-680,972. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93008221. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a process of converting an actinide metal such as thorium, uranium, or plutonium to an actinide oxide material by admixing the actinide metal in an aqueous medium with a hypochlorite as an oxidizing agent for sufficient time to form the actinide oxide material and recovering the actinide oxide material is provided together with a low temperature process of preparing an actinide oxide nitrate such as uranyl nitrate. Additionally, a composition of matter comprising the reaction product of uranium metal and sodium hypochlorite is provided, the reaction product being an essentially insoluble uranium oxide material suitable for disposal or long term storage.

25 **Combined transuranic-strontium extraction process.** Horwitz, E.P.; Dietz, M.L. To Dept. of Energy. 1991. USA Patent Application 7-717,426. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93015713. Source: OSTI; NTIS; INIS; GPO Dep.

The transuranic (TRU) elements neptunium, plutonium and amercium can be separated together with strontium from nitric acid waste solutions in a single process. An extractant solution of a crown ether and an alkyl(phenyl)-N.N-dialkylcarbanylmethylphosphine oxide in an appropriate diluent will extract the TRU's to gather with strontium, uranium and technetium. The TRU's and the strontium can then be selectively stripped from the extractant for disposal.

26 **System to control contamination during retrieval of buried TRU waste.** Menkhaus, D.E.; Loomis, G.G.; Mullen, C.K.; Scott, D.W.; Feldman, E.M.; Meyer, L.C. To Dept. of Energy, Washington, DC (US). USA Patent 5,203,644/A/. 20 Apr 1993. Filed date 29 Aug 1991. USA Patent Application 7-751,900. Int. Cl. B09B 1/00. [10] DOE Contract AC07-76ID01570. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A system is described to control contamination during the retrieval of hazardous waste comprising an outer containment building, an inner containment building, within the outer containment building, an electrostatic radioactive particle recovery unit connected to and in communication with the inner and outer containment buildings, and a contaminate suppression system including a moisture control subsystem, and a rapid monitoring system having the ability to monitor conditions in the inner and outer containment buildings.

27 **High-flexibility, noncollapsing lightweight hose.** Williams, D.A. To Dept. of Energy, Washington, DC (US). USA Patent 5,203,378/A/. 20 Apr 1993. Filed date 1 Feb 1991. USA Patent Application 7-648,931. Int. Cl. F16L 55/00. [10] DOE Contract AC11-76PN00014. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A high-flexibility, noncollapsing, lightweight, large-bore, wire-reinforced hose is inside fiber-reinforced PVC tubing that is flexible, lightweight, and abrasion resistant. It provides a strong, kink- and collapse-free conduit for moving large quantities of dangerous fluids, e.g., removing radioactive waste water or processing chemicals.

28 **Gas stream clean-up filter and method for forming same.** Mei, J.S.; DeVault, J.; Halow, J.S. To Dept. of Energy, Washington, DC (US). USA Patent 5,198,002/A/. 30 Mar 1993. Filed date 12 Mar 1992. USA Patent Application 7-850,478. Int. Cl. B01D 53/06. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A gas cleaning filter is formed in-situ within a vessel containing a fluidizable bed of granular material of a relatively large size fraction. A filter membrane provided by a porous metal or ceramic body or such a body supported a perforated screen on one side thereof is coated in-situ with a layer of the granular material from the fluidized bed by serially passing a bed-fluidizing gas stream through the bed of granular material and the membrane. The layer of granular material provides the filtering medium for the combined membrane-granular layer filter. The filter is not blinded by the granular material and provides for the removal of virtually all of the particulates from a process gas stream. The granular material can be at least partially provided by a material capable of chemically reacting with and removing sulfur compounds from the process gas stream. Low level radioactive waste containing organic material may be incinerated in a fluidized bed in communication with the described filter for removing particulates from the gaseous combustion products.

Health and Safety

Refer also to citation(s) 26

29 **Safety harness.** Gunter, L.W. To Dept. of Energy. 8 Apr 1991. USA Patent Application 7-681,291. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93008217. Source: OSTI; NTIS; GPO Dep.

A safety harness to be worn by a worker, especially a worker wearing a plastic suit thereunder for protection in a radioactive or chemically hostile environment. The safety harness comprises a torso surrounding portion with at least one horizontal strap for adjustably securing the harness about the torso, two vertical shoulder straps with rings just forward of the of the peak of the shoulders for attaching a life-line and a pair of adjustable leg supporting straps releasibly attachable to the torso surrounding portion. In the event of a fall, the weight of the worker, when his fall is broken and he is suspended from the rings with his body angled slightly back and chest up, will be borne by the portion of the leg straps behind his buttocks rather than between his legs. Furthermore, the supporting straps do not restrict the air supplied through hoses into his suit when so suspended.

30 **In-situ remediation system for groundwater and soils.** Corey, J.C.; Kaback, D.S.; Looney, B.B. To Dept. of Energy. 1991. USA Patent Application 7-711,686. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93015706. Source: OSTI; NTIS; INIS; GPO Dep.

The present invention relates to a system for in-situ remediation of contaminated groundwater and soil. In particular the present invention relates to stabilizing toxic metals in groundwater and soil. The United States Government has rights in this invention pursuant to Contract No.

DE-AC09-89SR18035 between the US Department of Energy and Westinghouse Savannah River Company.

31 **Flow monitoring and control system for injection wells.** Corey, J.C. To Dept. of Energy. 1991. USA Patent Application 7-730,424. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93015725. Source: OSTI; NTIS; GPO Dep.

The present invention relates to a system for monitoring and controlling the rate of fluid flow from an injection well used for in-situ remediation of contaminated groundwater. The United States Government has rights in this invention pursuant to Contract No. DE-AC09-89SR18035 between the US Department of Energy and Westinghouse Savannah River Company.

Safeguards, Inspection, and Accountability

32 **Secure distance ranging by electronic means.** Gritton, D.G. To Dept. of Energy. 1991. USA Patent Application 7-727,036. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE93015722. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention is comprised of a system for secure distance ranging between a reader 11 and a tag 12 wherein the distance between the two is determined by the time it takes to propagate a signal from the reader to the tag and for a responsive signal to return, and in which such time is random and unpredictable, except to the reader, even though the distance between the reader and tag remains the same. A random number is sent from the reader and encrypted by the tag into a number having 16 segments of 4 bits each. A first tag signal is sent after such encryption. In response, a random width start pulse is generated by the reader. When recieved in the tag, the width of the start pulse is measured in the tag and a segment of the encrypted number is selected in accordance with such width. A second tag pulse is generated at a time T after the start pulse arrives at the tag, the time T being dependent on the length of a variable time delay t. which is determined by the value of the bits in the selected segment of the encrypted number. At the reader, the total time from the beginning of the start pulse to the receipt of the second tag signal is measured. The value of t_v is known at the reader and the time T is subtracted from the total time to find the actual propagation t_p for signals to travel between the reader 11 and tag 12. The propagation time is then converted into distance.

33 **Non-contact tamper sensing by electronic means.** Gritton, D.G. To Dept. of Energy, Washington, DC (US). USA Patent 5,237,307/A/. 17 Aug 1993. Filed date 27 Nov 1991. USA Patent Application 7-700,441. Int. Cl. G08B 13/22. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A tamper-sensing tag is described comprising: a tag body adapted to be fixed against movement relative to a surface of an article, a capacitor having at least one variable-capacity section with first and second elements, said first element being positionable relative to said second element at various positions, displaced from each other, said one variable-capacity section having different amounts of capacity when said first element is in its various positions, respectively, relative to said second element, means for generating a first signal which is a function of the amount of capacity of said one variable-capacity section, said first signal having various values distinguishable from each other when said first element is in its various positions, respectively, relative to said second element, one of said first and second elements being fixed against movement relative to said tag body, and the other of said first and second elements being adapted to be fixed against movement relative to said surface of said article and with said first element being in a first position relative to said second element, said tag body and said other of said first and second elements being positionable relative to each other on said article prior to said tag body's being fixed to said article so as to enable said elements to be fixed to said article in said first position relative to each other, means in said tag for generating a second signal having a value unrelated to the amount of capacity of said one variable-capacity section, means in said tag for combining said first and second signals, means in said tag for encrypting said combined signals, means in said tag responsive to external interrogation of said tag for sending from said tag the encrypted combined signals in digital form, and wherein said means for generating said second signal has the function of changing the value of said second signal for each interrogation of said tag.

34 **Integrated optical tamper sensor with planar waveguide.** Carson, R.F.; Casalnuovo, S.A. To Dept. of Energy, Washington, DC (US). USA Patent 5,177,352/A/. 5 Jan 1993. Filed date 6 Jun 1991. USA Patent Application 7-711,235. Int. Cl. G01V 9/04. [10] DOE Contract AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A monolithic optical tamper sensor, comprising an optical emitter and detector, connected by an optical waveguide and placed into the critical entry plane of an enclosed sensitive region, the tamper sensor having a myriad of scraps of a material optically absorbent at the wavelength of interest, such that when the absorbent material is in place on the waveguide, an unique optical signature can be recorded, but when entry is attempted into the enclosed sensitive region, the scraps of absorbent material will be displaced and the optical/electrical signature of the tamper sensor will change and that change can be recorded.

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

Radiation Sources

35 **Particle beam generator using a radioactive source.** Underwood, D.G. To Dept. of Energy, Washington, DC (US). USA Patent 5,198,674/A/. 30 Mar 1993. Filed date 27 Nov 1991. USA Patent Application 7-798,782. Int. Cl. H01J 37/14. [10] DOE Contract W-31109-ENG-38.

Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The apparatus of the present invention selects from particles emitted by a radioactive source those particles having momentum within a desired range and focuses the selected particles in a beam having at least one narrow cross-dimension, and at the same time attenuates potentially disruptive gamma rays and low energy particles. Two major components of the present invention are an achromatic bending and focusing system, which includes sector magnets and quadrupole, and a quadrupole doublet final focus system. Permanent magnets utilized in the apparatus are constructed of a ceramic (ferrite) material which is inexpensive and easily machined.

09 BIOMASS FUELS

Processing

Refer also to citation(s) 40

36 **Combined enzyme mediated fermentation of cellulose and xylose to ethanol.** Lastick, S.M.; Mohagheghi, A.; Tucker, M.P.; Grohmann, K. To Dept. of Energy. 21 Mar 1991. USA Patent Application 7-672,984. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93008234. Source: OSTI; NTIS; GPO Dep.

A process for producing ethanol from mixed sugar streams from pretreated biomass comprising xylose and cellulose using enzymes to convert these substrates to fermentable sugars; selecting and isolating a yeast having the ability to ferment these sugars as they are being formed to produce ethanol; loading the substrates with the fermentation mix composed of yeast, enzymes and substrates; fermenting the loaded substrates and enzymes under anaerobic conditions at a pH range of between about 5.0 to about 6.0 and at a temperature range of between about 35°C to about 40°C until the fermentation is completed, the xylose being isomerized to xylulose, the cellulose being converted to glucose, and these sugars being concurrently converted to ethanol by yeast through means of the anaerobic fermentation; and recovering the ethanol.

37 **Two-stage dilute acid prehydrolysis of biomass.** Grohmann, K.; Torget, R.W. To Dept. of Energy. 8 Apr 1991. USA Patent Application 7-681,299. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93012025. Source: OSTI; NTIS; GPO Dep.

The invention relates to a two stage dilute acid prehydrolysis of biomass for solubilization of hemicellulosic sugars and a pretreatment for enzymatic hydrolysis of cellulose. In particular, the invention pertains to a two stage dilute acid prehydrolysis treatment of a feedstock of hemicellulosic material comprising xylan that is slow hydrolyzable and xylan that is fast hydrolyzable under low temperature conditions to hydrolyze said fast hydrolyzable xylan to xylose; removing said xylose and leaving a feedstock residue containing said slow hydrolyzable xylan; treating said residue containing said slow hydrolyzable xylan with a dilute organic or inorganic acid under temperature conditions higher than said low temperature conditions to hydrolyze said slow hydrolyzable xylan to xylose, and removing said xylose.

38 **Clay enhancement of methane, low molecular weight hydrocarbon and halocarbon conversion by methanotrophic bacteria.** Apel, W.A.; Dugan, P.R. To Dept. of Energy. 1991. USA Patent Application 7-738,001. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE93015728. Source: OSTI; NTIS; GPO Dep.

The invention described in this report relates to a combined system of an apparatus and a method of increasing the rates of oxidation of gases and hazardous vapors by methanotrophic and other bacteria. The gases of interest are methane and trichlorethylene and other hazardous vapors. In a preferred embodiment, the oxidation rate of methane is improved by the addition of clays, e.g., kaolin, sometimes called "China clay."

Products and By-Products

39 **Resole resin products derived from fractionated organic and aqueous condensates made by fast-pyrolysis of biomass materials.** Chum, H.L.; Black, S.K.; Diebold, J.P.; Kreibich, R.E. To [Dept. of Energy, Washington, DC (United States)]. USA Patent 5,235,021/A/. 10 Aug 1993. Filed date 16 Dec 1991. Int. Cl. C08G 8/04;B66C 1/00;B32B 21/08;C08J 11/00. [10] DOE Contract AC02-83CH10093. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An improved process is described for preparing phenol-formaldehyde resole resins by fractionating organic and aqueous condensates made by fast-pyrolysis of biomass materials while using a carrier gas to move feed into a reactor to produce phenolic-containing/neutrals suitable for manufacturing phenol-formaldehyde resole resins, said process comprising: admixing said organic and aqueous condensates with basic materials selected from the group consisting of sodium hydroxide, sodium bicarbonate, sodium carbonate, sodium sesquicarbonate, potassium hydroxide, potassium bicarbonate, potassium carbonate, ammonium hydroxide, ammonium bicarbonate, ammonium carbonate, lithium hydroxide, lithium bicarbonate, lithium carbonate, calcium hydroxide, calcium carbonate, magnesium hydroxide, magnesium carbonate, hydrates thereof, or mixtures thereof to neutralize acidic components of the condensates and to render said acidic components and polar compounds less soluble in organic phase; admixing said neutralized condensates with an organic solvent having approximately 8.4 to 9.1 $(cal/cm^3)^{1/2}$ with polar components in the 1.9 - 3.0 range, a solubility parameter and hydrogen bonding components in the 2 - 4.8 range to extract phenolic-containing and neutral fractions from the organic and aqueous phases into a solvent phase; separating the organic solvent-soluble fraction having the phenolic-containing and neutrals fractions from the aqueous fraction; removing the organic solvent to produce said phenolic-containing and neutrals compositions in a form substantially free from said solvent; and substituting said phenolic-containing and neutrals composition for a portion of phenol in a phenol-formaldehyde resole composition.

10 SYNTHETIC FUELS

Production

40 Sterilization of fermentation vessels by ethanol/water mixtures. Wyman, C.E. To Dept. of Energy. 20 Mar 1991. USA Patent Application 7-672,286. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93008237. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a method for sterilizing process fermentation vessels with a concentrated alcohol and water mixture integrated in a fuel alcohol or other alcohol production facility. Hot, concentrated alcohol is drawn from a distillation or other purification stage and sprayed into the empty fermentation vessels. This sterilizing alcohol/water mixture should be of a sufficient concentration, preferably higher than 12% alcohol by volume, to be toxic to undesirable microorganisms. Following sterilization, this sterilizing alcohol/water mixture can be recovered back into the same distillation or other purification stage from which it was withdrawn. The process of this invention has its best application in, but is not limited to, batch fermentation processes, wherein the fermentation vessels must be emptied, cleaned, and sterilized following completion of each batch fermentation process.

41 Catalysts for conversion of methane to higher hydrocarbons. Siriwardane, R.V. To Dept. of Energy, Washington, DC (US). USA Patent 5,177,294/A/. 5 Jan 1993. Filed date 15 May 1991. USA Patent Application 7-700,290. Int. Cl. C07C 2/00. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Catalysts for converting methane to higher hydrocarbons such as ethane and ethylene in the presence of oxygen at temperatures in the range of about 700 to 900 C are described. These catalysts comprise calcium oxide or gadolinium oxide respectively promoted with about 0.025-0.4 mole [?] and about 0.1-0.7 mole sodium pyrophosphate. A preferred reaction temperature in a range of about 800 to 850 C with a preferred oxygen-to-methane ratio of about 2:1 provides an essentially constant C_2 hydrocarbon yield in the range of about 12 to 19 percent over a period of time greater than about 20 hours.

14 SOLAR ENERGY

Solar Energy Conversion

Refer also to citation(s) 44

42 Improved monolithic tandem solar cell. Wanlass, M.W. To Dept. of Energy. 23 Apr 1991. USA Patent Application 7-689,566. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93012014. Source: OSTI; NTIS; GPO Dep.

A single-crystal, monolithic, tandem, photovoltaic solar cell is described which includes (a) an InP substrate having upper and lower surfaces, (b) a first photoactive subcell on the upper surf ace of the InP substrate, (c) a second photoactive subcell on the first subcell; and (d) an optically transparent prismatic cover layer over the second subcell. The first photoactive subcell is GaInAsP of defined composition. The second subcell is InP. The two subcells are lattice matched.

43 Current-matched high-efficiency, multijunction monolithic solar cells. Olson, J.M.; Kurtz, S.R. To Dept. of Energy, Washington, DC (US). USA Patent 5,223,043/A/. 29 Jun 1993. Filed date 1 May 1992. USA Patent Application 7-884,312. Int. Cl. H01L 31/078. [10] DOE Contract AC02-83CH10093. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A high-efficiency multijunction photovoltaic solar cell is described, consisting essentially of: a top semiconductor cell fabricated from $Ga_xIn_{1-x}P$ wherein x is $(0 < x < 0.5)$ a light-sensitive n/p homojunction therein for absorbing higher energy photons; a bottom semiconductor cell fabricated from GaAs with a light sensitive n/p homojunction therein for absorbing lower energy photons; and wherein the top cell thickness is optimized by thinning to from 0.5 to 1.7 microns and less than the bottom cell thickness in order to provide current matching between the top cell and the bottom cell in order to obtain improved conversion efficiency, a low-resistance attachment between the top cell and the bottom cell, wherein the top cell is lattice matched to the bottom cell; and electrical contact means attached to opposite sides of the solar cell to conduct current away from and into the solar cell.

Solar Thermal Utilization

Refer also to citation(s) 81

Solar Collectors and Concentrators

44 Photovoltaic solar concentrator module. Chiang, C.J. To Dept. of Energy. 16 May 1991. USA Patent Application 7-700,813. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE93012000. Source: OSTI; NTIS; GPO Dep.

This invention consists of a planar photovoltaic concentrator module for producing an electrical signal from incident solar radiation which includes an electrically insulating housing having a front wall, an opposing back wall and a hollow interior. A solar cell having electrical terminals is positioned within the interior of the housing. A planar conductor is connected with a terminal of the solar cell of the same polarity. A lens forming the front wall of the housing is operable to direct solar radiation incident to the lens into the interior of the housing. A refractive optical element in contact with the solar cell and facing the lens receives the solar radiation directed into the interior of the housing by the lens and directs the solar radiation to the solar cell to cause the solar cell to generate an electrical signal. An electrically conductive planar member is positioned in the housing to rest on the housing back wall in supporting relation with the solar cell terminal of opposite polarity.

The planar member is operable to dissipate heat radiated by the solar cell as the solar cell generates an electrical signal and further forms a solar cell conductor connected with the solar cell terminal to permit the electrical signal generated by the solar cell to be measured between the planar member and the conductor.

45 **Method and apparatus for uniformly concentrating solar flux for photovoltaic applications.** Jorgensen, G.J.; Carasso, M.; Wendelin, T.J.; Lewandowski, A.A. To Dept. of Energy. 1991. USA Patent Application 7-712,812. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93015708. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a dish reflector and method for concentrating moderate solar flux uniformly on a target plane on a solar cell array, the dish having a stepped reflective surface that is characterized by a plurality of ring-like segments arranged about a common axis, and each segment having a concave spherical configuration.

Heat Storage

46 **Microwave impregnation of porous materials with thermal energy storage materials.** Benson, D.K.; Burrows, R.W. To Dept. of Energy, Washington, DC (US). USA Patent 5,202,150/A/. 13 Apr 1993. Filed date 27 Apr 1992. USA Patent Application 7-874,141. Int. Cl. B05D 3/02. [10] DOE Contract AC02-83CH10093. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method for impregnating a porous, non-metallic construction material with a solid phase-change material is described. The phase-change material in finely divided form is spread onto the surface of the porous material, after which the porous material is exposed to microwave energy for a time sufficient to melt the phase-change material. The melted material is spontaneously absorbed into the pores of the porous material. A sealing chemical may also be included with the phase-change material (or applied subsequent to the phase-change material) to seal the surface of the porous material. Fire retardant chemicals may also be included with the phase-change materials. The treated construction materials are better able to absorb thermal energy and exhibit increased heat storage capacity.

15 GEOTHERMAL ENERGY

Geothermal Exploration and Exploration Technology

Refer also to citation(s) 178

Geothermal Engineering

Refer also to citation(s) 137

20 FOSSIL-FUELED POWER PLANTS

Power Plants and Power Generation

Refer also to citation(s) 120, 191

Waste Management

47 **Two stage sorption of sulfur compounds.** Moore, W.E. To Dept. of Energy. 1991. USA Patent Application 7-697,041. 13p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93012005. Source: OSTI; NTIS; GPO Dep.

A two stage method for reducing the sulfur content of exhaust gases is disclosed. Alkali- or alkaline-earth-based sorbent is totally or partially vaporized 10 and introduced into a sulfur-containing gas stream. The activated sorbent can be introduced in the reaction zone or the exhaust gases of a combustor or a gasifier. High efficiencies of sulfur removal can be achieved.

21 NUCLEAR POWER REACTORS AND ASSOCIATED PLANTS

Power Reactors, Nonbreeding, Light-Water Moderated, Nonboiling Water Cooled

48 **Automated robotic equipment for ultrasonic inspection of pressurizer heater wells.** Nachbar, H.D.; DeRossi, R.S.; Mullins, L.E. To Dept. of Energy, Washington, DC (US). USA Patent 5,194,215/A/. 16 Mar 1993. Filed date 20 Sep 1991. USA Patent Application 7-762,967. Int. Cl. G21C 17/017. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A robotic device for remotely inspecting pressurizer heater wells is provided which has the advantages of quickly, precisely, and reliably acquiring data at reasonable cost while also reducing radiation exposure of an operator. The device comprises a prober assembly including a probe which enters a heater well, gathers data regarding the condition of the heater well and transmits a signal carrying that data; a mounting device for mounting the probe assembly at the opening of the heater well so that the probe can enter the heater well; a first motor mounted on the mounting device for providing movement of the probe assembly in an axial direction; and a second motor mounted on the mounting device for providing rotation of the probe assembly. This arrangement enables full inspection of the heater well to be carried out.

22 NUCLEAR REACTOR TECHNOLOGY

Components and Accessories

Refer also to citation(s) 54, 55

49 Piping inspection instrument carriage. Hapstack, M.; Talarek, T.R.; Zollinger, W.T.; Heckendorn, F.M. II; Park, L.R. To Dept. of Energy. 1991. USA Patent Application 7-730,425. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93015726. Source: OSTI; NTIS; GPO Dep.

This invention, an instrument carriage for inspection of piping, comprises front and rear leg assemblies for engaging the interior of the piping and supporting and centering the carriage therein, an instrumentation arm carried by a shaft system running from front to rear leg assemblies. The shaft system has a screw shaft for moving the arm axially and a spline gear for moving the arm azimuthally. The arm has a pair of air cylinders that raise and lower a plate in the radial direction. On the plate are probes including, an eddy current probe and an ultrasonic testing probe. The ultrasonic testing probe is capable of spinning 360° about its axis.

50 Spring design for use in the core of a nuclear reactor. Willard, H.J. Jr. To Dept. of Energy, Washington, DC (US). USA Patent 5,226,633/A/. 13 Jul 1993. Filed date 13 May 1988. USA Patent Application 7-193,703. Int. Cl. F16F 1/18. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An elongated, laminated, bi-textured spring for use in the core of a nuclear reactor is described comprising: a first strip of zirconium alloy which is cut from a plate rolled zirconium alloy in the longitudinal direction of the plate, a second strip of zirconium alloy which is bonded to the first strip of zirconium alloy and which is cut from the same plate of rolled zirconium alloy as the first strip in direction transverse to the longitudinal direction of the plate, so that the two strips exhibit different amounts of irradiation induced strain to produce bending stresses which reduce the irradiation induced relaxation of the initial stresses loaded in the spring when the spring is formed.

Fuel Elements

51 Simulated nuclear reactor fuel assembly. Berta, V.T. To Dept. of Energy, Washington, DC (US). USA Patent 5,200,144/A/. 6 Apr 1993. Filed date 22 Jun 1992. USA Patent Application 7-864,717. Int. Cl. G21C 17/00. [10] DOE Contract AC07-76ID01570. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An apparatus for electrically simulating a nuclear reactor fuel assembly. It includes a heater assembly having a top end and a bottom end and a plurality of concentric heater tubes having electrical circuitry connected to a power source, and radially spaced from each other. An outer target tube and an inner target tube is concentric with the heater tubes and with each other, and the outer target tube surrounds and is radially spaced from the heater tubes. The inner target tube is surrounded by and radially spaced from the heater tubes and outer target tube. The top of the assembly is generally open to allow for the electrical power connection to the heater tubes, and the bottom of the assembly includes means for completing the electrical circuitry in the heater tubes to provide electrical resistance heating to simulate the power profile in a nuclear reactor. The embedded conductor elements in each heater tube is split into two halves for a substantial portion of its length and provided with electrical isolation such that each half of the conductor is joined at one end and is not joined at the other end.

Control Systems

Refer also to citation(s) 54, 55

52 Fast-acting nuclear reactor control device. Kotlyar, O.M.; West, P.B. To Dept. of Energy, Washington, DC (US). USA Patent 5,232,656/A/. 3 Aug 1993. Filed date 25 Feb 1992. USA Patent Application 7-841,109. Int. Cl. G21C 7/16. [10] DOE Contract AC07-76ID01570. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A fast-acting nuclear reactor control device is described for controlling a safety control rod within the core of a nuclear reactor, the reactor controlled by a reactor control system, the device comprising: a safety control rod drive shaft and an electromagnetic clutch co-axial with the drive shaft operatively connected to the safety control rod for driving and positioning the safety control rod within or without the reactor core during reactor operation, the safety rod being oriented in a substantially vertical position to allow the rod to fall into the reactor core under the influence of gravity during shutdown of the reactor; the safety control rod drive shaft further operatively connected to a hydraulic pump such that operation of the drive shaft simultaneously drives and positions the safety control rod and operates the hydraulic pump such that a hydraulic fluid is forced into an accumulator, filling the accumulator with oil for the storage and supply of primary potential energy for safety control rod insertion such that the release of potential energy in the accumulator causes hydraulic fluid to flow through the hydraulic pump, converting the hydraulic pump to a hydraulic motor having speed and power capable of full length insertion and high speed driving of the safety control rod into the reactor core; a solenoid valve interposed between the hydraulic pump and the accumulator, said solenoid valve being a normally open valve, actuated to close when the safety control rod is out of the reactor during reactor operation; and further wherein said solenoid opens in response to a signal from the reactor control system calling for shutdown of the reactor and rapid insertion of the safety control rod into the reactor core, such that the opening of the solenoid releases the potential energy in the accumulator to place the safety control rod in a safe shutdown position.

53 Expert system for online surveillance of nuclear reactor coolant pumps. Gross, K.C.; Singer, R.M.; Humenik, K.E. To Dept. of Energy, Washington, DC (US). USA Patent 5,223,207/A/. 29 Jun 1993. Filed date 29 Jan 1992. USA Patent Application 7-827,776. Int. Cl. G21C 7/00. [10] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An expert system for determining the operability of a specified pump is described comprising: a set of pumps of which the specified pump is a member; means for measuring physical parameters representative to the operations condition each pump of said set of pumps; means for acquiring data generated by said measuring means; an artificial-intelligence based inference engine coupled to said data acquiring means where said inference engine applies a sequential probability ratio test to statistically evaluate said acquired data to determine a status for the specified pump and its respective measuring means by continually monitoring and comparing changes in a specific operational parameter signal acquired from a plurality of measurement means; means for transferring said status generated by said interference engine to an output system.

Reactor Safety

54 **Nuclear reactor flow control method and apparatus.** Church, J.P. To Dept. of Energy. 23 Apr 1991. USA Patent Application 7-689,425. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93012016. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes method and apparatus for improving coolant flow in a nuclear reactor during accident as well as nominal conditions. The reactor has a plurality of fuel elements in sleeves and a plenum above the fuel and through which the sleeves penetrate. Holes are provided in the sleeve so that coolant from the plenum can enter the sleeve and cool the fuel. The number and size of the holes are varied from sleeve to sleeve with the number and size of holes being greater for sleeves toward the center of the core and less for sleeves toward the periphery of the core. Preferably the holes are all the same diameter and arranged in rows and columns, the rows starting from the bottom of every sleeve and fewer rows in peripheral sleeves and more rows in the central sleeves.

55 **Nuclear reactor flow control method and apparatus.** Church, J.P. To Dept. of Energy, Washington, DC (United States). USA Patent 5,198,185/A/. 30 Mar 1993. Filed date 23 Apr 1991. Int. Cl. G21C 15/00. [10] DOE Contract AC09-89SR18035. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Method and apparatus for improving coolant flow in a nuclear reactor during accident as well as nominal conditions. The reactor has a plurality of fuel elements in sleeves and a plenum above the fuel and through which the sleeves penetrate. Holes are provided in the sleeve so that coolant from the plenum can enter the sleeve and cool the fuel. The number and size of the holes are varied from sleeve to sleeve with the number and size of holes being greater for sleeves toward the center of the core and less for sleeves toward the periphery of the core. Preferably the holes are all the same diameter and arranged in rows and columns, the rows starting from the bottom of every sleeve and fewer rows in peripheral sleeves and more rows in the central sleeves.

24 POWER TRANSMISSION AND DISTRIBUTION

Power System Networks, Transmission and Distribution

56 **Electrical receptacle.** Leong, R. To Dept. of Energy, Washington, DC (US). USA Patent 5,221,211/A/. 22 Jun 1993. Filed date 15 May 1992. USA Patent Application 7-883,910. Int. Cl. H01R 13/11. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The invention is a receptacle for a three prong electrical plug which has either a tubular or U-shaped grounding prong. The inventive receptacle has a grounding prong socket which is sufficiently spacious to prevent the socket from significantly stretching when a larger, U-shaped grounding prong is inserted into the socket, and having two ridges to allow a snug fit when a smaller tubular shape grounding prong is inserted into the socket. The two ridges are made to prevent the socket from expanding when either the U-shaped grounding prong or the tubular grounding prong is inserted.

25 ENERGY STORAGE

Thermal

Refer also to citation(s) 46

Batteries

57 **Chloromethyl chlorosulfate as a voltage delay inhibitor in lithium cells.** Delnick, F.M. To Dept. of Energy, Washington, DC (US). USA Patent 5,202,203/A/. 13 Apr 1993. Filed date 5 Apr 1991. USA Patent Application 7-680,973. Int. Cl. H01M 6/14; H01M 6/16. [10] DOE Contract AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Chloromethyl chlorosulfate (CMCS) is used as a passive film growth inhibitor in electrochemical cells to minimize voltage delay and low-voltage discharge. Film growth on lithium anodes is significantly diminished when CMCS is added to $SOCl_2$ and SO_2Cl_2 electrolytes of lithium batteries. The CMCS also has the effect of extending the shelf-life of $Li/SOCl_2$ and Li/SO_2Cl_2 batteries.

58 **Method of electrode fabrication and an electrode for metal chloride battery.** Bloom, I.D.; Nelson, P.A.; Vissers, D.R. To Dept. of Energy, Washington, DC (US). USA Patent 5,194,343/A/. 16 Mar 1993. Filed date 9 Oct 1990. USA Patent Application 7-594,485. Int. Cl. H01M 4/00. [10] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method of fabricating an electrode for use in a metal chloride battery and an electrode are provided. The electrode has relatively larger and more uniform pores than those found in typical electrodes. The fabrication method includes the steps of mixing sodium chloride particles selected from a predetermined size range with metal particles selected from a predetermined size range, and then rigidifying the mixture. The electrode exhibits lower resistivity values of approximately 0.5 Ωcm^2 than those resistivity values of approximately 1.0-1.5 Ωcm^2 exhibited by currently available electrodes.

59 **Solid state safety jumper cables.** Kronberg, J.W. To Dept. of Energy, Washington, DC (United States). USA Patent 5,189,359/A/. 23 Feb 1993. Filed date 22 Jan 1991.

Int. Cl. H02J 7/00. [10] DOE Contract AC09-89SR18035. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Solid state jumper cables for connecting two batteries in parallel, having two bridge rectifiers for developing a reference voltage, a four-input decoder for determining which terminals are to be connected based on a comparison of the voltage at each of the four terminals to the reference voltage, and a pair of relays for effecting the correct connection depending on the determination of the decoder. No connection will be made unless only one terminal of each battery has a higher voltage than the reference voltage, indicating "positive" terminals, and one has a lower voltage than the reference voltage, indicating "negative" terminals, and that, therefore, the two high voltage terminals may be connected and the two lower voltage terminals may be connected. Current flows once the appropriate relay device is closed. The relay device is preferably a MOSFET (metal oxide semiconductor field effect transistor) combined with a series array of photodiodes that develop MOSFET gate-closing potential when the decoder output causes an LED to light.

30 DIRECT ENERGY CONVERSION

MHD Generators

60 **Plasma plume MHD power generator and method.** Hammer, J.H. To Dept. of Energy, Washington, DC (US). USA Patent 5,234,183/A/. 10 Aug 1993. Filed date 17 Apr 1992. USA Patent Application 7-869,929. Int. Cl. B64G 1/00. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method is described of generating power at a situs exposed to the solar wind which comprises creating at separate sources at the situs discrete plasma plumes extending in opposed directions, providing electrical communication between the plumes at their source and interposing a desired electrical load in the said electrical communication between the plumes.

Fuel Cells

61 **All ceramic structure for molten carbonate fuel cell.** Smith, J.L.; Kucera, E.H. To Dept. of Energy. 1991. Filed date 16 Apr 1991. USA Patent Application 7-685,759. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93012019. Source: OSTI; NTIS; GPO Dep.

An all-ceramic molten carbonate fuel cell having a composition formed of a multivalent metal oxide or oxygenate such as an alkali metal, transition metal oxygenate. The structure includes an anode and cathode separated by an electronically conductive interconnect. The electrodes and interconnect are compositions ceramic materials. Various combinations of ceramic compositions for the anode, cathode and interconnect are disclosed. The fuel cell exhibits stability in the fuel gas and oxidizing environments. It presents reduced sealing and expansion problems in fabrication and has improved long-term corrosion resistance.

62 **Ionic conductors for solid oxide fuel cells.** Krumpelt, M.; Bloom, I.D.; Pullockaran, J.D.; Myles, K.M. To Dept. of Energy, Washington, DC (US). USA Patent 5,232,794/A/. 3 Aug 1993. Filed date 17 Oct 1991. USA Patent Application 7-777,955. Int. Cl. H01M 8/10. [10] DOE Contract W-31-109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An ionic conductor of oxide ions or hydrated protons is described comprising: (a) molecular framework structure having a net positive charge or a net negative charge or oxide-ion vacancies; and (b) said molecular framework structure having channels large enough to transport said oxide ions or hydrated protons; wherein the molecular framework structure is selected from the group consisting of substituted aluminum phosphates, substituted orthosilicates, substituted silicoaluminates, substituted apatites having the general formula $Ca_5F(PO_4)_3$, substituted sodalites having the general formula $Na_4Al_3Si_3O_{12}Cl$, and combinations thereof.

63 **Solid-oxide fuel cell electrolyte.** Bloom, I.D.; Hash, M.C.; Krumpelt, M. To Dept. of Energy, Washington, DC (US). USA Patent 5,213,911/A/. 25 May 1993. Filed date 17 Oct 1991. USA Patent Application 7-777,954. Int. Cl. H01M 8/00. [10] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A solid-oxide electrolyte which is substantially free of the ability to conduct electrons and is chemically stable to H_2 in a fuel cell or battery operating environment is described comprising: a compound having weak metal-oxygen interactions; and a compound having stronger metal-oxygen interactions combined with said compound having weak metal-oxygen interactions, whereby the resulting combination has both strong and weak metal-oxygen interaction properties for providing increased thermodynamic stability and having a minimum ionic conductivity at 800 C of 1×10^{-1} ohm^{-1} cm^{-1}; and wherein the resulting combination is selected from the general compound group consisting of Bi-M-O, RE-M-O wherein RE is a rare earth, La-M-O, and combinations thereof, and wherein M is one or more metals selected from the group of metals consisting of Al, Y, La, Bi, rare earths, alkaline earths, and transition metals, provided the resulting compound shall contain at least two different metals from said group.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

Transportation

Refer also to citation(s) 75, 76

Industrial and Agricultural Processes

Refer also to citation(s) 38

64 **Conversion of hazardous materials using supercritical water oxidation.** Rofer, C.K.; Buelow, S.J.; Dyer, R.B.; Wander, J.D. To Dept. of Energy. 29 Mar 1991. USA

Patent Application 7-677,738. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93008232. Source: OSTI; NTIS; GPO Dep.

A process for destruction of hazardous materials in a medium of supercritical water without the addition of an oxidant material. The hazardous material is converted to simple compounds which are relatively benign or easily treatable to yield materials which can be discharged into the environment. Treatment agents may be added to the reactants in order to bind certain materials, such as chlorine, in the form of salts or to otherwise facilitate the destruction reactions.

65 Wastewater heat recovery method and apparatus. Kronberg, J.W. To Dept. of Energy. 1991. USA Patent Application 7-718,518. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93015715. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a heat recovery system with a heat exchanger and a mixing valve. A drain trap includes a heat exchanger with an inner coiled tube, baffle plate, wastewater inlet, wastewater outlet, cold water inlet, and preheated water outlet. Wastewater enters the drain trap through the wastewater inlet, is slowed and spread by the baffle plate, and passes downward to the wastewater outlet. Cold water enters the inner tube through the cold water inlet and flows generally upward, taking on heat from the wastewater. This preheated water is fed to the mixing valve, which includes a flexible yoke to which are attached an adjustable steel rod, two stationary zinc rods, and a pivoting arm. The free end of the arm forms a pad which rests against a valve seat. The rods and pivoting arm expand or contract as the temperature of the incoming preheated water changes. The zinc rods expand more than the steel rod, flexing the yoke and rotating the pivoting arm. The pad moves towards the valve seat as the temperature of the preheated water rises, and away as the temperature falls, admitting a variable amount of hot water to maintain a nearly constant average process water temperature.

66 Shielded fluid stream injector for particle bed reactor. Notestein, J.E. To Dept. of Energy, Washington, DC (US). USA Patent 5,232,673/A/. 3 Aug 1993. Filed date 27 Aug 1991. USA Patent Application 7-750,680. Int. Cl. B01J 8/12. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Apparatus is described for injecting a fluid stream into or withdrawing such stream from a particle bed region of a gravity-fed particle bed reactor comprising: a vessel defining a vertical reactor having a particle bed collection region and including means at an upper location in the vessel for introducing particles whereby the particles may move downward into and through the bed collection region by gravity; at least one fluid injection duct secured to a wall of said reactor and disposed horizontally across and within the particle bed collection region for receiving a fluid stream, said duct being straight and having a plurality of perforations extending through a wall of the duct along the length thereof in said particle bed collection region; and an elongated shield extending parallel to said duct and having a pair of downwardly inclined sides disposed above and spaced apart from said duct so as to substantially cover the duct, said shield being fixedly secured to a wall of said reactor; whereby said fluid stream may be dispersed uniformly into or removed from said particle bed region with minimized clogging of perforations in said duct.

67 Disposable sludge dewatering container and method. Cole, C.M. To Dept. of Energy, Washington, DC (US). USA Patent 5,232,599/A/. 3 Aug 1993. Filed date 1 May 1992. USA Patent Application 7-884,313. Int. Cl. C02F 3/00. [10] DOE Contract AC09-89SR18035. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method is described for preparing sludge for disposal, comprising the steps of: providing a layer of granular material over a layer of coarser material in the bottom of a disposable container; providing conduit means in the coarser material for extracting water from the layer of coarser material; depositing the sludge on the layer of granular material; extracting water through the conduit means by vacuuming; sealing the conduit means; and sealing the container.

68 Method for enhanced atomization of liquids. Thompson, R.E.; White, J.R. To [Dept. of Energy, Washington, DC (United States)]. USA Patent 5,217,362/A/. 8 Jun 1993. Filed date 30 Dec 1991. Int. Cl. F23D 11/44. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

In a process for atomizing a slurry or liquid process stream in which a slurry or liquid is passed through a nozzle to provide a primary atomized process stream, an improvement is described which comprises subjecting the liquid or slurry process stream to microwave energy as the liquid or slurry process stream exits the nozzle, wherein sufficient microwave heating is provided to flash vaporize the primary atomized process stream.

69 Vortex nozzle for segmenting and transporting metal chips from turning operations. Bieg, L.F. To Dept. of Energy, Washington, DC (US). USA Patent 5,203,509/A/. 20 Apr 1993. Filed date 3 Apr 1992. USA Patent Application 7-862,885. Int. Cl. B02C 23/26; B02C 19/06; B05B 1/34. [10] DOE Contract AC34-90DP62349. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Apparatus for collecting, segmenting and conveying metal chips from machining operations utilizes a compressed gas driven vortex nozzle for receiving the chip and twisting it to cause the chip to segment through the application of torsional forces to the chip. The vortex nozzle is open ended and generally tubular in shape with a converging inlet end, a constant diameter throat section and a diverging exhaust end. Compressed gas is discharged through angled vortex ports in the nozzle throat section to create vortex flow in the nozzle and through an annular inlet at the entrance to the converging inlet end to create suction at the nozzle inlet and cause ambient air to enter the nozzle. The vortex flow in the nozzle causes the metal chip to segment and the segments thus formed to pass out of the discharge end of the nozzle where they are collected, cleaned and compacted as needed.

70 **Inflatable containment diaphragm for sealing and removing stacks.** Meskanick, G.R.; Rosso, D.T. To Dept. of Energy, Washington, DC (US). USA Patent 5,201,345/A/. 13 Apr 1993. Filed date 23 Jul 1991. USA Patent Application 7-734,993. Int. Cl. F16L 55/10. [10] DOE Contract AC11-89PN38014. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A diaphragm with an inflatable torus-shaped perimeter is used to seal at least one end of a stack so that debris that might be hazardous will not be released during removal of the stack. A diaphragm is inserted and inflated in the lower portion of a stack just above where the stack is to be cut such that the perimeter of the diaphragm expands and forms a seal against the interior surface of the stack.

71 **Ice electrode electrolytic cell.** Glenn, D.F.; Suciu, D.F.; Harris, T.L.; Ingram, J.C. To Dept. of Energy, Washington, DC (US). USA Patent 5,200,054/A/. 6 Apr 1993. Filed date 22 Jul 1992. USA Patent Application 7-917,243. Int. Cl. C25C 5/02; C25C 5/00; B22F 9/00. [10] DOE Contract AC07-76ID01570. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

This invention relates to a method and apparatus for removing heavy metals from waste water, soils, or process streams by electrolytic cell means. The method includes cooling a cell cathode to form an ice layer over the cathode and then applying an electric current to deposit a layer of the heavy metal over the ice. The metal is then easily removed after melting the ice. In a second embodiment, the same ice-covered electrode can be employed to form powdered metals.

72 **Drill string enclosure.** Jorgensen, D.K.; Kuhns, D.J.; Wiersholm, O.; Miller, T.A. To Dept. of Energy, Washington, DC (US). USA Patent 5,191,156/A/. 2 Mar 1993. Filed date 14 Apr 1992. USA Patent Application 7-868,143. Int. Cl. B09B 1/00. [10] DOE Contract AC07-76ID01570. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The drill string enclosure consists of six component parts, including; a top bracket, an upper acrylic cylinder, an acrylic drill casing guide, a lower acrylic cylinder, a bottom bracket, and three flexible ducts. The upper acrylic cylinder is optional based upon the drill string length. The drill string enclosure allows for an efficient drill and sight operation at a hazardous waste site.

Municipalities and Community Systems

Refer also to citation(s) 72

33 ADVANCED PROPULSION SYSTEMS

Internal Combustion Engines

73 **Water augmented indirectly-fired gas turbine system and method.** Bechtel, T.F.; Parsons, E.J. Jr. To Dept. of Energy. 1991. Filed date 3 Jun 1991. USA Patent Application 7-709,567. 29p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93015702. Source: OSTI; NTIS; GPO Dep.

An indirectly-fired gas turbine system utilizing water augmentation for increasing the net efficiency and power output of the system is described. Water injected into the compressor discharge stream evaporatively cools the air to provide a high driving temperature difference across a high temperature air heater which is used to indirectly heat the water-containing air to a turbine inlet temperature of greater than about 1000°C. By providing a lower air heater hot side outlet temperature, heat rejection in the air heater is reduced to increase the heat recovery in the air heater and thereby increase the overall cycle efficiency.

74 **Method for bonding thin film thermocouples to ceramics.** Kreider, K.G. To United States Department of Energy, Washington, DC (US). USA Patent 5,215,597/A/. 1 Jun 1993. Filed date 8 Aug 1989. USA Patent Application 7-390,851. Int. Cl. H01L 35/28. [10] DOE Contract AI05-83OR21375. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An assembly suitable for measuring temperatures up to 700 degrees Centigrade at the cylinder walls in an internal combustion engine is described, comprising: a substrate comprised of a ceramic selected from the group consisting of alumina and partially stabilized zirconia and mixtures thereof, a thin layer of reactive metal deposited on said ceramic substrate, said reactive metal selected from the group consisting of chromium, titanium, and zirconium, and a thin thermocouple layer comprised of a thin layer of platinum metal and a thin layer of platinum-rhodium alloy deposited on said reactive metal layer, whereby said reactive metal layer serves as a bond layer for adhering said noble metal layers to said substrate.

Electric-Powered Systems

75 **Propulsion and stabilization system for magnetically levitated vehicles.** Coffey, H.T. To Dept. of Energy, Washington, DC (US). USA Patent 5,222,436/A/. 29 Jun 1993. Filed date 28 Jul 1992. USA Patent Application 7-920,736. Int. Cl. B60L 13/04. [10] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A magnetic levitation and propulsion system for a vehicle adapted to travel over a roadbed is described comprising: a guide way affixed to a support structure where the support structure is coupled to the roadbed, a plurality of superconducting magnet devices producing magnetic fields and affixed to the vehicle where the superconducting magnet devices are oriented parallel to one surface of the guide way to generate a repulsive force between the guide way and the magnetic devices, and a plurality of propulsion windings affixed to the support structure, where the propulsion windings are located above and parallel to the superconducting magnet devices and are energized by a power source to generate a vehicle propulsion force to propel the vehicle along the roadbed support structure.

76 **Expansion joint for guideway for magnetic levitation transportation system.** Rossing, T.D. To Dept. of

Energy, Washington, DC (US). USA Patent 5,184,557/A/. 9 Feb 1993. Filed date 10 Dec 1991. USA Patent Application 7-804,555. Int. Cl. B60L 13/00. [10] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An expansion joint that allows a guideway of a magnetic levitation transportation system to expand and contract while minimizing transients occurring in the magnetic lift and drag forces acting on a magnetic levitation vehicle traveling over the joint includes an upper cut or recess extending downwardly from the upper surface of the guideway and a non-intersecting lower cut or recess that extends upwardly from the lower surface of the guideway. The side walls of the cuts can be parallel to each other and the vertical axis of the guideway; the depth of the lower cut can be greater than the depth of the upper cut; and the overall combined lengths of the cuts can be greater than the thickness of the guideway from the upper to lower surface so that the cuts will overlap, but be spaced apart from each other. The distance between the cuts can be determined on the basis of the force transients and the mechanical behavior of the guideway. A second pair of similarly configured upper and lower cuts may be disposed in the guideway; the expansion joint may consist of two upper cuts and one lower cut; or the cuts may have non-parallel, diverging side walls so that the cuts have a substantially dove-tail shape.

36 MATERIALS

Metals and Alloys

Refer also to citation(s) 119, 140

77 **Solder for oxide layer-building metals and alloys.** Kronberg, J.W. To Dept. of Energy. 8 Apr 1991. USA Patent Application 7-681,290. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93008218. Source: OSTI; NTIS; GPO Dep.

A low-temperature solder and method for soldering an oxide layer-building metal such as Al, Ti, Ta or stainless steel. The composition comprises Sn and Zn; Ge as a wetting agent; preferably small amounts of Cu and Sb; and a grit, such as SiC. The grit abrades any oxide layer formed on the surface of the metal as the Ge penetrates beneath and loosens the oxide layer to provide good metal-to-metal contact. The Ge comprises less than 10 wt.% of the solder composition so that it provides sufficient wetting action but does not result in a melting temperature above 300 C. The method comprises the steps rubbing the solder against the metal surface so that the grit in the solder abrades the surface while heating the surface until the solder begins to melt and the germanium penetrates the oxide layer, then brushing aside any oxide layer loosened by the solder.

78 **High strength and density tungsten-uranium alloys.** Sheinberg, H. To Dept. of Energy. 1991. Filed date 8 Apr 1991. USA Patent Application 7-681,295. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93012028. Source: OSTI; NTIS; GPO Dep.

Alloys of tungsten and uranium and a method for making the alloys. Amount of tungsten present in the alloys is from about 55 to 85. A porous preform is made by sintering consolidated tungsten powder. The preform is impregnated with molten uranium such that (1) uranium fills the pores of the of the preform to form uranium in a tungsten matrix or (2) uranium dissolves portions of the preform to form a continuous uranium phase containing tungsten particles.

79 **Lithium metal reduction of plutonium oxide to produce plutonium metal.** Coops, M.S. To Dept. of Energy. 1991. Filed date 23 Apr 1991. USA Patent Application 7-689,423. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE93012017. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A method is described for the chemical reduction of plutonium oxides to plutonium metal by the use of pure lithium metal. Lithium metal is used to reduce plutonium oxide to alpha 5 plutonium metal (alpha-Pu). The lithium oxide by-product is reclaimed by sublimation and converted to the chloride salt, and after electrolysis, is removed as lithium metal. Zinc may be used as a solvent metal to improve thermodynamics of the reduction reaction at lower temperatures. Lithium metal reduction enables 10 plutonium oxide reduction without the production of huge quantities of $CaO-CaCl_2$ residues normally produced in conventional direct oxide reduction processes.

80 **X-Z-Theta cutting method.** Bieg, L.F. To Dept. of Energy, Washington, DC (US). USA Patent 5,178,498/A/. 12 Jan 1993. Filed date 11 Jun 1991. USA Patent Application 7-713,209. Int. Cl. B23C 3/00. [10] DOE Contract AC04-76DP03533. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method for machining a workpiece. The method includes the use of a rotary cutting tool mounted on the end of a movable arm. The arm is adapted to move in a plane perpendicular to the axis of rotation of the cutting tool. The cutting tool has cutting teeth to cut chips of material off of the workpiece in a predetermined size and shape to facilitate better removal of the chips from the workpiece. The teeth can be of different type and length to permit the tool to both rough cut and finish cut the workpiece during machining. The total depth of cut is divided by the number of tool teeth, so that the longest tool always performs the finishing cut.

Ceramics, Cermets, and Refractories

Refer also to citation(s) 80

81 **Manufacture of silicon carbide using solar energy.** Glatzmaier, G.C. To Dept. of Energy. 8 Apr 1991. USA Patent Application 7-681,296. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93008213. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a method is described for producing silicon carbide particles using solar energy. The method is efficient and avoids the need for use of electrical energy to heat the reactants. Finely divided silica and carbon are admixed and placed in a solar-heated reaction chamber for a time sufficient to cause a reaction between the ingredients to form silicon carbide of very small particle size. No grinding of silicon carbide is required to obtain small particles. The method may be carried out as a batch process or as a continuous process.

82 **Machinable dissolved metal oxide superconductors.** Chen, Chung-Hsuan. To Dept. of Energy. 1991. Filed date 8 May 1991. USA Patent Application 7-696,881. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE93012009. Source: OSTI; NTIS; GPO Dep.

Powders of a metal oxide superconductor are mixed with sufficient amount (10–80 mol%) of In, Sn, and/or Al, to become nonbrittle, machinable. Preferred superconductors are $YBa_2Cu_3O_{7-x}$ and Bi-Sr-Ca-Cu-O compounds.

83 **Microwave sintering of multiple articles.** Blake, R.D.; Katz, J.D. To Dept. of Energy, Washington, DC (US). USA Patent 5,227,600/A/. 13 Jul 1993. Filed date 31 Jul 1992. USA Patent Application 7-923,298. Int. Cl. H05B 6/80; C04B 33/32. [10] DOE Contract W-7405-ENG-36. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method for microwave sintering of multiple small articles of alumina is described comprising: (a) placing at least two articles of alumina in a sintering chamber located within a sintering container, where each article has a mass of no more than about 50 grams, where said chamber is cylindrical in shape, has a floor, a ceiling, and a sidewall, and has a bed of alumina particles located on said floor, where said container has a square or circular planform, where the container is constructed of insulating material and stabilized zirconia, and where the container is comprised of: (1) a base layer of insulating material having a thickness of from about 0.5 to 2.0 inches; (2) a floor layer of stabilized zirconia having a thickness of from about 0.125 to about 0.25 inch; (3) a cylindrical ring of insulating material having a horizontal thickness of from about 0.125 to about 0.375 inch, where said ring rests upon the floor layer and where the inner surface of the ring is the sidewall of the chamber; (4) a stabilized zirconia element which surrounds the ring and has a horizontal thickness of from about 0.25 to about 2.5 inches; (5) a ceiling layer of insulating material having a thickness of from about 0.25 to about 1.5 inches, and (6) a top layer of stabilized zirconia which has a thickness of from about 0.25 to about 1. 5 inches; (b) heating the container to a hold temperature within a hold temperature range, where said hold temperature range is from about 1,400 to about 1,700 C, and where said hold temperature is the surface temperature of one of said alumina articles; (c) maintaining the sintering container at a temperature within the hold temperature range for from about 5 to about 60 minutes by means of microwave radiation; and (d) cooling the container to a temperature below about 1,350 C at a maximum rate of no more than 30 C per minute, where said cooling rate is maintained below said maximum rate by subjecting the container to microwave radiation.

84 **Microwave sintering of nanophase ceramics without concomitant grain growth.** Eastman, J.A.; Sickafus, K.E.; Katz, J.D. To Dept. of Energy, Washington, DC (US). USA Patent 5,223,186/A/. 29 Jun 1993. Filed date 15 Apr 1991. USA Patent Application 7-685,117. Int. Cl. C04B 35/64. [10] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method of sintering nanocrystalline ceramic material is described comprising subjecting nanocrystalline ceramic material to microwave energy at atmospheric pressure to heat said ceramic material to a temperature less than about 70% of the melting point of the nanocrystalline ceramic material expressed in degrees K., to produce sintered nanocrystalline ceramic material having a density greater than about 95% of theoretical and an average grain size not more than about 60 nanometers after sintering.

85 **Fracture toughness for copper oxide superconductors.** Goretta, K.C.; Kullberg, M.L. To Dept. of Energy, Washington, DC (US). USA Patent 5,202,306/A/. 13 Apr 1993. Filed date 18 Sep 1991. USA Patent Application 7-761,551. Int. Cl. H01B 12/06; H01L 39/12; H01L 39/02. [10] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An oxide-based strengthening and toughening agent, such as tetragonal ZrO_2 particles, has been added to copper oxide superconductors, such as superconducting $YBa_2Cu_3O_x$ (123) to improve its fracture toughness (K_{IC}). A sol-gel coating which is non-reactive with the superconductor, such as Y_2BaCuO_5 (211) on the ZrO_2 particles minimized the deleterious reactions between the superconductor and the toughening agent dispersed therethrough. Addition of 20 mole percent ZrO_2 coated with 211 yielded a 123 composite with a K_{IC} of 4.5 $MPa(m)^{0.5}$.

86 **Combustion synthesis method and products.** Holt, J.B.; Kelly, M. To Dept. of Energy, Washington, DC (US). USA Patent 5,198,188/A/. 30 Mar 1993. Filed date 16 Jan 1991. USA Patent Application 7-641,977. Int. Cl. B32B 9/00; B05D 1/00; B22F 1/00. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Disclosed is a method of producing dense refractory products, comprising: (a) obtaining a quantity of exoergic material in powder form capable of sustaining a combustion synthesis reaction; (b) removing absorbed water vapor therefrom; (c) cold-pressing said material into a formed body; (d) plasma spraying said formed body with a molten exoergic material to form a coat thereon; and (e) igniting said exoergic coated formed body under an inert gas atmosphere and pressure to produce self-sustained combustion synthesis. Also disclosed are products produced by the method.

Other Materials

Refer also to citation(s) 80, 107, 111, 119

87 **Method for making glass.** Jantzen, C.M. To Dept. of Energy. 1991. Filed date 23 Apr 1991. USA Patent Application 7-690,046. 14p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93012013. Source: OSTI; NTIS; GPO Dep.

A method is discussed for making better quality molten borosilicate glass in a glass melter, the glass having the desired viscosity and, preferably, also the desired resistivity so that the glass melt can be established effectively and the product of the glass melter will have the desired level of quality. The method includes the adjustment of the composition of the glass constituents that are fed into the melter in accordance with certain correlations that reliably predict the viscosity and resistivity from the melter temperature and the melt composition, then heating the ingredients to the melter's operating temperature until they melt and homogenize. The equations include the calculation of a "non-bridging oxygen" term from the numbers of moles of the various ingredients, and then the determination of the viscosity and resistivity from the operating temperature of the melter and the non-bridging oxygen term.

88 **Surface coating for prevention of crust formation.** Kronberg, J.W. To Dept. of Energy. 1991. USA Patent Application 7-730,423. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93015724. Source: OSTI; NTIS; GPO Dep.

A flexible surface coating promotes the removal of deposits as they reach the surface by preventing adhesion and crust formation. Flexible layers are attached to each side of a flexible mesh substrate comprising of a plurality of zones composed of one or more neighboring cells, each zone having a different compressibility than its adjacent zones. The substrate is composed of a mesh made of strands and open cells. The cells may be filled with foam. Studs or bearings may also be positioned in the cells to increase the variation in compressibility and thus the degree of flexing of the coating. Surface loading produces varying amounts of compression from point to point causing the coating to flex as deposits reach it, breaking up any hardening deposits before a continuous crust forms. Preferably one or more additional layers are also used, such as an outer layer of a non-stick material such as TEFLON, which may be pigmented, and an inner, adhesive layer to facilitate applying, the coating, to a surface.

89 **Low density carbonized composite foams.** Fung-ming Kong. To Dept. of Energy, Washington, DC (US). USA Patent 5,232,772/A/. 3 Aug 1993. Filed date 19 Aug 1991. USA Patent Application 7-746,528. Int. Cl. B32B 5/18; B32B 9/00; C01B 31/02. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A carbonized composite foam which has two cellular structures is described, comprising: a first cellular structure formed from the polymerization of a monomer, and a second cellular structure formed from a high-carbon-yield prepolymer which occupies the cells of the first cellular structure, whereby the second cellular structure has cell diameters smaller than the first cellular structure, producing a bimodal cell size distribution; and wherein the second cellular structure has cell diameters less than about 1 micron, wherein the composite foam has a density less than about 50 mg/cm$_3$, and wherein the first and second cellular structures are carbonized.

90 **Production of hollow aerogel microspheres.** Upadhye, R.S.; Henning, S.A. To Dept. of Energy, Washington, DC (US). USA Patent 5,227,239/A/. 13 Jul 1993. Filed date 30 Nov 1990. USA Patent Application 7-620,123. Int. Cl. B32B 5/16. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A process is described for preparing hollow aerogel microspheres, comprising the steps of: reacting metal alkoxide with water and base catalyst in alcohol solvent until a viscous alcogel is attained; forming a drop of viscous alcogel; injecting inert gas and base catalyst into the drop, at the time of drop formation, to form a hollow alcogel microsphere; blowing the hollow alcogel microsphere free of the viscous alcogel to fall into an atmosphere of inert gas and base catalyst; capturing said hollow alcogel microsphere on foam; and subjecting said hollow alcogel microsphere to supercritical drying to form a hollow aerogel microsphere of 800-1,200 μm diameter with a wall thickness of 100-300 μm and a wall density of 0.03 to 0. 3 g/cm^3.

91 **Controlled metal-semiconductor sintering/alloying by one-directional reverse illumination.** Sopori, B.L. To Dept. of Energy, Washington, DC (US). USA Patent 5,223,453/A/. 29 Jun 1993. Filed date 19 Mar 1991. USA Patent Application 7-671,230. Int. Cl. H01L 21/26. [10] DOE Contract AC02-83CH10093. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method of simultaneously alloying a metal layer deposited on a first surface of a transparent semiconductor substrate and sintering metal strips deposited on a second surface of the substrate that is opposite said first surface is described comprising the step of: illuminating the second surface of the semiconductor substrate with electromagnetic radiation having a wavelength that is substantially transmitted by the semiconductor substrate and substantially absorbed at the interface of the metal layer with the first surface for a time sufficient to melt and alloy the metal layer with the semiconductor substrate and to sinter the metal strips to the second surface of the semiconductor substrate.

92 **Hybrid sol-gel optical materials.** Zeigler, J.M. To Dept. of Energy, Washington, DC (US). USA Patent 5,204,381/A/. 20 Apr 1993. Filed date 20 Apr 1992. USA Patent Application 7-870,857. Int. Cl. C08J 3/28. [10] DOE Contract AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Hybrid sol-gel materials comprise silicate sols cross-linked with linear polysilane, polygermane, or poly(silane-germane). The sol-gel materials are useful as optical identifiers in tagging and verification applications and, in a different aspect, as stable, visible light transparent non-linear optical materials. Methyl or phenyl silicones, polyaryl sulfides, polyaryl ethers, and rubbery polysilanes may be used in addition to the linear polysilane. The linear polymers cross-link with the sol to form a matrix having high optical transparency, resistance to thermooxidative aging, adherence to a variety of substrates, brittleness, and a resistance to cracking during thermal cycling.

93 High rate chemical vapor deposition of carbon films using fluorinated gases. Stafford, B.L.; Tracy, C.E.; Benson, D.K.; Nelson, A.J. To Dept. of Energy, Washington, DC (US). USA Patent 5,198,263/A/. 30 Mar 1993. Filed date 15 Mar 1991. USA Patent Application 7-669,718. Int. Cl. B05D 3/06; C23C 16/26. [10] Contract S-68-637. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A high rate, low-temperature deposition of amorphous carbon films is produced by PE-CVD in the presence of a fluorinated or other halide gas. The deposition can be performed at less than 100 C, including ambient room temperature, with a radio frequency plasma assisted chemical vapor deposition process. With less than 6.5 atomic percent fluorine incorporated into the amorphous carbon film, the characteristics of the carbon film, including index of refraction, mass density, optical clarity, and chemical resistance are within fifteen percent (15%) of those characteristics for pure amorphous carbon films, but the deposition rates are high.

94 Method of bonding metals to ceramics and other materials. Gruen, D.M.; Krauss, A.R.; DeWald, A.P.; Chienping Ju; Rigsbee, J.M. To [Dept. of Energy, Washington, DC (United States)]. USA Patent 5,176,950/A/. 5 Jan 1993. Filed date 27 Dec 1988. Int. Cl. B32B 9/00. [10] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A composite and method of forming same wherein the composite has a non-metallic portion and an alloy portion wherein the alloy comprises an alkali metal and a metal which is an electrical conductor such as Cu, Ag, Al, Sn or Au and forms an alloy with the alkali metal. A cable of superconductors and composite is also disclosed.

40 CHEMISTRY

Analytical and Separations Chemistry

Refer also to citation(s) 20, 25, 110, 169, 200, 202

95 Linear electric field mass spectrometry. McComas, D.J.; Nordholt, J.E. To Dept. of Energy. 29 Mar 1991. USA Patent Application 7-678,081. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93008231. Source: OSTI; NTIS; GPO Dep.

A mass spectrometer is described having a low weight and low power requirement, for use in space. It can be used to analyze the ionized particles in the region of the spacecraft on which it is mounted. High mass resolution measurements are made by timing ions moving through a gridless cylindrically sysmetric linear electric field.

96 Fiber optic hydrogen sensor. Buchanan, B.R.; Prather, W.S. To Dept. of Energy. 1991. USA Patent Application 7-678,520. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93015612. Source: OSTI; NTIS; GPO Dep.

Apparatus and method for detecting a chemical substance by exposing an optic fiber having a core and a cladding to the chemical substance so that the chemical substance can be adsorbed onto the surface of the cladding. The optic fiber is coiled inside a container having a pair of valves for controlling the entrance and exit of the substance. Light from a light source is received by one end of the optic fiber, preferably external to the container, and carried by the core of the fiber. Adsorbed substance changes the transmissivity of the fiber as measured by a spectrophotometer at the other end, also preferably external to the container. Hydrogen is detected by the absorption of infrared light carried by an optic fiber with a silica cladding. Since the adsorption is reversible, a sensor according to the present invention can be used repeatedly. Multiple positions in a process system can be monitored using a single container that can be connected to each location to be monitored so that a sample can be obtained for measurement, or, alternatively, containers can be placed near each position and the optic fibers carrying the partially-absorbed light can be multiplexed for rapid sequential reading, by a single spectrophotometer.

97 Colorimetric determination of pH. Baumann, E.W.; Buchanan, B.R. To Dept. of Energy. 1991. Filed date 8 Apr 1991. USA Patent Application 7-681,297. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93012027. Source: OSTI; NTIS; GPO Dep.

There is a need for a simple, rapid, reliable means for determining pH values of concentrated, high salt solutions without reliance on human eye and ambient light. The method comprises the steps of preparing a set of reference solutions, measuring the light absorption by each reference solution, adding indicator dye to each reference solution, measuring the light absorption by each such reference mixture, comparing the two solutions to determine the dye color at each pH, normalizing the spectra of mixture to the isosbestic point, and matching the color of the pH of the solution to one of the colors of the pHs in the reference solution set. In this way, the pH can be determined to within 0.1 pH unit, a far more precise method than using the human eye.

98 Programmable spectral imaging method and apparatus. Buican, T.N.; Yoshida, T.M. To Dept. of Energy. 1991. Filed date 30 Apr 1991. USA Patent Application 7-693,466. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93012012. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of an integrated fluorescence analysis system that enables a component part of a sample to be virtually sorted within a sample volume after a spectrum of the component part has been identified from a fluorescence spectrum of the entire sample in. a flow cytometer. Birefringent optics enables the entire spectrum to be resolved into a set of numbers representing the intensity of spectral components of the spectrum. One or more spectral components are selected to program a scanning laser microscope, preferably a confocal microscope, whereby the spectrum from individual pixels or voxels in the sample can be compared. Individual pixels or voxels containing the selected spectral components are identified and an image may be formed to show the morphology of the sample with respect to only those components having the selected spectral components. There is no need for any physical sorting of the sample components to obtain the morphological information.

99 Atomic line emission analyzer for hydrogen isotopes. Kronberg, J.W. To Dept. of Energy. 8 May 1991. USA Patent Application 7-697,032. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93012007. Source: OSTI; NTIS; GPO Dep.

Apparatus for isotopic analysis of hydrogen comprises a low pressure chamber into which a sample of hydrogen is introduced and then exposed to an electrical discharge to excite the electrons of the hydrogen atoms to higher energy states and thereby cause the emission of light on the return to lower energy states, a Fresnel prism made at least in part of a material anomalously dispersive to the wavelengths of interest for dispersing the emitted light, and a photodiode array for receiving the dispersed light. The light emitted by the sample is filtered to pass only the desired wavelengths, such as one of the lines of the Balmer series for hydrogen, the wavelengths of which differ slightly from one isotope to another. The output of the photodiode array is processed to determine the relative amounts of each isotope present in the sample. Additionally, the sample itself may be recovered using, a metal hydride.

100 Elimination of "memory" from sample handling and inlet system of a mass spectrometer. Chastgner, P. To Dept. of Energy. 8 May 1991. USA Patent Application 7-697,042. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93012004. Source: OSTI; NTIS; GPO Dep.

This paper describes a method for preparing the sample handling and inlet system of a mass spectrometer for analysis of a subsequent sample following analysis of a previous sample comprising the flushing of the system interior with supercritical CO_2 and venting the interior. The method eliminates the effect of system "memory" on the subsequent analysis, especially following persistent samples such as xenon and krypton.

101 Measurement of pH in high ionic strength solutions. Knauss, K.G.; Wolery, T.J.; Jackson, K.J. To Dept. of Energy. 20 May 1991. USA Patent Application 7-702,527. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE93011999. Source: OSTI; NTIS; GPO Dep.

A practical method is described for measuring pH in solutions of high ionic strength (e.g., brines, process solutions). The pH is determined by integratively measuring the potential due to H^+ and the potential due to another cation or anion and relating the combined electrical potential to a calculated pH for high ionic strength solutions.

102 Electrowinning process with electrode compartment to avoid contamination of electrolyte. Poa, D.S.; Pierce, R.D.; Mulcahey, T.P.; Johnson, G.K. To Dept. of Energy, Washington, DC (US). USA Patent 5,225,051/A/. 6 Jul 1993. Filed date 24 Sep 1991. USA Patent Application 7-764,760. Int. Cl. C25C 3/02; C25C 7/00; C25C 7/04. [10] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A process is described of electrolytically recovering a metal from an oxide of the metal comprising the steps of: (a) providing an electrolytic cell including a molten salt electrolyte containing the metal oxide and one or more halide salts of the metal, a pair of spaced apart electrodes in the electrolyte, and a source of electrical voltage to the electrodes, one of the electrodes being an anode and a source of particulate carbon contamination of the electrolyte during operation of the cell, (b) operating the cell to recover the metal as an element at the other electrode while confining the contaminant to a zone in the electrolyte about the one electrode, and (c) periodically removing the contaminant from the electrolyte zone while interrupting operation of the cell.

103 Voltammetric analysis apparatus and method. Almon, A.C. To Dept. of Energy, Washington, DC (United States). USA Patent 5,217,112/A/. 8 Jun 1993. Filed date 4 Sep 1991. Int. Cl. G01N 27/416. [10] DOE Contract AC09-89SR18035. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An apparatus and method is described for electrochemical analysis of elements in solution. An auxiliary electrode, a reference electrode, and five working electrodes are positioned in a container containing a sample solution. The working electrodes are spaced apart evenly from each other and the auxiliary electrode to minimize any inter-electrode interference that may occur during analysis. An electric potential is applied between the auxiliary electrode and each of the working electrodes. Simultaneous measurements taken of the current flow through each of the working electrodes for each given potential in a potential range are used for identifying chemical elements present in the sample solution and their respective concentrations. Multiple working electrodes enable a more positive identification to be made by providing unique data characteristic of chemical elements present in the sample solution.

104 Noise reduction in negative-ion quadrupole mass spectrometry. Chastagner, P. To Dept. of Energy, Washington, DC (United States). USA Patent 5,204,530/A/. 20 Apr 1993. Filed date 27 Dec 1991. Int. Cl. H01J 49/20. [10] DOE Contract AC09-89SR18035. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A quadrupole mass spectrometer (QMS) system is described having an ion source, quadrupole mass filter, and ion collector/recorder system. A weak, transverse magnetic field and an electron collector are disposed between the quadrupole and ion collector. When operated in negative ion mode, the ion source produces a beam of primarily negatively-charged particles from a sample, including electrons as well as ions. The beam passes through the quadrupole and enters the magnetic field, where the electrons are deflected away from the beam path to the electron collector. The negative ions pass undeflected to the ion collector where they are detected and recorded as a mass spectrum.

105 Atomic line emission analyzer for hydrogen isotopes. Kronberg, J.W. To Dept. of Energy, Washington, DC (United States). USA Patent 5,198,870/A/. 30 Mar 1993.

Filed date 8 May 1991. Int. Cl. G01J 3/30. [10] DOE Contract AC09-89SR18035. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Apparatus for isotopic analysis of hydrogen comprises a low pressure chamber into which a sample of hydrogen is introduced and then exposed to an electrical discharge to excite the electrons of the hydrogen atoms to higher energy states and thereby cause the emission of light on the return to lower energy states, a Fresnel prism made at least in part of a material anomalously dispersive to the wavelengths of interest for dispersing the emitted light, and a photodiode array for receiving the dispersed light. The light emitted by the sample is filtered to pass only the desired wavelengths, such as one of the lines of the Balmer series for hydrogen, the wavelengths of which differ slightly from one isotope to another. The output of the photodiode array is processed to determine the relative amounts of each isotope present in the sample. Additionally, the sample itself may be recovered using a metal hydride.

106 Fiber-optic apparatus and method for measurement of luminescence and Raman scattering. Myrick, M.L.; Angel, S.M. To Dept. of Energy, Washington, DC (US). USA Patent 5,194,913/A/. 16 Mar 1993. Filed date 20 Mar 1991. USA Patent Application 7-672,335. Int. Cl. G01N 21/64; G01N 21/65. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A dual fiber forward scattering optrode for Raman spectroscopy with the remote ends of the fibers in opposed, spaced relationship to each other to form a analyte sampling space therebetween and the method of measuring Raman spectra utilizing same are described. One optical fiber is for sending an exciting signal to the remote sampling space and, at its remote end, has a collimating microlens and an optical filter for filtering out background emissions generated in the fiber. The other optical fiber is for collecting the Raman scattering signal at the remote sampling space and, at its remote end, has a collimating microlens and an optical filter to prevent the exciting signal from the exciting fiber from entering the collection fiber and to thereby prevent the generation of background emissions in the collecting fiber.

Inorganic, Organic, and Physical Chemistry

Refer also to citation(s) 16, 17, 40, 41, 64, 116, 135

107 Coatings with controlled porosity and chemical properties. Frye, G.C.; Brinker, C.J.; Doughty, D.H.; Bein, T.; Moller, K. To [Dept. of Energy, Washington, DC (United States)]. USA Patent 5,224,972/A/. 6 Jul 1993. Filed date 18 Apr 1991. Int. Cl. B01D 53/04. [10] DOE Contract AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Coatings and sensors are described having both steric and chemical selectivity. Controlled porosity provides the steric selectivity, whereas chemically tailored film properties, using controlled composition or modification by coupling agents, chemical species replacement, or chemical species within pores, provide the chemical selectivity. Single or multiple layers may be provided.

108 Molecular water oxidation catalyst. Gratzel, M.; Munavalli, S.; Fu Jann Pern; Frank, A.J. To Dept. of Energy, Washington, DC (US). USA Patent 5,223,634/A/. 29 Jun 1993. Filed date 12 Oct 1988. USA Patent Application 7-256,912. Int. Cl. C07F 15/00. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A dimeric composition of the formula shown in the patent wherein L', L'', L''', and L'''' are each a bidentate ligand having at least one functional substituent, the ligand selected from bipyridine, phenanthroline, 2-phenylpyridine, bipyrimidine, and bipyrazyl and the functional substituent selected from carboxylic acid, ester, amide, halogenide, anhydride, acyl ketone, alkyl ketone, acid chloride, sulfonic acid, phosphonic acid, and nitro and nitroso groups. An electrochemical oxidation process for the production of the above functionally substituted bidentate ligand diaqua oxo-bridged ruthenium dimers and their use as water oxidation catalysts is described.

109 Synthesis of iron based hydrocracking catalysts. Farcasiu, M.; Eldredge, P.A.; Ladner, E.P. To Dept. of Energy, Washington, DC (US). USA Patent 5,214,015/A/. 25 May 1993. Filed date 3 Apr 1992. USA Patent Application 7-862,887. Int. Cl. B01J 31/02. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method of preparing an iron based hydrocracking catalyst is described, comprising reacting iron (111) oxide powders and elemental sulfur with a liquid hydrogen donor having a hydroaromatic structure present in the range of from about 5 to about 50 times the weight of iron (111) oxide at a temperature in the range of from about 180 C to about 240 C for a time in the range of from about 0 to about 8 hours.

110 Separation processes using expulsion from dilute supercritical solutions. Cochran, H.D. Jr. To Dept. of Energy, Washington, DC (US). USA Patent 5,204,003/A/. 20 Apr 1993. Filed date 8 May 1991. USA Patent Application 7-697,031. Int. Cl. B01D 61/00. [10] DOE Contract AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A process is described for separating isotopes as well as other mixtures by utilizing the behavior of dilute repulsive or weakly attractive elements of the mixtures as the critical point of the solvent is approached.

111 Polyamide thermosets. Benicewicz, B.C.; Hoyt, A.E. To Dept. of Energy, Washington, DC (US). USA Patent 5,198,551/A/. 30 Mar 1993. Filed date 7 Jun 1991. USA Patent Application 7-711,721. Int. Cl. C07D 209/56. [10] DOE Contract W-7405-ENG-36. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The present invention provides (1) curable polyamide monomers represented by the formula: R^1-A^1-B^1-A^2-B^2-A^3-R^2 where R^1 and R^2 are radicals selected from the group consisting of maleimide, substituted maleimide, nadimide, substituted nadimide, ethynyl, and $(C(R^3)_2)_2$ where R^3 is hydrogen with the proviso that the two carbon atoms of $(C(R^3)_2)_2$ are bound on the aromatic ring of A^1 or A^3 to adjacent carbon atoms, A^1 and A^3 are 1,4-phenylene and the same where said group contains one or more substituents selected from the group consisting of halo, e.g., fluoro, chloro, bromo, or iodo, nitro, lower alkyl, e.g., methyl, ethyl, and propyl, lower alkoxy, e.g., methoxy, ethoxy, or propoxy, and fluoroalkyl or fluoroalkoxy, e.g., trifluoromethyl, pentafluoroethyl and the like, A^2 is selected from the group consisting of 1,4-phenylene, 4,4′-biphenyl, 2,6-naphthylene and the same where said groups contain one or more substituents selected from the group consisting of halo, e.g., fluoro, chloro, bromo, or iodo, nitro, lower alkyl, e.g., methyl, ethyl, and propyl, lower alkoxy, e.g., methoxy, ethoxy, or propoxy, and fluoroalkyl or fluoroalkoxy, e.g., trifluoromethyl, pentafluoroethyl and the like, and B^1 and B^2 are selected from the group consisting of -C(O)-N(H)- and -N(H)-C(O)-, (2) thermoset polyamide compositions comprised of cured segments derived from monomers represented by the formula: R^1-A^1-B^1-A^2-B^2-A^3-R^2 as described above, and curable blends of at least two of the polyamide monomers and (3) processes of preparing the curable polyamide monomers.

Electrochemistry

Refer also to citation(s) 20

112 Electrochemical cell. Nagy, Z.; Yonco, R.M.; You, Hoydoo; Melendres, C.A. To Dept. of Energy. 23 Apr 1991. USA Patent Application 7-689,426. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE93012015. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of an electrochemical cell has a layer-type or sandwich configuration with a Teflon center section that houses working, reference and counter electrodes and defines a relatively narrow electrolyte cavity. The center section is surrounded on both sides with thin Teflon membranes. The membranes are pressed in place by a pair of Teflon inner frames which are in turn supported by a pair of outer metal frames. The pair of inner and outer frames are provided with corresponding, appropriately shaped slits that are in plane generally transverse to the plane of the working electrode and permit X-ray beams to enter and exit the cell through the Teflon membranes that cover the slits so that the interface between the working electrode and the electrolyte within the cell may be analyzed by transmission geometry. In one embodiment, the center section consists of two parts, one on top of the other. Alternatively, the center section of the electrochemical cell may consist of two intersliding pieces or may be made of a single piece of Teflon sheet material. The electrolyte cavity is shaped so that the electrochemical cell can be rotated 900 in either direction while maintaining the working-and counter electrodes submerged in the electrolyte.

Photochemistry

113 Gadolinium photoionization process. Paisner, J.A.; Comaskey, B.J.; Haynam, C.A.; Eggert, J.H. To Dept. of Energy, Washington, DC (US). USA Patent 5,202,005/A/. 13 Apr 1993. Filed date 14 Aug 1991. USA Patent Application 7-744,748. Int. Cl. B01D 5/00. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method is provided for selective photoionization of the odd-numbered atomic mass gadolinium isotopes 155 and 157. The selective photoionization is accomplished by circular or linear parallel polarized laser beam energy effecting a three-step photoionization pathway.

Radiochemistry and Nuclear Chemistry

Refer also to citation(s) 24

114 Synthesis of actinide nitrides, phosphides, sulfides and oxides. Van Der Sluys, W.G.; Burns, C.J.; Smith, D.C. To Dept. of Energy. 2 Apr 1991. USA Patent Application 7-679,487. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93008225. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a process of preparing an actinide compound of the formula An_xZ_y wherein An is an actinide metal atom selected from the group consisting of thorium, uranium, plutonium, neptunium, and americium, x is selected from the group consisting of one, two or three, Z is a main group element atom selected from the group consisting of nitrogen, phosphorus, oxygen and sulfur and y is selected from the group consisting of one, two, three or four, by admixing an actinide organometallic precursor wherein said actinide is selected from the group consisting of thorium, uranium, plutonium, neptunium, and americium, a suitable solvent and a protic Lewis base selected from the group consisting of ammonia, phosphine, hydrogen sulfide and water, at temperatures and for time sufficient to form an intermediate actinide complex, heating said intermediate actinide complex at temperatures and for time sufficient to form the actinide compound, and a process of depositing a thin film of such an actinide compound, e.g., uranium mononitride, by subliming an actinide organometallic precursor, e.g., a uranium amide precursor, in the presence of an effective amount of a protic Lewis base, e.g., ammonia, within a reactor at temperatures and for time sufficient to form a thin film of the actinide compound, are disclosed.

115 Enantioselective synthesis of L-(-)-4-boronophenylalanine (L-BPA). Samsel, E.G. To Dept. of Energy. 1991. Filed date 4 Jun 1991. USA Patent Application 7-710,208. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE93015704. Source: OSTI; NTIS; GPO Dep.

4-Boronophenylalanine (BPA) is being investigated for boron neutron capture therapy of metastatic melanomas and other tumors. It is believed that the pure enantiomer L-BPA is more biologically active than the D,L racemate. This patent discloses a method of making substantially pure L-BPA. The method comprises the steps of reacting 4-bromobenzaldehyde with ethylene glycol, reacting the resulting acetal with Mg to produce a Grignard reagent and thereafter reacting with tributyl borate and then converting to an acid environment to form 4-boronobenzaldehyde, which is then reacted with diethanol amine, condensing the resulting ester with 2-phenyl-2-oxazolin-5-one to form an azlactone, reacting the azlactone with an alkali metal hydroxide, asymmetrically hydrogengating the product in the presence of Rh chelate to form L-(+)-N-benzoyl-4-boronophenylalanine, and thereafter acidifying this in an organic medium to produce L-BPA.

116 Process for making solid-state radiation-emitting composition. Ashley, C.S.; Brinker, C.J.; Reed, S.; Walko, R.J. To [Dept. of Energy, Washington, DC (United States)]. USA Patent 5,240,647/A/. 31 Aug 1993. Filed date 3 Sep 1991. Int. Cl. C09K 11/04. [10] DOE Contract AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The invention provides a process for loading an aerogel substrate with tritium and the resultant compositions. According to the process, an aerogel substrate is hydrolyzed so that surface OH groups are formed. The hydrolyzed aerogel is then subjected to tritium exchange employing, for example, a tritium-containing gas, whereby tritium atoms replace H atoms of surface OH groups. OH and/or CH groups of residual alcohol present in the aerogel may also undergo tritium exchange.

117 Recovery of germanium-68 from irradiated targets. Phillips, D.R.; Jamriska, D.J. Sr.; Hamilton, V.T. To Dept. of Energy, Washington, DC (US). USA Patent 5,190,735/A/. 2 Mar 1993. Filed date 30 Mar 1992. USA Patent Application 7-860,617. Int. Cl. C01G 17/00. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A process for selective separation of germanium-68 from proton irradiated molybdenum targets is provided and includes dissolving the molybdenum target in a hydrogen peroxide solution to form a first ion-containing solution, contacting the first ion-containing solution with a cationic resin whereby ions selected from the group consisting of molybdenum, niobium, technetium, selenium, vanadium, arsenic, germanium, zirconium and rubidium remain in a second ion-containing solution while ions selected from the group consisting of rubidium, zinc, beryllium, cobalt, iron, manganese, chromium, strontium, yttrium and zirconium are selectively adsorbed by the first resin, adjusting the pH of the second ion-containing solution to within a range of from about 0.7 to about 3.0, adjusting the soluble metal halide concentration in the second ion-containing solution to a level adapted for subsequent separation of germanium, contacting the pH-adjusted, soluble metal halide-containing second ion-containing solution with a dextran-based material whereby germanium ions are separated by the dextran-based material, and recovering the germanium from the dextran-based material, preferably by distillation.

42 ENGINEERING

Facilities, Equipment, and Techniques

Refer also to citation(s) 27, 48, 171

118 Material containment enclosure. Carlson, D.O. To Dept. of Energy. 1 Apr 1991. USA Patent Application 7-678,387. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93008230. Source: OSTI; NTIS; GPO Dep.

An isolation enclosure and a group of isolation enclosures was designed which is useful when a relatively large containment area is required. The enclosure is in the form of a ring having a section removed so that a technician may enter the center area of the ring. in a preferred embodiment, an access zone is located in the transparent wall of the enclosure and extends around the inner perimeter of the ring so that a technician can insert his hands into the enclosure to reach any point within. The inventive enclosures provide more containment area per unit area of floor space than conventional material isolation enclosures.

119 Diamond tool machining of materials which react with diamond. Lundin, R.L.; Stewart, D.D.; Evans, C.J. To Dept. of Energy. 1 Apr 1991. USA Patent Application 7-678,488. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93008226. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of an apparatus for the diamond machining of materials which detrimentally react with diamond cutting tools in which the cutting tool and the workpiece are chilled to very low temperatures. This chilling halts or retards the chemical reaction between the workpiece and the diamond cutting tool so that wear rates of the diamond tool on previously detrimental materials are comparable with the diamond turning of materials which do not react with diamond.

120 Pipe crawler with extendable legs. Zollinger, W.T. To Dept. of Energy. 2 Apr 1991. USA Patent Application 7-679,497. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93008223. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a pipe crawler for moving through a pipe in inchworm fashion having front and rear leg assemblies separated by air cylinders to increase and decrease the spacing. between assemblies. Each leg of the four legs of an assembly is moved between a wall-engaging, extended position and a retracted position by a separate air cylinder. The air cylinders of the leg assemblies are preferably arranged in pairs of oppositely directed cylinders with no pair laying in the same axial plane as another pair. Therefore, the cylinders can be as long as a leg assembly is wide and the crawler can crawl through sections of pipes where the diameter is twice that of other sections. The crawler carries a valving system, a manifold to distribute air supplied by a single umbilical air hose to the various air cylinders in a sequence controlled electrically by a controller. The crawler also utilizes a rolling mechanism, casters in this case, to reduce friction between the crawler and pipe wall thereby further extending the range of the pipe crawler.

121 Glovebox plug for glove changing. Carlson, D.O.; Shalkowski, E. Jr. To Dept. of Energy. 5 Apr 1991. USA Patent Application 7-680,975. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93008219. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a plug for use in plugging a glove opening of a glovebox when the glove is replaced. An inflated inner tube which is retained between flat plates mounted on a 05 threaded rod is compressed in order to expand its diameter to equal that of the inside of the glove opening.

122 Laser cutting with chemical reaction assist. Gettemy, D.J. To Dept. of Energy. 8 Apr 1991. USA Patent Application 7-681,293. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93008215. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a method for cutting with a laser beam where an oxygen-hydrocarbon reaction is used to provide auxiliary energy to a metal workpiece to supplement the energy supplied by the laser. Oxygen is supplied to the laser focus point on the workpiece by a nozzle through which the laser beam also passes. A liquid hydrocarbon is supplied by coating the workpiece along the cutting path with the hydrocarbon prior to laser irradiation or by spraying a stream of hydrocarbon through a nozzle aimed at a point on the cutting path which is just ahead of the focus point during irradiation.

123 Gripper deploying and inverting linkage. Minichan, R.L.; Killian, M.A. To Dept. of Energy. 8 Apr 1991. USA Patent Application 7-681,294. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93008214. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of an end effector deploying and inverting, linkage. The linkage comprises an air cylinder mounted in a frame or tube, a sliding bracket next to the air cylinder, a stopping bracket depending, from the frame and three, pivotally-attached links that are attached to the end effector and to each other in such a way as to be capable of inverting the end effector and translating it laterally. The first of the three links is a straight element that is moved up and down by the shaft of the air cylinder. The second link is attached at one end to the stopping bracket and to the side of the end effector at the other end. The first link is attached near the middle of the second, sharply angled link so that, as the shaft of the air cylinder moves up and down, the second link rotates about an axis perpendicular to the frame and inverts and translates the end effector. The rotation of the second link is stopped at both ends when the link engages stops on the stopping bracket. The third link, slightly angled, is attached to the sliding bracket at one end and to the end of the end effector at the other. The third link helps to control the end effector in its motion.

124 Gripping device. Hapstack, M. To Dept. of Energy. 8 Apr 1991. USA Patent Application 7-682,788. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93012024. Source: OSTI; NTIS; GPO Dep.

This invention consists of a gripping device having at least two fingers: one movable finger and at least one stationary finger. The fingers are attached to a support by a collar, the movable finger being pivotally attached. The support carries an air cylinder with a shaft to actuate the movable finger. The movable finger has a wide portion with a slot. On the distal end of the air cylinder's shaft is a travelerthat rides int he slot and, as it does, causes the movable finger to pivot toward and away from the two stationary fingers.

125 Adjustable-angle pipe fitting. Kronberg, J.W. To Dept. of Energy. 1991. USA Patent Application 7-724,662. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93015720. Source: OSTI; NTIS; GPO Dep.

This invention pertains to a pipe fitting for joining two pipes at a desired, preselected angle and comprises a curved section of pipe with a generally circular cross-section. One end of the curved pipe is preferably furnished with a bell fitting. The other end is adapted to be inserted into the bell of another pipe fitting. The surface of the pipe is marked with circumferential lines spaced at several-degree intervals, the lines corresponding to the angle of the bend which will result if the pipe is cut along that line. The outer diameter of the pipe is closely controlled to be the same throughout its length as the outer diameter of a straight pipe, so the cut end can be inserted into the bell of another fitting without further treatment, and the radius of curvature of the pipe is larger than a standard street elbow, preferably three to ten times the diameter of the pipe. Thus, a cut approximately perpendicular to the axial centerline can be made at any point along the length of the pipe to form an elbow of any desired angle.

126 Fluid-driven reciprocating apparatus and valving for controlling same. Whitehead, J.C.; Toews, H.G. To Dept. of Energy, Washington, DC (US). USA Patent 5,222,873/A/. 29 Jun 1993. Filed date 19 Jun 1992. USA Patent Application 7-901,290. Int. Cl. F04B 35/02. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A liquid pumping system is described comprising: a pair of fluid-driven reciprocating pump assemblies; and a pair of fluid activated valve assemblies operatively connected to each of the pump assemblies; the valve assemblies being interconnected such that stroking of one of the pair of pump assemblies causes activation of the valve assembly connected to the other of the pair of pump assemblies; each of the valve assemblies including a signal means attached to a piston-like member in the pump assembly on which the valve assembly is mounted; whereby stroking of the piston-like member in one of the pump assemblies activates the signal means, which activates the valve assembly of the other of the pump assemblies.

127 Material isolation enclosure. Martell, C.J.; Dahlby, J.W.; Gallimore, B.F.; Comer, B.E.; Stone, W.A.; Carlson, D.O. To Dept. of Energy, Washington, DC (US). USA Patent 5,205,624/A/. 27 Apr 1993. Filed date 12 Mar 1991. USA Patent Application 7-667,915. Int. Cl. A61G 11/00. [10] DOE Contract W-7405-ENG-36. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An enclosure is described, similar to a glove box, for isolating materials from the atmosphere, yet allowing a technician to manipulate the materials and also apparatus which is located inside the enclosure. A portion of a wall of the enclosure is comprised of at least one flexible curtain. An opening defined by a frame is provided for the technician to insert his hands and forearms into the enclosure.

The frame is movable in one plane, so that the technician has access to substantially all of the working interior of the enclosure. As the frame is moved by the technician, while he accomplishes work inside the enclosure, the curtain moves such that the only opening through the enclosure wall is the frame. In a preferred embodiment, where a negative pressure is maintained inside the enclosure, the frame is comprised of airfoils so that turbulence is reduced, thereby enhancing material retention within the box.

128 Underwater manipulator. Schrum, P.B.; Cohen, G.H. To Dept. of Energy, Washington, DC (US). USA Patent 5,203,645/A/. 20 Apr 1993. Filed date 10 Jan 1992. USA Patent Application 7-819,244. Int. Cl. B63C 11/52. [10] DOE Contract AC11-76PN00014. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Self-contained, waterproof, water-submersible, remote-controlled apparatus is described for manipulating a device, such as an ultrasonic transducer for measuring crack propagation on an underwater specimen undergoing shock testing. The subject manipulator includes metal bellows for transmittal of angular motions without the use of rotating shaft seals or O-rings. Inside the manipulator, a first stepper motor controls angular movement. In the preferred embodiment, the bellows permit the first stepper motor to move an ultrasonic transducer ±45 degrees in a first plane and a second bellows permit a second stepper motor to move the transducer ±10 degrees in a second plane orthogonal to the first. In addition, an XY motor-driven table provides XY motion.

129 Ball feeder for replenishing evaporator feed. Felde, D.K.; McKoon, R.H. To Dept. of Energy, Washington, DC (US). USA Patent 5,195,651/A/. 23 Mar 1993. Filed date 26 Jun 1991. USA Patent Application 7-721,009. Int. Cl. B23Q 7/00. [10] DOE Contract W-7405-ENG-48 ;AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Vapor source material such as uranium, which is to be dropped into a melt in an evaporator, is made into many balls of identical diameters and placed inside a container. An elongated sloping pipe is connected to the container and leads to the evaporator such that these balls can travel sequentially therealong by gravity. A metering valve in this pipe for passing these balls one at a time is opened in response to a signal when it is ascertained by a detector that there is a ball ready to be passed. A gate in the pipe near the evaporator momentarily stops the motion of the traveling ball and is then opened to allow the ball drop into the melt at a reduced speed.

130 Method and apparatus for transporting liquid slurries. Berry, G.F.; Lyczkowski, R.W.; Chisheng Wang. To Dept. of Energy, Washington, DC (US). USA Patent 5,193,942/A/. 16 Mar 1993. Filed date 16 Jan 1991. USA Patent Application 7-642,270. Int. Cl. B65G 53/04. [10] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An improved method and device to prevent erosion of slurry transport devices is disclosed which uses liquid injection to prevent contact by the slurry composition with the inner surface of the walls of the transport system. A non-abrasive liquid is injected into the slurry transport system and maintains intimate contact with the entire inner surface of the transport system, thereby creating a fluid barrier between the non-abrasive liquid and the inner surface of the transport system which thereby prevents erosion.

131 Magnetic gripper device. Meyer, R.E. To Dept. of Energy, Washington, DC (US). USA Patent 5,192,155/A/. 9 Mar 1993. Filed date 20 Apr 1992. USA Patent Application 7-870,965. Int. Cl. B25G 3/12. [10] DOE Contract W-7405-ENG-36. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A climbing apparatus is provided for climbing ferromagnetic surfaces, such as storage tanks and steel frame structures. A magnet assembly is rotatably mounted in a frame assembly. The frame assembly provides a pair of cam surfaces having different dimensions so that, when the frame is rotated, the cam surfaces contact the ferromagnetic surface to separate the magnet assembly from the surface. The different cam dimensions enable one side of the magnet at a time to be detached from the surface to reduce the effort needed to disengage the climbing apparatus. The cam surface also provides for smoothly attaching the apparatus. A hardened dowel pin is also attached to the frame and the pointed end of the dowel engages the surface when the magnet is attached to the surface to prevent downward sliding movement of the assembly under the weight of the user.

132 Gripper deploying and inverting linkage. Minichan, R.L.; Killian, M.A. To Dept. of Energy, Washington, DC (United States). USA Patent 5,190,333/A/. 2 Mar 1993. Filed date 8 Apr 1991. Int. Cl. G21C 19/26. [10] DOE Contract AC09-89SR18035. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An end effector deploying and inverting linkage. The linkage comprises an air cylinder mounted in a frame or tube, a sliding bracket next to the air cylinder, a stopping bracket depending from the frame and three, pivotally-attached links that are attached to the end effector and to each other in such a way as to be capable of inverting the end effector and translating it laterally. The first of the three links is a straight element that is moved up and down by the shaft of the air cylinder. The second link is attached at one end to the stopping bracket and to the side of the end effector at the other end. The first link is attached near the middle of the second, sharply angled link so that, as the shaft of the air cylinder moves up and down, the second link rotates about an axis perpendicular to the frame and inverts and translates the end effector. The rotation of the second link is stopped at both ends when the link engages stops on the stopping bracket. The third link, slightly angled, is attached to the sliding bracket at one end and to the end of the end effector at the other. The third helps to control the end effector in its motion.

Heat Transfer and Fluid Flow

133 Swirling structure for mixing two concentric fluid flows at nozzle outlet. Mensink, D.L. To Dept. of Energy, Washington, DC (United States). USA Patent 5,228,624/A/. 20 Jul 1993. Filed date 2 Mar 1992. Int. Cl.

B05B 7/10. [10] DOE Contract AC09-89SR18035. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A nozzle device is described for causing two fluids to mix together. In particular, a spray nozzle comprises two hollow, concentric housings, an inner housing and an outer housing. The inner housing has a channel formed therethrough for a first fluid. Its outer surface cooperates with the interior surface of the outer housing to define the second channel for a second fluid. The outer surface of the inner housing and the inner surface of the outer housing each carry a plurality of vanes that interleave but do not touch, each vane of one housing being between two vanes of the other housing. The vanes are curved and the inner surface of the outer housing and the outer surface of the inner housing converge to narrow the second channel. The shape of second channel results in a swirling, accelerating second fluid that will impact the first fluid just past the end of the nozzle where mixing will take place.

134 **Basic fluid system trainer.** Semans, J.P.; Johnson, P.G.; LeBoeuf, R.F.; Kromka, J.A.; Goron, R.H.; Hay, G.D. To Dept. of Energy, Washington, DC (US). USA Patent 5,178,543/A/. 12 Jan 1993. Filed date 30 Apr 1991. USA Patent Application 7-693,477. Int. Cl. G09B 23/00. [10] Contract N00024-79-C4026. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A trainer, mounted and housed within a mobile console, is used to teach and reinforce fluid principles to students. The system trainer has two centrifugal pumps, each driven by a corresponding two-speed electric motor. The motors are controlled by motor controllers for operating the pumps to circulate the fluid stored within a supply tank through a closed system. The pumps may be connected in series or in parallel. A number of valves are also included within the system to effect different flow paths for the fluid. In addition, temperature and pressure sensing instruments are installed throughout the closed system for measuring the characteristics of the fluid, as it passes through the different valves and pumps. These measurements are indicated on a front panel mounted to the console, as a teaching aid, to allow the students to observe the characteristics of the system.

Materials Testing

Refer also to citation(s) 194

135 **Multiple-frequency acoustic wave devices for chemical sensing and materials characterization in both gas and liquid phase.** Martin, S.J.; Ricco, A.J. To Dept. of Energy, Washington, DC (US). USA Patent 5,235,235/A/. 10 Aug 1993. Filed date 24 May 1991. USA Patent Application 7-705,408. Int. Cl. H01L 41/08. [10] DOE Contract AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A chemical or intrinsic physical property sensor is described comprising: (a) a substrate; (b) an interaction region of said substrate where the presence of a chemical or physical stimulus causes a detectable change in the velocity and/or an attenuation of an acoustic wave traversing said region; and (c) a plurality of paired input and output interdigitated electrodes patterned on the surface of said substrate where each of said paired electrodes has a distinct periodicity, where each of said paired electrodes is comprised of an input and an output electrode; (d) an input signal generation means for transmitting an input signal having a distinct frequency to a specified input interdigitated electrode of said plurality so that each input electrode receives a unique input signal, whereby said electrode responds to said input signal by generating an acoustic wave of a specified frequency, thus, said plurality responds by generating a plurality of acoustic waves of different frequencies; (e) an output signal receiving means for determining an acoustic wave velocity and an amplitude of said acoustic waves at several frequencies after said waves transverses said interaction region and comparing these values to an input acoustic wave velocity and an input acoustic wave amplitude to produce values for perturbations in acoustic wave velocities and for acoustic wave attenuation as a function of frequency, where said output receiving means is individually coupled to each of said output interdigitated electrode; (f) a computer means for analyzing a data stream comprising information from said output receiving means and from said input signal generation means to differentiate a specified response due to a perturbation from a subsequent specified response due to a subsequent perturbation to determine the chemical or intrinsic physical properties desired.

136 **Method and apparatus for acoustic plate mode liquid-solid phase transition detection.** Blair, D.S.; Freye, G.C.; Hughes, R.C.; Martin, S.J.; Ricco, A.J. To Dept. of Energy, Washington, DC (US). USA Patent 5,187,980/A/. 23 Feb 1993. Filed date 31 May 1990. USA Patent Application 7-531,492. Int. Cl. G01N 9/24; G08B 19/02. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method and apparatus for sensing a liquid-solid phase transition event is provided which comprises an acoustic plate mode detecting element placed in contact with a liquid or solid material which generates a high-frequency acoustic wave that is attenuated to an extent based on the physical state of the material in contact with the detecting element. The attenuation caused by the material in contact with the acoustic plate mode detecting element is used to determine the physical state of the material being detected. The method and device are particularly suited for detecting conditions such as the icing and deicing of wings of an aircraft. In another aspect of the present invention, a method is provided wherein the adhesion of a solid material to the detecting element can be measured using the apparatus of the invention.

Combustion Systems

Refer also to citation(s) 68

Mining and Underground Engineering

Refer also to citation(s) 72

137 **Downhole material injector for lost circulation control.** Glowka, D.A. To Dept. of Energy. 1991. Filed date 17 Apr 1991. USA Patent Application 7-686,442.

25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE93012018. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of an apparatus and method for simultaneously and separately emplacing two streams of different materials through a drillstring in a borehole to a downhole location for lost circulation control. The two streams are mixed outside the drillstring at the desired downhole location and harden only after mixing for control of a lost circulation zone.

Components, Electron Devices and Circuits

Refer also to citation(s) 170, 173, 178, 181, 190, 193

138 Asynchronous parallel status comparator. Arnold, J.W.; Hart, M.M. To Dept. of Energy. 1 Apr 1991. USA Patent Application 7-678,428. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93008229. Source: OSTI; NTIS; GPO Dep.

This is an apparatus for matching asynchronously received signals and determining whether two or more out of a total number of possible signals match. The apparatus comprises, in one embodiment, an array of sensors positioned in discrete locations and in communication with one or more processors. The processors will receive signals if the sensors detect a change in the variable sensed from a nominal to a special condition and will transmit location information in the form of a digital data set to two or more receivers. The receivers collect, read, latch and acknowledge the data sets and forward them to decoders that produce an output signal for each data set received. The receivers also periodically reset the system following each scan of the sensor array. A comparator then determines if any two or more, as specified by the user, of the output signals corresponds to the same location. A sufficient number of matches produces a system output signal that activates a system to restore the array to its nominal condition.

139 Ring regenerative laser amplifier. Perry, M.D.; Patterson, F.G. To Dept. of Energy. 1991. Filed date 22 May 1991. USA Patent Application 7-704,590. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE93011997. Source: OSTI; NTIS; GPO Dep.

This invention consists of an efficient, high gain, compact regenerative amplifier that amplifies a seed pulse of laser energy to produce an amplified pulse of greater energy. The amplifier is useful for amplifying seed pulses having a broad bandwidth or in situations where tunability is necessary. The amplifier has high gain while maintaining high pulse contrast. A seed pulse can be amplified to the saturation fluence while maintaining a high contrast ($>10^3$). The regenerative amplifier has an optical cavity in a ring configuration, a gain material positioned in the cavity, a polarization-rotating element positioned in the cavity to rotate the polarization of the pulse upon each pass around the cavity, means for inserting the seed pulse into the cavity, and means for removing the polarization-rotated, amplified pulse from the cavity. In some embodiments, the seed pulse is switched in passively, by a selective polarization, and is switched out after a predetermined number of passes around the ring cavity. This completely passive arrangement avoids possibility of switchout failure, and minimizes the ASE problem. In other embodiments, a selectively actuable switch, such as electro-optic element, may be provided within the ring cavity, to switch-in the seed pulse and switch-out the amplified pulse. The electro-optic element may be actuated with a square wave that has a peak voltage equal to the half-wave voltage of the electro-optic crystal.

140 Irreversible magnetic switch. Karnowsky, M.M.; Yost, F.G. To Dept. of Energy. 1991. USA Patent Application 7-713,206. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE93015709. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of an irreversible magnetic switch containing a ferromagnetic amorphous metal having a predetermined crystallization temperature in its inductor magnetic path. With the incorporation of such material, the magnetic properties after cooling from a high temperature excursion above its crystallization temperature are only a fraction of the original value. The difference is used to provide a safety feature in the magnetic switch.

141 Method and apparatus for continuous lamination of sheet material. Schurman, W.R. To Dept. of Energy. 1991. USA Patent Application 7-713,208. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-88DP43495. Order Number DE93015710. Source: OSTI; NTIS; GPO Dep.

A method and apparatus for continuous lamination of sheet material includes a pair of cooperating platens having an in-feed sheet receiving section and a pre-exit sheet receiving section. The in-feed sheet receiving section includes means for providing a first temperature for laminating the sheet material and the pre-exit sheet receiving section includes means for providing a second temperature substantially lower than the in-feed sheet receiving section temperature for cooling the laminated sheet material. One of the platens is movable relative to the other platen for applying a predetermined intermittent pressure on the sheet material.

142 Remote two-wire data entry method and device. Kronberg, J.W. To Dept. of Energy. 1991. USA Patent Application 7-720,128. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93015716. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a device for detecting switch closure such as in a keypad for entering data comprising a matrix of conductor pairs and switches, each pair of conductors shorted by the pressing of a particular switch, and current-regulating devices on each conductor for limiting current in one direction and passing it without limit in the other direction. The device is driven by alternating current. The ends of the conductors in a conductor pair limit current of opposing polarities with respect to each other so that the signal on a shorted pair is an alternating current signal with a unique combination of a positive and a negative peak, which, when analyzed, allows the determination of which key was pressed. The binary identification of the pressed key is passed to the input port of a host device.

143 Laser focus compensating sensing and imaging device. Vann, C.S. To Dept. of Energy, Washington, DC (US). USA Patent 5,241,557/A/. 31 Aug 1993. Filed date 9 Mar 1992. USA Patent Application 7-848,583. Int. Cl. H01S 3/08. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A laser focus compensating sensing and imaging device permits the focus of a single focal point of different frequency laser beams emanating from the same source point. In particular it allows the focusing of laser beam originating from the same laser device but having differing intensities so that a low intensity beam will not convert to a higher frequency when passing through a conversion crystal associated with the laser generating device. The laser focus compensating sensing and imaging device uses a Cassegrain system to fold the lower frequency, low intensity beam back upon itself so that it will focus at the same focal point as a high intensity beam. An angular tilt compensating lens is mounted about the secondary mirror of the Cassegrain system to assist in alignment. In addition cameras or CCD's are mounted with the primary mirror to sense the focused image. A convex lens is positioned co-axial with the Cassegrain system on the side of the primary mirror distal of the secondary for use in aligning a target with the laser beam. A first alternate embodiment includes a Cassegrain system using a series of shutters and an internally mounted dichroic mirror. A second alternate embodiment uses two laser focus compensating sensing and imaging devices for aligning a moving tool with a work piece.

144 Three dimensional, multi-chip module. Bernhardt, A.F.; Petersen, R.W. To Dept. of Energy, Washington, DC (US). USA Patent 5,241,450/A/. 31 Aug 1993. Filed date 13 Mar 1992. USA Patent Application 7-850,642. Int. Cl. H05K 7/20. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A plurality of multi-chip modules are stacked and bonded around the perimeter by sold-bump bonds to adjacent modules on, for instance, three sides of the perimeter. The fourth side can be used for coolant distribution, for more interconnect structures, or other features, depending on particular design considerations of the chip set. The multi-chip modules comprise a circuit board, having a planarized interconnect structure formed on a first major surface, and integrated circuit chips bonded to the planarized interconnect surface. Around the periphery of each circuit board, long, narrow "dummy chips" are bonded to the finished circuit board to form a perimeter wall. The wall is higher than any of the chips on the circuit board, so that the flat back surface of the board above will only touch the perimeter wall. Module-to-module interconnect is laser-patterned on the sides of the boards and over the perimeter wall in the same way and at the same time that chip to board interconnect may be laser-patterned.

145 Digitally controlled distributed phase shifter. Hietala, V.M.; Kravitz, S.H.; Vawter, G.A. To Dept. of Energy, Washington, DC (US). USA Patent 5,237,629/A/. 17 Aug 1993. Filed date 19 Mar 1992. USA Patent Application 7-854,024. Int. Cl. G02B 6/10; H01P 3/00. [10] DOE Contract AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A digitally controlled distributed phase shifter is comprised of N phase shifters. Digital control is achieved by using N binary length-weighted electrodes located on the top surface of a waveguide. A control terminal is attached to each electrode thereby allowing the application of a control signal. The control signal is either one or two discrete bias voltages. The application of the discrete bias voltages changes the modal index of a portion of the waveguide that corresponds to a length of the electrode to which the bias voltage is applied, thereby causing the phase to change through the underlying portion of the waveguide. The digitally controlled distributed phase shift network has a total phase shift comprised of the sum of the individual phase shifters.

146 Method and split cavity oscillator/modulator to generate pulsed particle beams and electromagnetic fields. Clark, M.C.; Coleman, P.D.; Marder, B.M. To Dept. of Energy, Washington, DC (US). USA Patent 5,235,248/A/. 10 Aug 1993. Filed date 8 Jun 1990. USA Patent Application 7-540,828. Int. Cl. H01J 25/02. [10] DOE Contract AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A compact device called the split cavity modulator whose self-generated oscillating electromagnetic field converts a steady particle beam into a modulated particle beam. The particle beam experiences both signs of the oscillating electric field during the transit through the split cavity modulator. The modulated particle beam can then be used to generate microwaves at that frequency and through the use of extractors, high efficiency extraction of microwave power is enabled. The modulated beam and the microwave frequency can be varied by the placement of resistive wires at nodes of oscillation within the cavity. The short beam travel length through the cavity permit higher currents because both space charge and pinching limitations are reduced. The need for an applied magnetic field to control the beam has been eliminated.

147 Method and apparatus for detecting timing errors in a system oscillator. Gliebe, R.J.; Kramer, W.R. To Dept. of Energy, Washington, DC (US). USA Patent 5,229,752/A/. 20 Jul 1993. Filed date 20 Sep 1991. USA Patent Application 7-762,968. Int. Cl. G08B 21/00; H03B 1/00. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method is described of detecting a timing error in a system oscillator signal of a system oscillator, comprising the steps of: generating a clock signal in phase with said system oscillator signal; applying said clock signal to a delay means; applying said system oscillator signal to said delay means and to a comparison means; delaying said system oscillator signal by means of said delay means by a time period equal to a single system oscillator signal period to generate a delayed signal; comparing said delayed signal with said system oscillator signal by means of said comparison means to generate a comparison signal; detecting an error when said comparison signal indicates that said delayed signal differs from said system oscillator signal; and generating an indication signal when an error has been detected by said detecting step.

148 Gigatron microwave amplifier. McIntyre, P.M. To [Dept. of Energy, Washington, DC (United States)]. USA Patent 5,227,701/A/. 13 Jul 1993. Filed date 18 May 1988. Int. Cl. H01J 25/00. [10] DOE Contract AC02-85ER40236. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An electron tube for achieving high power at high frequency with high efficiency is described, including an input coupler, a ribbon-shaped electron beam and a traveling wave output coupler. The input coupler is a lumped constant resonant circuit that modulates a field emitter array cathode at microwave frequency. A bunched ribbon electron beam is emitted from the cathode in periodic bursts at the desired frequency. The beam has a ribbon configuration to eliminate limitations inherent in round beam devices. The traveling wave coupler efficiently extracts energy from the electron beam, and includes a waveguide with a slot there through for receiving the electron beam. The ribbon beam is tilted at an angle with respect to the traveling wave coupler so that the electron beam couples in-phase with the traveling wave in the waveguide. The traveling wave coupler thus extracts energy from the electron beam over the entire width of the beam.

149 Method of producing strained-layer semiconductor devices via subsurface-patterning. Dodson, B.W. To Dept. of Energy, Washington, DC (US). USA Patent 5,225,368/A/. 6 Jul 1993. Filed date 8 Feb 1991. USA Patent Application 7-652,737. Int. Cl. H01L 21/322; H01L 21/324. [10] DOE Contract AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method is described for patterning subsurface dislocation features in a semiconductor device, wherein said semiconductor device includes a semiconductor substrate and a strained semiconductor layer, the method comprising: (a) creating a pattern of semiconductor material on said semiconductor device, said deposited material is of a thickness which thermodynamically stabilizes areas of said strained semiconductor layer that lie beneath said pattern; and (b) generating a plurality of dislocations in select areas of said strained semiconductor layer by applying heat to said semiconductor device to cause a relaxation in areas of said strained layer which do not lie beneath said semiconductor material pattern, thereby creating said plurality of dislocations in said relaxed areas.

150 Coherence delay augmented laser beam homogenizer. Rasmussen, P.; Bernhardt, A. To Dept. of Energy, Washington, DC (US). USA Patent 5,224,200/A/. 29 Jun 1993. Filed date 27 Nov 1991. USA Patent Application 7-799,524. Int. Cl. G02B 6/00. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The geometrical restrictions on a laser beam homogenizer are relaxed by using a coherence delay line to separate a coherent input beam into several components each having a path length difference equal to a multiple of the coherence length with respect to the other components. The components recombine incoherently at the output of the homogenizer, and the resultant beam has a more uniform spatial intensity suitable for microlithography and laser pantogography. Also disclosed is a variable aperture homogenizer, and a liquid filled homogenizer.

151 Electrical network method for the thermal or structural characterization of a conducting material sample or structure. Ortiz, M.G. To Dept. of Energy, Washington, DC (US). USA Patent 5,217,304/A/. 8 Jun 1993. Filed date 13 May 1992. USA Patent Application 7-882,225. Int. Cl. G01N 25/20; G01N 27/04; G01N 27/18. [10] DOE Contract AC07-76ID01570. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method for modeling a conducting material sample or structure system, as an electrical network of resistances in which each resistance of the network is representative of a specific physical region of the system. The method encompasses measuring a resistance between two external leads and using this measurement in a series of equations describing the network to solve for the network resistances for a specified region and temperature. A calibration system is then developed using the calculated resistances at specified temperatures. This allows for the translation of the calculated resistances to a region temperature. The method can also be used to detect and quantify structural defects in the system.

152 Microchannel cooling of face down bonded chips. Bernhardt, A.F. To Dept. of Energy, Washington, DC (US). USA Patent 5,218,515/A/. 8 Jun 1993. Filed date 13 Mar 1992. USA Patent Application 7-850,634. Int. Cl. H05K 7/20. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Microchannel cooling is applied to flip-chip bonded integrated circuits, in a manner which maintains the advantages of flip-chip bonds, while overcoming the difficulties encountered in cooling the chips. The technique is suited to either multi chip integrated circuit boards in a plane, or to stacks of circuit boards in a three dimensional interconnect structure. Integrated circuit chips are mounted on a circuit board using flip-chip or control collapse bonds. A microchannel structure is essentially permanently coupled with the back of the chip. A coolant delivery manifold delivers coolant to the microchannel structure, and a seal consisting of a compressible elastomer is provided between the coolant delivery manifold and the microchannel structure. The integrated circuit chip and microchannel structure are connected together to form a replaceable integrated circuit module which can be easily decoupled from the coolant delivery manifold and the circuit board. The coolant supply manifolds may be disposed between the circuit boards in a stack and coupled to supplies of coolant through a side of the stack.

153 Cavity resonance absorption in ultra-high bandwidth CRT deflection structure by a resistive load. Dunham, M.E.; Hudson, C.L. To Dept. of Energy, Washington, DC (US). USA Patent 5,210,464/A/. 11 May 1993.

Filed date 15 May 1991. USA Patent Application 7-700,286. Int. Cl. H01J 23/10. [10] DOE Contract AC08-88NV10617. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An improved ultra-high bandwidth helical coil deflection structure for a cathode ray tube is described comprising a first metal member having a bore therein, the metal walls of which form a first ground plane; a second metal member coaxially mounted in the bore of the first metal member and forming a second ground plane; a helical deflection coil coaxially mounted within the bore between the two ground planes; and a resistive load disposed in one end of the bore and electrically connected to the first and second ground planes, the resistive load having an impedance substantially equal to the characteristic impedance of the coaxial line formed by the two coaxial ground planes to inhibit cavity resonance in the structure within the ultra-high bandwidth of operation. Preferably, the resistive load comprises a carbon film on a surface of an end plug in one end of the bore.

154 **Simplified flangeless unisex waveguide coupler assembly.** Michelangelo, D.; Moeller, C.P. To Dept. of Energy, Washington, DC (US). USA Patent 5,208,569/A/. 4 May 1993. Filed date 3 Jun 1992. USA Patent Application 7-893,154. Int. Cl. H01P 1/06. [10] DOE Contract AC03-89ER51114. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A unisex coupler assembly is disclosed capable of providing a leak tight coupling for waveguides with axial alignment of the waveguides and rotational capability. The sealing means of the coupler assembly are not exposed to RF energy, and the coupler assembly does not require the provision of external flanges on the waveguides. In a preferred embodiment, O ring seals are not used and the coupler assembly is, therefore, bakeable at a temperature up to about 150 C. The coupler assembly comprises a split collar which clamps around the waveguides and a second collar which fastens to the split collar. The split collar contains an inner annular groove. Each of the waveguides is provided with an external annular groove which receives a retaining ring. The split collar is clamped around one of the waveguides with the inner annular groove of the split collar engaging the retaining ring carried in the external annular groove in the waveguide. The second collar is then slipped over the second waveguide behind the annular groove and retaining ring therein and the second collar is coaxially secured by fastening means to the split collar to draw the respective waveguides together by coaxial force exerted by the second collar against the retaining ring on the second waveguide. A sealing ring is placed against an external sealing surface at a reduced external diameter end formed on one waveguide to sealingly engage a corresponding sealing surface on the other waveguide as the waveguides are urged toward each other.

155 **Random one-of-N selector.** Kronberg, J.W. To Dept. of Energy, Washington, DC (United States). USA Patent 5,204,671/A/. 20 Apr 1993. Filed date 22 Jan 1991. Int. Cl. H04B 1/00. [10] DOE Contract AC09-89SR18035. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An apparatus for selecting at random one item *of N items* on the average comprising counter and reset elements for counting repeatedly between zero and N, a number selected by the user, a circuit for activating and deactivating the counter, a comparator to determine if the counter stopped at a count of zero, an output to indicate an item has been selected when the count is zero or not selected if the count is not zero. Randomness is provided by having the counter cycle very often while varying the relatively longer duration between activation and deactivation of the count. The passive circuit components of the activating/deactivating circuit and those of the counter are selected for the sensitivity of their response to variations in temperature and other physical characteristics of the environment so that the response time of the circuitry varies. Additionally, the items themselves, which may be people, may vary in shape or the time they press a pushbutton, so that, for example, an ultrasonic beam broken by the item or person passing through it will add to the duration of the count and thus to the randomness of the selection.

156 **High voltage feed through bushing.** Brucker, J.P. To Dept. of Energy, Washington, DC (US). USA Patent 5,200,578/A/. 6 Apr 1993. Filed date 27 Nov 1991. USA Patent Application 7-799,467. Int. Cl. H01B 17/26. [10] DOE Contract W-7405-ENG-36. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A feed through bushing for a high voltage diode provides for using compression sealing for all sealing surfaces. A diode assembly includes a central conductor extending through the bushing and a grading ring assembly circumferentially surrounding and coaxial with the central conductor. A flexible conductive plate extends between and compressively seals against the central conductor and the grading ring assembly, wherein the flexibility of the plate allows inner and outer portions of the plate to axially translate for compression sealing against the central conductor and the grading ring assembly, respectively. The inner portion of the plate is bolted to the central conductor for affecting sealing. A compression beam is also bolted to the central conductor and engages the outer portion of the plate to urge the outer portion toward the grading ring assembly to obtain compression sealing therebetween.

157 **Monolithic dye laser amplifier.** Kuklo, T.C. To Dept. of Energy, Washington, DC (US). USA Patent 5,199,040/A/. 30 Mar 1993. Filed date 30 May 1991. USA Patent Application 7-707,510. Int. Cl. H01S 3/02. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A fluid dye laser amplifier for amplifying a dye beam by pump beams has a channel structure defining a channel through which a laseable fluid flows and the dye and pump beams pass transversely to one another through a lasing region. The channel structure is formed with two pairs of mutually spaced-apart and mutually confronting glass windows, which are interlocked and make surface-contacts with one another and surround the lasing region. One of the glass window pairs passes the dye beam and the other passes the pump beams therethrough and through the lasing region. Where these glass window pieces make surface-contacts, glue is used to join the pieces together to form a monolithic structure so as to prevent the dye in the fluid passing through the channel from entering the space between the mutually contacting glass window pieces.

158 Micro-machined resonator. Godshall, N.A.; Koehler, D.R.; Liang, A.Y.; Smith, B.K. To Dept. of Energy, Washington, DC (US). USA Patent 5,198,716/A/. 30 Mar 1993. Filed date 9 Dec 1991. USA Patent Application 7-803,815. Int. Cl. H01L 41/08. [10] DOE Contract AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A micro-machined resonator, typically quartz, with upper and lower micro-machinable support members, or covers, having etched wells which may be lined with conductive electrode material, between the support members is a quartz resonator having an energy trapping quartz mesa capacitively coupled to the electrode through a diaphragm; the quartz resonator is supported by either micro-machined cantilever springs or by thin layers extending over the surfaces of the support. If the diaphragm is rigid, clock applications are available, and if the diaphragm is resilient, then transducer applications can be achieved. Either the thin support layers or the conductive electrode material can be integral with the diaphragm. In any event, the covers are bonded to form a hermetic seal and the interior volume may be filled with a gas or may be evacuated. In addition, one or both of the covers may include oscillator and interface circuitry for the resonator.

159 High power, high frequency, vacuum flange. Felker, B.; McDaniel, M.R. To Dept. of Energy, Washington, DC (US). USA Patent 5,196,814/A/. 23 Mar 1993. Filed date 1 Nov 1991. USA Patent Application 7-786,647. Int. Cl. H01P 1/04. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An improved waveguide flange is disclosed for high power operation that helps prevent arcs from being initiated at the junctions between waveguide sections. The flanges at the end of the waveguide sections have counter bores surrounding the waveguide tubes. When the sections are bolted together the counter bores form a groove that holds a fully annealed copper gasket. Each counterbore has a beveled step that is specially configured to insure the gasket forms a metal-to-metal vacuum seal without gaps or sharp edges. The resultant inner surface of the waveguide is smooth across the junctions between waveguide sections, and arcing is prevented.

160 Tungsten-yttria carbide coating for conveying copper. Rothman, A.J. To Dept. of Energy, Washington, DC (US). USA Patent 5,194,218/A/. 16 Mar 1993. Filed date 18 Aug 1988. USA Patent Application 7-241,234. Int. Cl. B22F 7/00. [10] Contract W705-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method is provided for providing a carbided-tungsten-yttria coating on the interior surface of a copper vapor laser. The surface serves as a wick for the condensation of liquid copper to return the condensate to the interior of the laser for revolatilization.

161 Fading channel simulator. Argo, P.E.; Fitzgerald, T.J. To Dept. of Energy, Washington, DC (US). USA Patent 5,191,594/A/. 2 Mar 1993. Filed date 27 Nov 1991. USA Patent Application 7-798,780. Int. Cl. H04L 1/04; H04B 1/10; H04B 15/00. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Fading channel effects on a transmitted communication signal are simulated with both frequency and time variations using a channel scattering function to affect the transmitted signal. A conventional channel scattering function is converted to a series of channel realizations by multiplying the square root of the channel scattering function by a complex number of which the real and imaginary parts are each independent variables. The two-dimensional inverse-FFT of this complex-valued channel realization yields a matrix of channel coefficients that provide a complete frequency-time description of the channel. The transmitted radio signal is segmented to provide a series of transmitted signal and each segment is subject to FFT to generate a series of signal coefficient matrices. The channel coefficient matrices and signal coefficient matrices are then multiplied and subjected to inverse-FFT to output a signal representing the received affected radio signal. A variety of channel scattering functions can be used to characterize the response of a transmitter-receiver system to such atmospheric effects.

162 Coupling apparatus for a metal vapor laser. Ball, D.G.; Miller, J.L. To Dept. of Energy, Washington, DC (US). USA Patent 5,189,678/A/. 23 Feb 1993. Filed date 29 Sep 1986. USA Patent Application 6-915,197. Int. Cl. H01J 3/10. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Coupling apparatus for a large bore metal vapor laser is disclosed. The coupling apparatus provides for coupling high voltage pulses (approximately 40 KV) to a metal vapor laser with a high repetition rate (approximately 5 KHz). The coupling apparatus utilizes existing thyratron circuits and provides suitable power input to a large bore metal vapor laser while maintaining satisfactory operating lifetimes for the existing thyratron circuits.

163 Wavelength meter having single mode fiber optics multiplexed inputs. Hackel, R.P.; Paris, R.D.; Feldman, M. To Dept. of Energy, Washington, DC (US). USA Patent 5,189,485/A/. 23 Feb 1993. Filed date 21 Feb 1991. USA Patent Application 7-667,471. Int. Cl. G02B 5/14; G01J 3/18. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A wavelength meter having a single mode fiber optics input is disclosed. The single mode fiber enables a plurality of laser beams to be multiplexed to form a multiplexed input to the wavelength meter. The wavelength meter can provide a determination of the wavelength of any one or all of the plurality of laser beams by suitable processing. Another aspect of the present invention is that one of the laser beams could be a known reference laser having a predetermined wavelength. Hence, the improved wavelength meter can provide an on-line calibration capability with the reference laser input as one of the plurality of laser beams.

164 Non-intrusive beam power monitor for high power pulsed or continuous wave lasers. Hawsey, R.A.; Scudiere, M.B. To Dept. of Energy, Washington, DC (US).

USA Patent 5,184,189/A/. 2 Feb 1993. Filed date 29 May 1991. USA Patent Application 7-706,831. Int. Cl. G01J 1/42; H01S 3/13. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A system and method for monitoring the output of a laser is provided in which the output of a photodiode disposed in the cavity of the laser is used to provide a correlated indication of the laser power. The photodiode is disposed out of the laser beam to view the extraneous light generated in the laser cavity whose intensity has been found to be a direct correlation of the laser beam output power level. Further, the system provides means for monitoring the phase of the laser output beam relative to a modulated control signal through the photodiode monitor.

165 **Micro-valve pump light valve display.** Yeechun Lee. To Dept. of Energy, Washington, DC (US). USA Patent 5,181,016/A/. 19 Jan 1993. Filed date 15 Jan 1991. USA Patent Application 7-641,391. Int. Cl. G09G 3/34. [10] DOE Contract W-7405-ENG-36. Grant DEA179-87BP65584. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A flat panel display incorporates a plurality of micropump light valves (MLV's) to form pixels for recreating an image. Each MLV consists of a dielectric drop sandwiched between substrates, at least one of which is transparent, a holding electrode for maintaining the drop outside a viewing area, and a switching electrode from accelerating the drop from a location within the holding electrode to a location within the viewing area. The sustrates may further define non-wetting surface areas to create potential energy barriers to assist in controlling movement of the drop. The forces acting on the drop are quadratic in nature to provide a nonlinear response for increased image contrast. A crossed electrode structure can be used to activate the pixels whereby a large flat panel display is formed without active driver components at each pixel.

166 **Virtually distortion-free imaging system for large field, high resolution lithography using electrons, ions or other particle beams.** Hawryluk, A.M.; Ceglio, N.M. To Dept. of Energy, Washington, DC (US). USA Patent 5,178,974/A/. 12 Jan 1993. Filed date 10 Apr 1991. USA Patent Application 7-683,011. Int. Cl. G03B 27/32; G03B 27/68. [10] DOE Contract W-7405-ENG-48. Contract N00024-79-C4026. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Virtually distortion free large field high resolution imaging is performed using an imaging system which contains large field distortion or field curvature. A reticle is imaged in one direction through the optical system to form an encoded mask. The encoded mask is then imaged back through the imaging system onto a wafer positioned at the reticle position. Particle beams, including electrons, ions and neutral particles, may be used as well as electromagnetic radiation.

167 **Magnetic compression laser driving circuit.** Ball, D.G.; Birx, D.; Cook, E.G. To Dept. of Energy, Washington, DC (US). USA Patent 5,177,754/A/. 5 Jan 1993. Filed date 15 Mar 1989. USA Patent Application 7-336,451. Int. Cl. H01S 3/00. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A magnetic compression laser driving circuit is disclosed. The magnetic compression laser driving circuit compresses voltage pulses in the range of 1.5 microseconds at 20 kilovolts of amplitude to pulses in the range of 40 nanoseconds and 60 kilovolts of amplitude. The magnetic compression laser driving circuit includes a multi-stage magnetic switch where the last stage includes a switch having at least two turns which has larger saturated inductance with less core material so that the efficiency of the circuit and hence the laser is increased.

168 **Virtually distortion-free imaging system for large field, high resolution lithography.** Hawryluk, A.M.; Ceglio, N.M. To Dept. of Energy, Washington, DC (US). USA Patent 5,176,970/A/. 5 Jan 1993. Filed date 12 Oct 1990. USA Patent Application 7-597,968. Int. Cl. G03B 27/32; G03B 27/68. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Virtually distortion free large field high resolution imaging is performed using an imaging system which contains large field distortion or field curvature. A reticle is imaged in one direction through the optical system to form an encoded mask. The encoded mask is then imaged back through the imaging system onto a wafer positioned at the reticle position.

43 PARTICLE ACCELERATORS

Design, Development, and Operation

169 **Small system for tritium accelerator mass spectrometry.** Roberts, M.L.; Davis, J.C. To Dept. of Energy, Washington, DC (US). USA Patent 5,189,302/A/. 23 Feb 1993. Filed date 28 Oct 1991. USA Patent Application 7-783,803. Int. Cl. B01D 59/44; H01J 49/40. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Apparatus for ionizing and accelerating a sample containing isotopes of hydrogen and detecting the ratios of hydrogen isotopes contained in the sample is disclosed. An ion source generates a substantially linear ion beam including ions of tritium from the sample. A radio-frequency quadrupole accelerator is directly coupled to and axially aligned with the source at an angle of substantially zero degrees. The accelerator accelerates species of the sample having different mass to different energy levels along the same axis as the ion beam. A spectrometer is used to detect the concentration of tritium ions in the sample. In one form of the invention, an energy loss spectrometer is used which includes a foil to block the passage of hydrogen, deuterium and ^{3}He ions, and a surface barrier or scintillation detector to detect the concentration of tritium ions. In another form of the invention, a combined momentum/energy loss spectrometer is used which includes a magnet to separate the ion beams, with Faraday cups to measure the hydrogen and deuterium and a surface barrier or scintillation detector for the tritium ions.

Auxiliaries and Components

Refer also to citation(s) 172, 216

170 **Tunability enhanced electromagnetic wiggler.** Schlueter, R.D.; Deis, G.A. To Dept. of Energy. 20 Mar 1991. USA Patent Application 7-672,308. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE93008236. Source: OSTI; NTIS; GPO Dep.

The invention discloses a wiggler used in synchrotron radiation sources and free electron lasers, where each pole is surrounded by at least two electromagnetic coils. The electromagnetic coils are energized with different amounts of current to provide a wide tunable range of the on-axis magnetic flux density, while preventing magnetic saturation of the poles.

171 **Correction coil cable.** Wang, Sou-Tien. To Dept. of Energy. 9 Apr 1991. USA Patent Application 7-682,833. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-88ER80682. Order Number DE93012023. Source: OSTI; NTIS; INIS; GPO Dep.

The present invention relates generally to the field of the manufacture of electrical coil windings, and more particularly to a unique cable assembly for use in winding coils having small wires and a large number of winding turns. The predominant current usage of the correction coil cable of the present invention is as the winding wire for correction coils in the superconducting super collider and in similar devices which might be developed in the future.

Storage Rings

172 **Single-bunch synchrotron shutter.** Norris, J.R.; Jauhuei Tang; Lin Chen; Thurnauer, M. To Dept. of Energy, Washington, DC (US). USA Patent 5,225,788/A/. 6 Jul 1993. Filed date 20 Sep 1991. USA Patent Application 7-762,966. Int. Cl. H05H 7/08. [10] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An apparatus is described for selecting a single synchrotron pulse from a sequence of pulses from a synchrotron source comprising: a rotatable spindle having multiple faces of a reflective surface placed in the path of the pulses; a shutter spaced from the spindle and synchrotron source at a location to receive pulses reflected from the spindle, the shutter including a gap of substantially less width than the spacing between the spindle and shutter; the spacing of the shutter from the spindle, the rotational speed of the spindle, and the width of the gap in the shutter, all being selected so that the reflected light off the spindle moves at a speed to transmit only a single pulse of radiation through the gap in the shutter.

44 INSTRUMENTATION

173 **High resolution data acquisition.** Thornton, G.W.; Fuller, K.R. To Dept. of Energy, Washington, DC (US). USA Patent 5,200,933/A/. 6 Apr 1993. Filed date 28 May 1992. USA Patent Application 7-889,565. Int. Cl. G04F 8/00; G04F 10/00. [10] DOE Contract W-7405-ENG-36. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A high resolution event interval timing system measures short time intervals such as occur in high energy physics or laser ranging. Timing is provided from a clock, pulse train, and analog circuitry for generating a triangular wave synchronously with the pulse train (as seen in diagram on patent). The triangular wave has an amplitude and slope functionally related to the time elapsed during each clock pulse in the train. A converter forms a first digital value of the amplitude and slope of the triangle wave at the start of the event interval and a second digital value of the amplitude and slope of the triangle wave at the end of the event interval. A counter counts the clock pulse train during the interval to form a gross event interval time. A computer then combines the gross event interval time and the first and second digital values to output a high resolution value for the event interval.

Radiation Instrumentation

Refer also to citation(s) 202

174 **Automatically processed alpha-track radon monitor.** Langner, G.H. Jr. To Dept. of Energy. 2 May 1991. USA Patent Application 7-694,738. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86ID12584. Order Number DE93012010. Source: OSTI; NTIS; GPO Dep.

An automatically processed alpha-track radon monitor is provided which includes a housing having an aperture allowing radon entry, and a filter that excludes the entry of radon daughters into the housing. A flexible track registration material is located within the housing that records alpha-particle emissions from the decay of radon and radon daughters inside the housing. The flexible track registration material is capable of being spliced such that the registration material from a plurality of monitors can be spliced into a single strip to facilitate automatic processing of the registration material from the plurality of monitors. A process for the automatic counting of radon registered by a radon monitor is also provided.

175 **Audible radiation monitor.** Odell, D.M.C. To Dept. of Energy, Washington, DC (US). USA Patent 5,231,288/A/. 27 Jul 1993. Filed date 2 Mar 1992. USA Patent Application 7-844,330. Int. Cl. G01T 1/17. [10] DOE Contract AC09-89SR18035. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An apparatus is described, comprising: at least one radiation detector, each of said at radiation detector producing an output; means responsive to said at least one radiation detector for determining the resonance energy levels of any radiation detected by said at least one radiation detector;

and means in mapped communication with said determining means for producing at least one chord in an audible range, each of said at least one chord characteristic of a radioisotope, said producing means producing said at least one chord when said at least one radiation detector detects a radioisotope.

176 Method and apparatus for providing pulse pile-up correction in charge quantizing radiation detection systems. Britton, C.L. Jr.; Wintenberg, A.L. To Dept. of Energy, Washington, DC (US). USA Patent 5,225,682/A/. 6 Jul 1993. Filed date 24 Jan 1992. USA Patent Application 7-825,225. Int. Cl. G01T 1/17. [10] DOE Contract AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A radiation detection method is described for continuously correcting the quantization of detected charge in a radiation detection system during pulse pile-up conditions, comprising the steps of: continuously converting radiation event pulses from a radiation detector to voltage pulses of a predetermined shape whose peak amplitudes are proportional to the quantity of charge of each corresponding detected event; sampling and storing the peak amplitudes of each of said voltage pulses in accordance with their respective times of occurrence; generating a correction factor signal for each of said voltage pulses based on the known response of said predetermined shape pulses whose amplitude represents a fraction of a previous pulse's amplitude corresponding to the previous pulse's influence on a following pulse's peak amplitude at the time of occurrence of said following pulse; and, subtracting said correction factor signal amplitude from said following pulse peak amplitude to obtain a corrected amplitude signal indicative of the charge quantity of the radiation event corresponding to said following pulse peak.

177 Long range alpha particle detector. MacArthur, D.W.; Wolf, M.A.; McAtee, J.L.; Unruh, W.P.; Cucchiara, A.L.; Huchton, R.L. To Dept. of Energy, Washington, DC (US). USA Patent 5,184,019/A/. 2 Feb 1993. Filed date 3 Jun 1991. USA Patent Application 7-709,566. Int. Cl. H01J 47/02. [10] DOE Contract W-7405-ENG-36. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An alpha particle detector capable of detecting alpha radiation from distant sources. In one embodiment, a high voltage is generated in a first electrically conductive mesh while a fan draws air containing air molecules ionized by alpha particles through an air passage and across a second electrically conductive mesh. The current in the second electrically conductive mesh can be detected and used for measurement or alarm. The detector can be used for area, personnel and equipment monitoring.

Well Logging Instrumentation

178 Compact acoustic refrigerator. Bennett, G.A. To Dept. of Energy. 1991. Filed date 4 Jun 1991. USA Patent Application 7-710,207. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93015703. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a compact acoustic refrigeration system that actively cools components, e.g., electrical circuits, in a borehole environment. An acoustic engine includes first thermodynamic elements for generating a standing acoustic wave in a selected medium. An acoustic refrigerator includes second thermodynamic elements located in the standing wave for generating a relatively cold temperature at a first end of the second thermodynamic elements and a relatively hot temperature at a second end of the second thermodynamic elements. A resonator volume cooperates with the first and second thermodynamic elements to support the standing wave. To accommodate the high heat fluxes required for heat transfer to/from the first and second thermodynamic elements, first heat pipes transfer heat from the heat load to the second thermodynamic elements and second heat pipes transfer heat from first and second thermodynamic elements to the borehole environment.

179 A fiber optically isolated and remotely stabilized data transmission system. Nelson, M.A. To Dept. of Energy. 1991. USA Patent Application 7-717,580. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-88NV10617. Order Number DE93015714. Source: OSTI; NTIS; GPO Dep.

It is, an object of this invention to provide a fiber optically isolated and remotely stabilized data transmission system wherein optical data may be transmitted over an optical data fiber from a remote source which includes a data transmitter and a power supply at the remote source, the transmitter may be remotely calibrated and stabilized via an optical control fiber, and the power source may be remotely cycled between duty and standby modes via an optical control fiber.

180 Borehole data transmission apparatus. Kotlyar, O.M. To [Dept. of Energy, Washington, DC (United States)]. USA Patent 5,197,040/A/. 23 Mar 1993. Filed date 31 Mar 1992. Int. Cl. G01V 1/40. [10] DOE Contract FG01-90CE15471. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A borehole data transmission apparatus is described whereby a centrifugal pump impeller(s) is used to provide a turbine stage having substantial pressure characteristics in response to changing rotational speed of a shaft for the pressure pulsing of data from the borehole through the drilling mud to the surface of the earth.

Thermal Instrumentation

Refer also to citation(s) 74

Optical Instrumentation

Refer also to citation(s) 92, 96, 105, 168, 179, 200

181 Circular zig-zag scan video format. Peterson, C.G.; Simmons, C.M. To Dept. of Energy. 21 Mar 1991. USA Patent Application 7-672,983. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93008235. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a circular, zig-zag scan for use with vidicon tubes. A sine wave is generated, rectified and its fourth root extracted. The fourth root, and its inverse, are used to generate horizontal ramp and sync signals. The fourth root is also used to generate a vertical sync signal, and the vertical sync signal, along with the horizontal sync signal, are used to generate the vertical ramp signal. Cathode blanking and preamplifier clamp signals are also obtained from the vertical sync signal.

182 False color viewing device. Kronberg, J.W. To Dept. of Energy. 8 May 1991. USA Patent Application 7-697,158. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93012003. Source: OSTI; NTIS; GPO Dep.

This invention consists of a viewing device for observing objects in near-infrared false-color comprising a pair of goggles with one or more filters in the apertures, and pads that engage the face for blocking stray light from the sides so that all light reaching, the user's eyes come through the filters. The filters attenuate most visible light and pass near-infrared (having wavelengths longer than approximately 700 nm) and a small amount of blue-green and blue-violet (having wavelengths in the 500 to 520 nm and shorter than 435 nm, respectively). The goggles are useful for looking at vegetation to identify different species and for determining the health of the vegetation, and to detect some forms of camouflage.

183 Apparatus for synthesis of a solar spectrum. Sopori, B.L. To Dept. of Energy, Washington, DC (US). USA Patent 5,217,285/A/. 8 Jun 1993. Filed date 15 Mar 1991. USA Patent Application 7-670,112. Int. Cl. F21V 5/02. [10] DOE Contract AC02-83CH10093. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Solar simulator apparatus is described, comprising: first light source means for producing a first light beam having a first wavelength band; second light source means for producing both a second light beam having a second wavelength band and a third light beam having a third wavelength band; and a fiber optic cable having a first input leg, a second input leg, and a third input leg combined into a single, mixed output leg, wherein said first input leg is positioned in said first light beam, said second input leg is positioned in said second light beam, and said third input leg is positioned in said third light beam, and wherein said first input leg includes a plurality of first leg optic fibers that are optimized to transmit light having said first wavelength band, said second input leg includes a plurality of second leg optic fibers that are optimized to transmit light having said second wavelength band, and said third input leg includes a plurality of third leg optic fibers that are optimized to transmit light having said third wavelength band, said first, second, and third leg optic fibers being combined together to form said output leg in such manner that said output leg produces a substantially uniform output light beam comprising an additive mixture of the first wavelength band of the first beam, the second wavelength band of the second beam, and the third wavelength band of the third beam.

184 Apparatus for preventing particle deposition from process streams on optical access windows. Logan, R.G.; Grimm, U. To Dept. of Energy, Washington, DC (US). USA Patent 5,217,510/A/. 8 Jun 1993. Filed date 18 Oct 1991. USA Patent Application 7-779,473. Int. Cl. B03C 3/40. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An electrostatic precipitator is disposed inside and around the periphery of the window of a viewing port communicating with a housing through which a particle-laden gas stream is being passed. The precipitator includes a pair of electrodes around the periphery of the window, spaced apart and connected to a unidirectional voltage source. Application of high voltage from the source to the electrodes causes air molecules in the gas stream to become ionized, attaching to solid particles and causing them to be deposited on a collector electrode. This prevents the particles from being deposited on the window and keeps the window clean for viewing and making optical measurements.

185 Reflective optical imaging system for extreme ultraviolet wavelengths. Viswanathan, V.K.; Newnam, B.E. To Dept. of Energy, Washington, DC (US). USA Patent 5,212,588/A/. 18 May 1993. Filed date 9 Apr 1991. USA Patent Application 7-682,780. Int. Cl. G02B 5/10. [10] DOE Contract W-7405-ENG-36. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A projection reflection optical system has two mirrors in a coaxial, four reflection configuration to reproduce the image of an object. The mirrors have spherical reflection surfaces to provide a very high resolution of object feature wavelengths less than 200 μm, and preferably less than 100 μm. An image resolution of features less than 0.05-0.1 μm, is obtained over a large area field; i.e., 25.4 mm × 25.4 mm, with a distortion less than 0.1 of the resolution over the image field.

186 Laser metrology for coherent multi-telescope arrays. Shao, M.; Massie, N.A. To Dept. of Energy, Washington, DC (US). USA Patent 5,208,654/A/. 4 May 1993. Filed date 16 May 1990. USA Patent Application 7-524,114. Int. Cl. G01B 11/02. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

In multi-telescope arrays that comprise multiple telescopes, a beam-combining module, and flat mirrors for directing light beams from the multiple telescopes to the beam combining module, a laser metrology system is used for monitoring various pathlengths along a beam path where deviations are likely. Some pathlengths are defined simply by a pair of retroreflectors or reflectors at both ends. Lengths between pairs of retroreflectors are measured and monitored by laser interferometers. One critical pathlength deviation is related to the displacement of the flat mirror. A reference frame is set up relative to the beam-combining module to form and define the coordinate system within which the positions of the flat mirrors are measured and monitored. In the preferred embodiment, a pair of retroreflectors along the optical axis of the beam-combining module defines a reference frame. A triangle is formed by the reference frame as the base and another retroreflector at the flat mirror as the vertex. The triangle is used to monitor the position of the flat mirror. A beam's pathlength is dynamically corrected in response to the monitored deviations.

187 Active imaging system with Faraday filter. Snyder, J.J. To Dept. of Energy, Washington, DC (US). USA Patent 5,202,741/A/. 13 Apr 1993. Filed date 29 Jun 1992. USA Patent Application 7-905,989. Int. Cl. G01C 3/08. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An active imaging system has a low to medium powered laser transmitter and receiver wherein the receiver includes a Faraday filter with an ultranarrow optical bandpass and a bare (nonintensified) CCD camera. The laser is locked in the vicinity of the passband of the Faraday filter. The system has high sensitivity to the laser illumination while eliminating solar background.

Geophysical and Meteorological Instrumentation

Refer also to citation(s) 215

Miscellaneous Instrumentation

Refer also to citation(s) 32, 49, 95, 98, 100, 101, 104, 106, 135, 136

188 Three-axis particle impact probe. Fasching, G.E.; Smith, N.S. Jr.; Utt, C.E. To Dept. of Energy. 2 Apr 1991. USA Patent Application 7-679,488. 18p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93008224. Source: OSTI; NTIS; GPO Dep.

Three-axis particle impact probes detect particle impact vectors along x-, y-, and z-axes by means of a head mounted on the outer end of a shaft that is flexibly mounted in silicone rubber at the top of a housing so as to enable motion imparted to the head upon impact to be transmitted to a grounded electrode secured to the shaft within the housing. Excitable electrodes are mounted in the housing in a fixed position, spaced apart from the ground electrode and forming, with the ground electrode, capacitor pairs. Movement of the ground electrode results in changes in capacitance, and these differences in capacitance are used for measurement or derivation of momentum vectors along each of the three axes. In one embodiment, the ground electrode is mounted at the base of the shaft and is secured to a silicone rubber layer at the top of the housing, providing for cantilevered movement. In another embodiment, the shaft is mounted at its mid point in a flexible bushing so that it undergoes pivotal movement around that point.

189 Three axis velocity probe system. Smith, N.S. Jr.; Fasching, G.E.; Utt, C.E. To Dept. of Energy. 10 Apr 1991. USA Patent Application 7-683,014. 32p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93012021. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a three-axis velocity probe system for determining three-axis positional velocities of small particles in fluidized bed systems and similar applications. This system has a sensor head containing four closely-spaced sensing electrodes of small wires that have flat ends to establish a two axis plane, e.g., a X-Y plane. Two of the sensing electrodes are positioned along one of the axes and the other two are along the second axis. These four sensing electrodes are surrounded by a guard electrode, and the outer surface is a ground electrode and support member for the sensing head. The electrodes are excited by, for example, a sinusoidal voltage having a peak-to-peak voltage of up to 500 volts at a frequency of 2 MHz. Capacitive currents flowing between the four sensing electrodes and the ground electrode are influenced by the presence and position of a particle passing the sensing head. Any changes in these currents due to the particle are amplified and synchronously detected to produce positional signal values that are converted to digital form. Using these digital forms and two values of time permit generation of values of the three components of the particle vector and thus the total velocity vector.

190 Low volume flow meter. Meixler, L.D. To Dept. of Energy. 1991. USA Patent Application 7-694,176. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE93015700. Source: OSTI; NTIS; INIS; GPO Dep.

This invention is comprised of a low flow monitor which provides a means for determining if a fluid flow meets a minimum threshold level of flow. The low flow monitor operates with a minimum of intrusion by the flow detection device into the flow. The electrical portion of the monitor is externally located with respect to the fluid stream which allows for repairs to the monitor without disrupting the flow. The electronics provide for the adjustment of the threshold level to meet the required conditions. The apparatus can be modified to provide an upper limit to the flow monitor by providing for a parallel electronic circuit which provides for a bracketing of the desired flow rate.

191 A method and apparatus for tube crevice detection and measurement. Kikta, T.J.; Mitchell, R.D. To Dept. of Energy. 1991. USA Patent Application 7-707,538. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-76PN00014. Order Number DE93015701. Source: OSTI; NTIS; INIS; GPO Dep.

This invention relates to a method and apparatus for determining the extent of contact between an electrically conducting tube and an electrically conductive tubesheet surrounding the tube, based upon the electrical resistance of the tube and tubesheet. A constant current source is applied to the interior of the electrically conducting tube by probes and a voltmeter is connected between other probes to measure the voltage at the point of current injection, which is inversely proportional to the amount of contact between the tube and tubesheet. Namely, the higher the voltage measured by the voltmeter, the less contact between the tube and tubesheet.

192 Multiple wavelength x-ray monochromators. Steinmeyer, P.A. To Dept. of Energy. 1991. USA Patent Application 7-714,805. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP03533. Order Number DE93015712. Source: OSTI; NTIS; INIS; GPO Dep.

An apparatus and method is provided for separating input x-ray radiation containing first and second x-ray wavelengths into spatially separate first and second output radiation which contain the first and second x-ray wavelengths, respectively. The apparatus includes a crystalline diffractor which includes a first set of parallel crystal planes, where each of the planes is spaced a predetermined second distance from one another. The crystalline diffractor also includes a second set of parallel crystal planes inclined at an angle with respect to the first set of crystal planes where each of the planes of the second set of parallel crystal planes is spaced a predetermined second distance from one another. In one embodiment, the crystalline diffractor is comprised of a single crystal. In a second embodiment, the crystalline diffractor is comprised of a stack of two crystals. In a third embodiment, the crystalline diffractor includes a single crystal that is bent for focussing the separate first and second output x-ray radiation wavelengths into separate focal points.

193 **Sensor/source electrometer circuit.** Hughes, W.J. To Dept. of Energy. 1991. USA Patent Application 7-723,120. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC12-76SN00052. Order Number DE93015717. Source: OSTI; NTIS; GPO Dep.

A multiple decade electrometer circuit is claimed which can measure low input currents or act as a current source and is comprised of a microprocessor controlled digital to analog converters to derive individual decades. A plurality of decades are created by multiple D-A voltage sources which generate electrometer currents through scaled resistors. After a first series of decades of current are successively produced, the converters are 10 cycled to generate current through new resistors scaled to produce another series decades of current. In this manner, the electrometer circuit generates or senses a plurality of decades of current without significant scale change.

194 **Apparatus and method for measuring and imaging surface resistance.** Martens, J.S.; Hietala, V.M.; Hohenwarter, G.K.G. To Dept. of Energy, Washington, DC (US). USA Patent 5,239,269/A/. 24 Aug 1993. Filed date 7 Nov 1991. USA Patent Application 7-789,225. Int. Cl. G01R 27/32. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Apparatus is described for determining and imaging surface resistance of a sample comprising: means for generating electromagnetic radiation in the frequency range of 10^9 10^{12} Hz; modified confocal resonator means for radiating said electromagnetic radiation; remote sample means for reflecting said electromagnetic radiation; and means for determining and imaging the surface resistance of said sample means from said reflected electromagnetic radiation.

195 **Plasma momentum meter for momentum flux measurements.** Zonca, F.; Cohen, S.A.; Bennett, T.; Timberlake, J.R. To Dept. of Energy, Washington, DC (US). USA Patent 5,239,563/A/. 24 Aug 1993. Filed date 5 Jul 1991. USA Patent Application 7-726,076. Int. Cl. G21B 1/02. [10] DOE Contract AC02-76CH03073. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An apparatus is described for measuring momentum flux from an intense plasma stream, comprising: refractory target means oriented normal to the flow of said plasma stream for bombardment by said plasma stream where said bombardment by said plasma stream applies a pressure to said target means, pendulum means for communicating a translational displacement of said target to a force transducer where said translational displacement of said target is transferred to said force transducer by an elongated member coupled to said target, where said member is suspended by a pendulum configuration means and where said force transducer is responsive to said translational displacement of said member, and force transducer means for outputting a signal representing pressure data corresponding to said displacement.

196 **Method for simultaneous measurement of mass loading and fluid property changes using a quartz crystal microbalance.** Granstaff, V.E.; Martin, S.J. To Dept. of Energy, Washington, DC (US). USA Patent 5,201,215/A/. 13 Apr 1993. Filed date 17 Oct 1991. USA Patent Application 7-779,727. Int. Cl. G01N 11/00. [10] DOE Contract AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method is described, using a quartz crystal microbalance, to obtain simultaneous measurement of solid mass accumulation and changes in liquid density-viscosity product. The simultaneous real-time measurements of electrical parameters yields that changes in surface mass can be differentiated from changes in solution properties. Two methods to obtain the admittance/frequency data are employed.

45 MILITARY TECHNOLOGY, WEAPONRY, AND NATIONAL DEFENSE

197 **Shock destruction armor system.** Froeschner, K.E. To United States Department of Energy, Washington, DC (US). USA Patent 5,214,235/A/. 25 May 1993. Filed date 25 Mar 1992. USA Patent Application 7-856,260. Int. Cl. F41H 5/04. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A shock destruction armor system mounted in a vertical relationship on an external surface of a vehicle for destroying the force of impact of an incoming projectile having a length, L, equal to an aspect ratio, m, times its diameter, D, said armor system is described comprising: armor plate means, comprising a plurality of substantially vertical super-imposed armor plates secured at only one edge thereof to said vehicle, each of said armor plates having a predetermined thickness and separated one-from another by a predetermined distance, said thickness of each of said armor plates progressively increasing from a frontal armor plate, adapted to receive the force of impact of an incoming projectile, to a last armor plate thereof, said distance between said armor plates progressively increasing from a first distance between said frontal armor plate and its next-following armor plate through a last distance between said last armor plate and its next-preceding armor plate, for hydrodynamically and sequentially at least substantially destroying an incoming projectile impacting a first of said armor plates, and for inducing debris generated from the explosion on an area of impact on the first armor plate to egress from such area prior to impact of such an incoming projectile on the next-following armor plate.

198 Explosive laser light initiation of propellants. Piltch, M.S. To Dept. of Energy, Washington, DC (US). USA Patent 5,212,339/A/. 18 May 1993. Filed date 27 Mar 1992. USA Patent Application 7-858,457. Int. Cl. F42B 3/113. [10] DOE Contract W-7405-ENG-36. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A improved initiator for artillery shell using an explosively generated laser light to uniformly initiate the propellent. A small quantity of a high explosive, when detonated, creates a high pressure and temperature, causing the surrounding noble gas to fluoresce. This fluorescence is directed into a lasing material, which lases, and directs laser light into a cavity in the propellant, uniformly initiating the propellant.

199 Hybrid armature projectile. Hawke, R.S.; Asay, J.R.; Hall, C.A.; Konrad, C.H.; Sauve, G.L.; Shahinpoor, M.; Susoeff, A.R. To Dept. of Energy, Washington, DC (US). USA Patent 5,191,164/A/. 2 Mar 1993. Filed date 1 Apr 1991. USA Patent Application 7-678,430. Int. Cl. F41B 6/00. [10] DOE Contract W-7405-ENG-48 ;AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A projectile for a railgun that uses a hybrid armature and provides a seed block around part of the outer surface of the projectile to seed the hybrid plasma brush. In addition, the hybrid armature is continuously vaporized to replenish plasma in a plasma armature to provide a tandem armature and provides a unique ridge and groove to reduce plasma blowby.

Chemical Explosions and Explosives

200 Detection device for high explosives. Grey, A.E.; Partin, J.K.; Stone, M.L.; Von Wandruslka, R.M. To Dept. of Energy. 1991. Filed date 28 May 1991. USA Patent Application 7-707,414. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE93011994. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention is comprised of a portable fiber optic detector that senses the presence of specific target chemicals by electrostatically attracting the target chemical to an aromatic compound coating on an optical fiber. Attaching the target chemical to the coated fiber reduces the fluorescence so that a photon sensing detector records the reduced light level and activates an appropriate alarm or indicator.

201 Selectable fragmentation warhead. Bryan, C.S.; Paisley, D.L.; Montoya, N.I.; Stahl, D.B. To Dept. of Energy, Washington, DC (US). USA Patent 5,229,542/A/. 20 Jul 1993. Filed date 27 Mar 1992. USA Patent Application 7-858,744. Int. Cl. F42B 12/22; F42C 19/00. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A selectable fragmentation warhead is described comprising: a case having proximal and distal ends; a fragmenting plate mounted in said distal end of said casing; first explosive means cast adjacent to said fragmenting plate for creating a predetermined number of fragments from said fragmenting plate; three or more first laser-driven slapper detonators located adjacent to said first explosive means for detonating said first explosive means in a predetermined pattern; smoother-disk means located adjacent to said first means for accelerating said fragments; second explosive means cast adjacent to said smoother-disk means for further accelerating said fragments; at least one laser-driven slapper detonators located in said second explosive means; a laser located in said proximal end of said casing; optical fibers connecting said laser to said first and second laser-driven slapper detonators; and optical switch means located in series with said optical fibers connected to said plurality of first laser-driven slapper detonators for blocking or passing light from said laser to said plurality of first laser-driven slapper detonators.

54 ENVIRONMENTAL SCIENCES

Environmental Sciences, Atmospheric

Refer also to citation(s) 15, 28, 47, 70

202 Tritium monitor and collection system. Baker, J.D.; Wickham, K.L.; Ely, W.E.; Tuggle, D.G.; Meikrantz, D.H.; Grafwaller, E.G.; Maltrud, H.R.; Bourne, G.L. To Dept. of Energy. 26 Mar 1991. USA Patent Application 7-674,981. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE93008233. Source: OSTI; NTIS; GPO Dep.

This system measures tritium on-line and collects tritium from a flowing inert gas stream. It separates the tritium from other non-hydrogen isotope contaminating gases, whether radioactive or not. The collecting portion of the system is constructed of various zirconium alloys called getters. These alloys adsorb tritium in any of its forms at one temperature and at a higher temperature release it as a gas. The system consists of four on-line getters and heaters, two ion chamber detectors, two collection getters, and two guard getters. When the incoming gas stream is valved through the on-line getters, 99.9% of it is adsorbed and the remainder continues to the guard getter where traces of tritium not collected earlier are adsorbed. The inert gas stream then exits the system to the decay chamber. Once the on-line getter has collected tritium for a predetermined time, it is valved off and the next online getter is valved on. Simultaneously, the first getter is heated and a pure helium purge is employed to carry the tritium from the getter. The tritium loaded gas stream is then routed through an ion chamber which measures the tritium activity. The ion chamber effluent passes through a collection getter that readsorbs the tritium and is removable from the system once it is loaded and is then replaced with a clean getter. Prior to removal of the collection getter, the system switches to a parallel collection getter. The effluent from the collection getter passes through a guard getter to remove traces of tritium prior to exiting the system. The tritium loaded collection getter, once removed, is analyzed by liquid scintillation techniques. The entire sequence is under computer control except for the removal and analysis of the collection getter.

203 Cooler and particulate separator for an off-gas stack. Wright, G.T. To Dept. of Energy. 8 Apr 1991. USA Patent Application 7-681,292. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE93008216. Source: OSTI; NTIS; GPO Dep.

This report describes an off-gas stack for a melter, furnace or reaction vessel comprising an air conduit leading to two sets of holes, one set injecting air into the off-gas stack near the melter plenum and the second set injecting air downstream of the first set. The first set injects air at a compound angle, having both downward and tangential components, to create a reverse vortex flow, counter to the direction of flow of gas through the stack and also along the periphery of the stack interior surface. Air from the first set of holes prevents recirculation zones from forming and the attendant accumulation of particulate deposits on the wall of the stack and will also return to the plenum any particulate swept up in the gas entering the stack. The second set of holes injects air in the same direction as the gas in the stack to compensate for the pressure drop and to prevent the concentration of condensate in the stack. A set of sprayers, receiving water from a second conduit, is located downstream of the second set of holes and sprays water into the gas to further cool it.

204 High speed door assembly. Shapiro, C. To Dept. of Energy, Washington, DC (US). USA Patent 5,205,069/A/. 27 Apr 1993. Filed date 2 Oct 1991. USA Patent Application 7-769,657. Int. Cl. E05F 15/20; E05B 65/10. [10] DOE Contract AC07-76ID01570. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A high speed door assembly is described, comprising an actuator cylinder and piston rods, a pressure supply cylinder and fittings, an electrically detonated explosive bolt, a honeycomb structured door, a honeycomb structured decelerator, and a structural steel frame encasing the assembly to close over a 3 foot diameter opening within 50 milliseconds of actuation, to contain hazardous materials and vapors within a test fixture.

Environmental Sciences, Terrestrial

Refer also to citation(s) 26, 30, 31, 71, 72, 204

205 Method and apparatus for removing ions from soil. Bibler, J.P. To Dept. of Energy, Washington, DC (United States). USA Patent 5,190,628/A/. 2 Mar 1993. Filed date 25 Feb 1992. Int. Cl. B01D 61/44. [10] DOE Contract AC09-89SR18035. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method and apparatus are presented for selectively removing species of ions from an area of soil. Permeable membranes 14 and 18 impregnated with an ion exchange resin that is specific to one or more species of chemical ions are inserted into ground 12 in close proximity to, and on opposing sides of, a soil area of interest 22. An electric potential is applied across electrodes 26 and 28 to cause the migration of ions out of soil area 22 toward the membranes 14 and 18. Preferably, the resin exchanges ions of sodium or hydrogen for ions of mercury that it captures from soil area 22. Once membranes 14 and 18 become substantially saturated with mercury ions, the potential applied across electrodes 26 and 28 is discontinued and membranes 14 and 18 are preferably removed from soil 12 for storage or recovery of the ions. The membranes are also preferably impregnated with a buffer to inhibit the effect of the hydrolysis of water by current from the electrodes.

206 Flow monitoring and control system for injection wells. Corey, J.C. To Dept. of Energy, Washington, DC (United States). USA Patent 5,186,255/A/. 16 Feb 1993. Filed date 16 Jul 1991. Int. Cl. E21B 34/06; E21B 34/16; E21B 43/12; E21B 47/00. [10] DOE Contract AC09-89SR18035. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A system for monitoring and controlling the injection rate of fluid by an injection well of an in-situ remediation system for treating a contaminated groundwater plume. The well is fitted with a gated insert, substantially coaxial with the injection well. A plurality of openings, some or all of which are equipped with fluid flow sensors and gates, are spaced along the insert. The gates and sensors are connected to a surface controller. The insert may extend throughout part of, or substantially the entire length of the injection well. Alternatively, the insert may comprise one or more movable modules which can be positioned wherever desired along the well. The gates are opened part-way at the start of treatment. The sensors monitor and display the flow rate of fluid passing through each opening on a controller. As treatment continues, the gates are opened to increase flow in regions of lesser flow, and closed to decrease flow in regions of greater flow, thereby approximately equalizing the amount of fluid reaching each part of the plume.

55 BIOMEDICAL SCIENCES, BASIC STUDIES

Biochemistry

207 Catalyzed enzyme electrodes. Zawodzinski, T.A.; Wilson, M.S.; Rishpon, J.; Gottesfeld, S. To Dept. of Energy, Washington, DC (US). USA Patent 5,227,042/A/. 13 Jul 1993. Filed date 15 May 1992. USA Patent Application 7-883,746. Int. Cl. G01N 27/26. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An enzyme electrode is prepared with a composite coating on an electrical conductor. The composite coating is formed from a casting solution of a perfluorosulfonic acid polymer, an enzyme, and a carbon supported catalyst. The solution may be cast directly on the conductor surface or may be formed as a membrane and applied to the surface. The perfluorosulfonic acid ionomer formed from the casting solution provides an insoluble biocompatible protective matrix for the enzyme and acts to retain the enzyme for long term availability in the electrode structure. The carbon supported catalyst provides catalytic sites throughout the layer for the oxidation of hydrogen peroxide from the enzyme reactions. The carbon support then provides a conductive path for establishing an electrical signal to the electrical conductor. In one embodiment, the electrical conductor is a carbon cloth that permits oxygen or other gas to be introduced to the perfluorosulfonic polymer to promote the enzyme reaction independent of oxygen in the solution being tested.

208 Ordered transport and identification of particles. Shera, E.B. To Dept. of Energy, Washington, DC (US). USA Patent 5,209,834/A/. 11 May 1993. Filed date 9 Mar 1992. USA Patent Application 7-848,582. Int. Cl. G01N 27/26; G01N 27/447. [10] DOE Contract W-7405-ENG-36. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method and apparatus are provided for application of electrical field gradients to induce particle velocities to enable particle sequence and identification information to be obtained. Particle sequence is maintained by providing electroosmotic flow for an electrolytic solution in a particle transport tube. The transport tube and electrolytic solution are selected to provide an electroosmotic radius of >100 so that a plug flow profile is obtained for the electrolytic solution in the transport tube. Thus, particles are maintained in the same order in which they are introduced in the transport tube. When the particles also have known electrophoretic velocities, the field gradients introduce an electrophoretic velocity component onto the electroosmotic velocity. The time that the particles pass selected locations along the transport tube may then be detected and the electrophoretic velocity component calculated for particle identification. One particular application is the ordered transport and identification of labeled nucleotides sequentially cleaved from a strand of DNA.

209 Optical probe for the cytochrome P-450 cholesterol side chain cleavage enzyme. Marrone, B.L.; Simpson, D.J.; Unkefer, C.J.; Whaley, T.W. To Dept. of Energy, Washington, DC (US). USA Patent 5,208,332/A/. 4 May 1993. Filed date 20 Dec 1991. USA Patent Application 7-811,217. Int. Cl. C07D 265/38. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An optical probe enables the study of enzyme activity by absorbance spectroscopy or by sensitive fluorescence methods. In particular, the probe provides the ability to monitor the activity of cytochrome $P\text{-}450_{scc}$ enzyme, the rate limiting enzyme for steroid biosynthesis. Located on the inner mitochondrial membrane, $P\text{-}450_{scc}$ catalyzes the conversion of cholesterol to prednesolone and isocapraldehyde by sequential oxidations of the cholesterol side chain. The fluorogenic probe includes a cholesterol-like steroid linked to a chromophore through a linking group. The chromophore is selected to have little optical response when linked to the steroid substrate and an enhanced optical response when cleaved from the substrate and linking group. Thus, a fluorescent anion that can be optically detected is generated by the side-chain cleavage reaction during steroidogenesis.

210 Reversibly immobilized biological materials in monolayer films on electrodes. Weaver, P.F.; Frank, A.J. To Dept. of Energy, Washington, DC (US). USA Patent 5,208,154/A/. 4 May 1993. Filed date 8 Apr 1991. USA Patent Application 7-681,298. Int. Cl. C12N 11/14; C12N 11/02; C12N 11/08; C12N 1/02; G01N 27/[10] DOE Contract AC02-83CH10093. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Methods and techniques are described for reversibly binding charged biological particles in a fluid medium to an electrode surface. The methods are useful in a variety of applications. The biological materials may include microbes, proteins, and viruses. The electrode surface may consist of reversibly electroactive materials such as polyvinylferrocene, silicon-linked ferrocene or quinone.

211 Method for distinguishing normal and transformed cells using G1 kinase inhibitors. Crissman, H.A.; Gadbois, D.M.; Tobey, R.A.; Bradbury, E.M. To Dept. of Energy, Washington, DC (US). USA Patent 5,185,260/A/. 9 Feb 1993. Filed date 29 Aug 1991. USA Patent Application 7-751,855. Int. Cl. C12N 1/38. [10] DOE Contract W-7405-ENG-36. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A G_1 phase kinase inhibitor is applied in a low concentration to a population of normal and transformed mammalian cells. The concentration of G_1 phase kinase inhibitor is selected to reversibly arrest normal mammalian cells in the G_1 cell cycle without arresting growth of transformed cells. The transformed cells may then be selectively identified and/or cloned for research or diagnostic purposes. The transformed cells may also be selectively killed by therapeutic agents that do not affect normal cells in the G_1 phase, suggesting that such G_1 phase kinase inhibitors may form an effective adjuvant for use with chemotherapeutic agents in cancer therapy for optimizing the killing dose of chemotherapeutic agents while minimizing undesirable side effects on normal cells.

Genetics

Refer also to citation(s) 208

Medicine

Refer also to citation(s) 115, 209

212 Electromagnetic field triggered drug and chemical delivery via liposomes. Liburdy, R.P. To [Dept. of Energy, Washington, DC (United States)]. USA Patent 5,190,761/A/. 2 Mar 1993. Filed date 12 Jun 1990. Int. Cl. A61K 9/127;A61K 9/133. [10] DOE Contract AC03-76SF00098. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The present invention relates to a system and to a method of delivering a drug to a preselected target body site of a patient, comprising the steps of encapsulating the chemical agent within liposomes, essentially temperature insensitive, i.e. not having a specific predetermined phase transition temperature within the specific temperature range of drug administration; administering the liposomes to the target body site; and subjecting the target body site to nonionizing electromagnetic fields in an area of the preselected target body in order to release the chemical agent from the liposomes at a temperature of between about +10 and 65 C. The invention further relates to the use of the liposomes to bind to the surface of or to enter target tissue or an organ in a living system, and, when subjected to a nonionizing field, to release a drug from the liposomes into the target site.

Microbiology

Refer also to citation(s) 210

Pathology

213 Compact biomedical pulsed signal generator for bone tissue stimulation. Kronberg, J.W. To Dept. of Energy, Washington, DC (United States). USA Patent 5,217,009/A/. 8 Jun 1993. Filed date 10 Jul 1991. USA Patent Application 7-727,705. Int. Cl. A61N 1/36. [10] DOE Contract AC09-89SR18035. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An apparatus for stimulating bone tissue for stimulating bone growth or treating osteoporosis by applying directly to the skin of the patient an alternating current electrical signal comprising wave forms known to simulate the piezoelectric constituents in bone. The apparatus may, by moving a switch, stimulate bone growth or treat osteoporosis, as desired. Based on low-power CMOS technology and enclosed in a moisture-resistant case shaped to fit comfortably, two astable multivibrators produce the desired waveforms. The amplitude, pulse width and pulse frequency, and the subpulse width and subpulse frequency of the waveforms are adjustable. The apparatus, preferably powered by a standard 9-volt battery, includes signal amplitude sensors and warning signals indicate an output is being produced and the battery needs to be replaced.

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

Radiation Effects

Refer also to citation(s) 174

214 Determination of actinides in urine and fecal samples. McKibbin, T.T. To Dept. of Energy, Washington, DC (US). USA Patent 5,190,881/A/. 2 Mar 1993. Filed date 4 Feb 1992. USA Patent Application 7-831,017. Int. Cl. G01N 33/20. [10] DOE Contract AC07-84ID12435. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method of determining the radioactivity of specific actinides that are carried in urine or fecal sample material is disclosed. The samples are ashed in a muffle furnace, dissolved in an acid, and then treated in a series of steps of reduction, oxidation, dissolution, and precipitation, including a unique step of passing a solution through a chloride form anion exchange resin for separation of uranium and plutonium from americium.

57 HEALTH AND SAFETY

Refer also to citation(s) 29

58 GEOSCIENCES

215 Advanced motor driven clamped borehole seismic receiver. Engler, B.P.; Sleefe, G.E.; Striker, R.P. To Dept. of Energy, Washington, DC (US). USA Patent 5,189,262/A/. 23 Feb 1993. Filed date 15 Oct 1991. USA Patent Application 7-775,871. Int. Cl. G01V 1/40. [10] DOE Contract AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A borehole seismic tool is described including a borehole clamp which only moves perpendicular to the borehole. The clamp is driven by an electric motor, via a right angle drive. When used as a seismic receiver, the tool has a three part housing, two of which are hermetically sealed. Accelerometers or geophones are mounted in one hermetically sealed part, the electric motor in the other hermetically sealed part, and the clamp and right angle drive in the third part. Preferably the tool includes cable connectors at both ends. Optionally a shear plate can be added to the clamp to extend the range of the tool.

66 PHYSICS

Techniques of General Use In Physics

216 Superfluid thermodynamic cycle refrigerator. Swift, G.W.; Kotsubo, V.Y. To Dept. of Energy. 2 Apr 1991. USA Patent Application 7-679,498. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE93008222. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a cryogenic refrigerator which cools a heat source by cyclically concentrating and diluting the amount of ^{3}He in a single phase ^{3}He/^{4}He solution. The ^{3}He in superfluid ^{4}He acts in a manner of an ideal gas in a vacuum. Thus, refrigeration is obtained using any conventional thermal cycle, but preferably a Stirling or Carnot cycle. A single phase solution of liquid ^{3}He at an initial concentration in superfluid ^{4}He is contained in a first variable volume connected to a second variable volume through a superleak device that enables free passage of ^{4}He while restricting passage of ^{3}He. The ^{3}He is compressed (concentrated) and expanded (diluted) in a phased manner to carry out the selected thermal cycle to remove heat from the heat load for cooling below 1 K.

217 Quantitative method for measuring heat flux emitted from a cryogenic object. Duncan, R.V. To Dept. of Energy, Washington, DC (US). USA Patent 5,193,909/A/. 16 Mar 1993. Filed date 12 May 1992. USA Patent Application 7-881,980. Int. Cl. G01K 17/00. [10] DOE Contract AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The present invention is a quantitative method for measuring the total heat flux, and of deriving the total power dissipation, of a heat-fluxing object which includes the steps of placing an electrical noise-emitting heat-fluxing object in a liquid helium bath and measuring the superfluid transition temperature of the bath. The temperature of the liquid helium bath is thereafter reduced until some measurable parameter, such as the electrical noise, exhibited by the heat-fluxing object or a temperature-dependent resistive thin film in intimate contact with the heat-fluxing object, becomes greatly reduced. The temperature of the liquid helum bath is measured at this point. The difference between the superfluid transition temperature of the liquid helium bath surrounding the heat-fluxing object, and the temperature of the liquid helium bath when the electrical noise emitted by the heat-fluxing object becomes greatly reduced, is determined. The total heat flux from the heat-fluxing object is determined as a function of this difference between these temperatures. In certain applications, the technique can be used to optimize thermal design parameters of cryogenic electronics, for example, Josephson junction and infrared sensing devices.

Quantum Physics Aspects of Condensed Matter

218 Superconducting microcircuitry by the microlithographic patterning of superconducting compounds and related materials. Coppa, N.V. To Dept. of Energy, Washington, DC (US). USA Patent 5,238,913/A/. 24 Aug 1993. Filed date 30 Mar 1992. USA Patent Application 7-860,337. Int. Cl. H01L 39/00. [10] DOE Contract W-7405-ENG-36. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method is described of producing superconducting microcircuits comprising the steps of: depositing a thin film of $Ba_2Cu_3O_{5+x}$(O < x < 1) onto a substrate; depositing a thin film of a dopant onto said thin film of $Ba_2Cu_3O_{5+x}$; depositing a photoresist onto said thin film of a dopant; shining light through a mask containing a pattern for a desired circuit configuration and onto said photoresist; developing said photoresist to remove portions of said photoresist shined by the light and to selectively expose said dopant film; etching said selectively exposed dopant film from said thin film of $Ba_2Cu_3O_{5+x}$ to form a pattern of dopant; and heating said substrate at a temperature and for a period of time sufficient to diffuse and react said pattern of dopant with said thin film of $Ba_2Cu_3O_{5+x}$.

219 Method of preloading superconducting coils by using materials with different thermal expansion coefficients. Heim, J.R. To Dept. of Energy, Washington, DC (US). USA Patent 5,187,859/A/. 23 Feb 1993. Filed date 23 Aug 1990. USA Patent Application 7-571,361. Int. Cl. H01L 39/24. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The invention provides a high magnetic field coil. The invention provides a preloaded compressive force to the coil maintain the integrity of the coil. The compressive force is obtained by reinforcing the coil with two materials of different thermal expansion rates and then heating the coil to 700 C to obtain the desired compression. The embodiment of the invention uses Nb_3Sn as the conducting wire, since Nb_3Sn must be heated to 700 C to cause a reaction which makes Nb_3Sn superconducting.

70 PLASMA PHYSICS AND FUSION

Plasma Physics and Fusion Research

Refer also to citation(s) 195

220 Injection of electrons with predominantly perpendicular energy into an area of toroidal field ripple in a tokamak plasma to improve plasma confinement. Ono, Masayuki; Furth, H. To Dept. of Energy, Washington, DC (US). USA Patent 5,225,146/A/. 6 Jul 1993. Filed date 8 Nov 1991. USA Patent Application 7-789,519. Int. Cl. G21B 1/00. [10] DOE Contract AC02-76CH03073. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method is described of improving confinement properties of a plasma of a tokamak having a toroidal magnetic field direction comprising: (a) providing a ripple field region in the plasma; (b) injecting electrons having predominantly perpendicular energy with respect to the toroidal magnetic field direction of the plasma into the ripple field region for trapping the electrons into the plasma; and, (c) negatively charging the plasma center with respect to the edge by allowing the electrons to grad-B drift vertically toward the plasma interior until they are detrapped, thereby creating a radial electric field at the edge of the plasma.

Fusion Technology

221 Apparatus for conversion of whispering-gallery modes into a free space Gaussian like beam. Stallard, B.W.; Makowski, M.A.; Byers, J.A. To Dept. of Energy. 1991. USA Patent Application 7-711,693. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE93015707. Source: OSTI; NTIS; INIS; GPO Dep.

An optical converter for efficient conversion of millimeter wavelength whispering-gallery gyrotron output into a linearly polarized, free-space Gaussian-like beam. The converter uses a mode-converting taper and three mirror optics. The first mirror has an azimuthal tilt to eliminate the k_ϕ component of the propagation vector of the gyrotron output beam. The second mirror has a twist reflector to linearly polarize the beam. The third mirror has a constant phase surface so the converter output is in phase.

99 GENERAL AND MISCELLANEOUS

Mathematics and Computers

Refer also to citation(s) 138, 142

222 **Sequencing and fan-out mechanism for causing a set of at least two sequential instructions to be performed in a data flow processing computer.** Grafe, V.G.; Hoch, J.E. To Dept. of Energy, Washington, DC (US). USA Patent 5,226,131/A/. 6 Jul 1993. Filed date 28 Aug 1991. USA Patent Application 7-751,002. Int. Cl. G06F 9/40. [10] DOE Contract AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An apparatus is described for causing a set of at least two sequential instructions to be performed in a data flow processing computer, comprising: (a) an input means to accept an input token, said input token being a unit communication in said data flow processing computer, said input token comprising a data value and an instruction identifier; (b) identifying means operatively connected to said input means to identify said set of sequential instructions from said instructions identifier, said set of sequential instructions to be executed upon the arrival of said input token; (c) means to retrieve said set of sequential instructions in a predetermined order from a memory wherein each instruction of said set of sequential instructions is stored in a memory location of said memory, said retrieving means operatively connected to said identifying means; (d) means to transmit each instruction and all data required by each instruction of said set of sequential instructions in said predetermined order to an execution unit; and (e) means to determine that one of said instructions is a last instruction of said set of sequential instructions and to prepare said input means to receive a second input token.

Section III
Other Patents from Technologies Funded by DOE

Records included in Section III are being funded by DOE and may or may not be available for licensing. Contact appropriate entity to determine availability for licensing.

01 COAL, LIGNITE, AND PEAT

Processing

Refer also to citation(s) 235, 240

223 **Method of upgrading oils containing hydroxyaromatic hydrocarbon compounds to highly aromatic gasoline.** Baker, E.G.; Elliott, D.C. To Battelle Memorial Inst., Richland, WA (US). USA Patent 5,180,868/A/. 19 Jan 1993. Filed date 9 Oct 1990. USA Patent Application 7-577,781. Int. Cl. C07C 1/00. [10] DOE Contract AC06-76RL01830. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The present invention is a multi-stepped method of converting an oil which is produced by various biomass and coal conversion processes and contains primarily single and multiple ring hydroxyaromatic hydrocarbon compounds to highly aromatic gasoline. The single and multiple ring hydroxyaromatic hydrocarbon compounds in a raw oil material are first deoxygenated to produce a deoxygenated oil material containing single and multiple ring aromatic compounds. Then, water is removed from the deoxygenated oil material. The next step is distillation to remove the single ring aromatic compounds as gasoline. In the third step, the multiple ring aromatics remaining in the deoxygenated oil material are cracked in the presence of hydrogen to produce a cracked oil material containing single ring aromatic compounds. Finally, the cracked oil material is then distilled to remove the single ring aromatics as gasoline.

224 **Catalysts for conversion of syngas to liquid motor fuels.** Rabo, J.A.; Coughlin, P.K. To Union Carbide Corp., Danbury, CT (US). USA Patent 4,652,538/A/. 24 Mar 1987. Filed date 26 Sep 1985. USA Patent Application 7-780,259. Int. Cl. B01J 29/10; B01J 29/20. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A catalyst composition is described adapted for enhanced conversion of synthesis gas comprising carbon monoxide and hydrogen to C_5^+ hydrocarbon mixtures having enhanced suitability for use as liquid motor fuels comprising: (a) a Fischer-Tropsch catalyst component; and (b) a co-catalyst/support component comprising a steam-stabilized, hydrophobic zeolite Y catalyst, whereby said catalyst composition exhibits enhanced stability in the desired synthesis gas conversion, with relatively minor production of heavy products boiling beyond the diesel oil range. The composition is also described of claim 2 in which said Fischer-Tropsch catalyst comprises cobalt.

Waste Management

Refer also to citation(s) 251

225 **NOx reduction by sulfur tolerant coronal-catalytic apparatus and method.** Mathur, V.K.; Breault, R.W.; McLarnon, C.R.; Medros, F.G. To Tecogen Inc., Waltham, MA (US). USA Patent 5,240,575/A/. 31 Aug 1993. Filed date 23 Jan 1992. USA Patent Application 7-824,596. Int. Cl. C01B 21/00; C01B 21/30. [10] DOE Contract AC22-87PC79852. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

This invention presents an NO_x environment effective reduction apparatus comprising a sulfur tolerant coronal-catalyst such as high dielectric coronal-catalysts like glass wool, ceramic-glass wool or zirconium glass wool and method of use. In one embodiment the invention comprises an NO_x reduction apparatus of sulfur tolerant coronal-catalyst adapted and configured for hypercritical presentation to an NO_x bearing gas stream at a minimum of at least about 75 watts/cubic meter.

226 **Regenerative process and system for the simultaneous removal of particulates and the oxides of sulfur and nitrogen from a gas stream.** Cohen, M.R.; Gal, E. To General Electric Environmental Services, Lebanon, PA (US). USA Patent 5,202,101/A/. 13 Apr 1993. Filed date 23 Jun 1992. USA Patent Application 7-905,133. Int. Cl. B01J 8/00; C01B 17/00; C01B 21/00. [10] DOE Contract AC21-88MC23174. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A process and system are described for simultaneously removing from a gaseous mixture, sulfur oxides by means of a solid sulfur oxide acceptor on a porous carrier, nitrogen oxides by means of ammonia gas and particulate matter by means of filtration and for the regeneration of loaded solid sulfur oxide acceptor. Finely-divided solid sulfur oxide acceptor is entrained in a gaseous mixture to deplete sulfur oxides from the gaseous mixture, the finely-divided solid

Known licensing contacts for major laboratories are listed on page iv

sulfur oxide acceptor being dispersed on a porous carrier material having a particle size up to about 200 microns. In the process, the gaseous mixture is optionally pre-filtered to remove particulate matter and thereafter finely-divided solid sulfur oxide acceptor is injected into the gaseous mixture.

227 SOx/NOx sorbent and process of use. Ziebarth, M.S.; Hager, M.J.; Beeckman, J.W.; Plecha, S. To W. R. Grace and Co.-Conn.; New York, NY (US). USA Patent 5,180,703/A/. 19 Jan 1993. Filed date 24 Apr 1991. USA Patent Application 7-690,466. Int. Cl. B01J 20/08; B01J 20/10. [10] DOE Contract AC22-89PC88889. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An alumina sorbent capable of adsorbing NOx and SOx from waste gases and being regenerated by heating above 600 C. is made by incorporating an alumina stabilizing agent into the sorbent. A preferred method is to add the stabilizer when the alumina is precipitated. The precipitated powder is formed subsequently into a slurry, milled and dripped to form the stabilizing spheroidal alumina particles. These particles are impregnated with an alkali metal or alkaline earth metal to form the stabilized sorbent. Alumina stabilizers include one or more of silica, lanthana, other rare earths, titania, zirconia and alkaline earths.

02 PETROLEUM

Drilling and Production

228 Measuring resistivity changes from within a first cased well to monitor fluids injected into oil bearing geological formations from a second cased well while passing electrical current between the two cased wells. Vail, W.B. III. To Para Magnetic Logging, Inc., Woodinville, WA (US). USA Patent 5,187,440/A/. 16 Feb 1993. Filed date 23 Aug 1991. USA Patent Application 7-749,136. Int. Cl. G01V 3/20. [10] DOE Contract FG06-84ER13294. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A.C. current is conducted through geological formations separating two cased wells in an oil field undergoing enhanced oil recovery operations such as water flooding operations. Methods and apparatus are disclosed to measure the current leakage conducted into a geological formation from within a first cased well that is responsive to fluids injected into formation from a second cased well during the enhanced oil production activities. The current leakage and apparent resistivity measured within the first cased well are responsive to fluids injected into formation from the second cased well provided the distance of separation between the two cased wells is less than, or on the order of, a Characteristic Length appropriate for the problem.

Processing

Refer also to citation(s) 284

229 Reactor for exothermic reactions. Smith, L.A. Jr.; Hearn, D.; Jones, E.M. Jr. To Chemical Research and Licensing Co., Pasadena, TX (US). USA Patent 5,190,730/A/. 2 Mar 1993. Filed date 8 Jul 1991. USA Patent Application 7-728,041. Int. Cl. B01J 3/00. [10] DOE Contract FC07-80CS40454. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A liquid phase process is described for oligomerization of C_4 and C_5 isoolefins or the etherification thereof with C_1 to C_6 alcohols wherein the reactants are contacted in a reactor with a fixed bed acid cation exchange resin catalyst at an LHSV of 5 to 20, pressure of 0 to 400 psig and temperature of 120 to 300 F. Wherein the improvement is the operation of the reactor at a pressure to maintain the reaction mixture at its boiling point whereby at least a portion but less than all of the reaction mixture is vaporized. By operating at the boiling point and allowing a portion of the reaction mixture to vaporize, the exothermic heat of reaction is dissipated by the formation of more boil up and the temperature in the reactor is controlled.

230 Method for conducting exothermic reactions. Smith, L. Jr.; Hearn, D.; Jones, E.M. Jr. To Chemical Research and Licensing Co., Houston, TX (US). USA Patent 5,177,289/A/. 5 Jan 1993. Filed date 8 Mar 1991. USA Patent Application 7-666,847. Int. Cl. C07C 2/02. [10] DOE Contract FC07-80CS40454. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A liquid phase process for oligomerization of C_4 and C_5 isoolefins or the etherification thereof with C_1 to C_6 alcohols wherein the reactants are contacted in a reactor with a fixed bed acid cation exchange resin catalyst at an LHSV of 5 to 20, pressure of 0 to 400 psig and temperature of 120 to 300 F. wherein the improvement is the operation of the reactor at a pressure to maintain the reaction mixture at its boiling point whereby at least a portion but less than all of the reaction mixture is vaporized. By operating at the boiling point and allowing a portion of the reaction mixture to vaporize, the exothermic heat of reaction is dissipated by the formation of more boil up and the temperature in the reactor is controlled.

231 Alkylation of organic aromatic compounds. Smith, L.A. Jr.; Arganbright, R.P.; Hearn, D. To Chemical Research and Licensing Co., Houston, TX (US). USA Patent 5,176,883/A/. 5 Jan 1993. Filed date 13 May 1991. USA Patent Application 7-702,344. Int. Cl. B01J 8/02; B01J 8/04; B01D 3/00. [10] DOE Contract FC07-80CS40454. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Aromatic compounds are alkylated in a combination reactor/distillation column comprising a vessel suitable for operating between 70 C and 500 C and from 0.5 to 20 atmospheres pressure; an inert distillation packing in the lower one-third of said vessel; solid acidic catalytic material such as zeolites or an acidic cation exchange resin supported in the middle one-third of said vessel; and inert distillation packing in the upper one-third of said vessel. A benzene inlet is located near the upper end of the vessel; an olefin inlet is juxtaposed with said solid acidic catalytic material; a bottoms outlet is positioned near the bottom of said vessel for removing said cumene and ethyl benzene; and an overhead outlet is placed at the top of said vessel for removing any unreacted benzene and olefin.

03 NATURAL GAS

Drilling, Production, and Processing

232 **Nitrogen sorption.** Friesen, D.T.; Babcock, W.C.; Edlund, D.J.; Miller, W.K. To Bend Research, Inc., Bend, OR (US). USA Patent 5,225,174/A/. 6 Jul 1993. Filed date 11 Dec 1991. USA Patent Application 7-805,586. Int. Cl. C01B 21/00; C01B 13/00. [10] DOE Contract FG03-90ER80892. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Nitrogen-sorbing and -desorbing compositions and methods of using the same are disclosed, which are useful for the selective separation of nitrogen from other gases, especially natural gas.

Waste Management

Refer also to citation(s) 251

05 NUCLEAR FUELS

Transport, Handling, and Storage

233 **Method and apparatus for close packing of nuclear fuel assemblies.** Newman, D.F. To Battelle Memorial Inst., Richland, WA (US). USA Patent 5,198,183/A/. 30 Mar 1993. Filed date 6 Mar 1992. USA Patent Application 7-847,456. Int. Cl. G21C 7/06. [10] DOE Contract AC06-76RL01830. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The apparatus of the present invention is a plate of neutron absorbing material. The plate may have a releasable locking feature permitting the plate to be secured within a nuclear fuel assembly between nuclear fuel rods during storage or transportation then removed for further use or destruction. The method of the present invention has the step of placing a plate of neutron absorbing material between nuclear fuel rods within a nuclear fuel assembly, preferably between the two outermost columns of nuclear fuel rods. Additionally, the plate may be releasably locked in place.

08 HYDROGEN

Production

234 **Hydrogen-permeable composite metal membrane and uses thereof.** Edlund, D.J.; Friesen, D.T. To Bend Research, Inc., Bend, OR (US). USA Patent 5,217,506/A/. 8 Jun 1993. Filed date 15 May 1992. USA Patent Application 7-883,697. Int. Cl. B01D 53/22; B01D 71/02. [10] DOE Contract FG03-91ER81228 ;FG03-91ER81229. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Various hydrogen production and hydrogen sulfide decomposition processes are disclosed that utilize composite metal membranes that contain an intermetallic diffusion barrier separating a hydrogen-permeable base metal and a hydrogen-permeable coating metal. The barrier is a thermally stable inorganic proton conductor.

235 **Low-cost process for hydrogen production.** Cha, C.H.; Bauer, H.F.; Grimes, R.W. To Western Research Inst., Laramie, WY (US). USA Patent 5,198,084/A/. 30 Mar 1993. Filed date 17 Jul 1989. USA Patent Application 7-380,408. Int. Cl. C01B 3/24; C01B 31/00. [10] DOE Contract AC21-87MC24268. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method is provided for producing hydrogen and carbon black from hydrocarbon gases comprising mixing the hydrocarbon gases with a source of carbon and applying radiofrequency energy to the mixture. The hydrocarbon gases and the carbon can both be the products of gasification of coal, particularly the mild gasification of coal. A method is also provided for producing hydrogen and carbon monoxide by treating a mixture of hydrocarbon gases and steam with radio-frequency energy.

09 BIOMASS FUELS

Production

236 **cDNA encoding a polypeptide including a hevein sequence.** Raikhel, N.V.; Broekaert, W.F.; Namhai Chua; Kush, A. To Michigan State Univ., East Lansing, MI (US). USA Patent 5,187,262/A/. 16 Feb 1993. Filed date 24 Sep 1990. USA Patent Application 7-587,071. Int. Cl. C07K 15/10. [10] DOE Contract AC02-76ER01338. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A cDNA clone (HEV1) encoding hevein was isolated via polymerase chain reaction (PCR) using mixed oligonucleotides corresponding to two regions of hevein as primers and a Hevea brasiliensis latex cDNA library as a template. HEV1 is 1,018 nucleotides long and includes an open reading frame of 204 amino acids.

Processing

Refer also to citation(s) 223

237 **Bacterial extracellular lignin peroxidase.** Crawford, D.L.; Ramachandra, M. To Idaho Research Foundation Inc., Moscow, ID (US). USA Patent 5,232,845/A/. 3 Aug 1993. Filed date 16 Oct 1989. USA Patent Application 7-422,023. Int. Cl. C12N 15/00; C12N 15/53; C12N 15/74. [10] DOE Contract FG07-86ER13586. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

DNA constructs are provided for the production of Streptomyces lignin peroxidase. The enzyme finds use in the degradation of lignin and oxidation of organic substrates.

238 **Cloning and sequencing of the alcohol dehydrogenase II gene from Zymomonas Mobilis.** Ingram, L.O.; Conway, T. To Univ. of Florida, Gainesville, FL (US). USA Patent 5,162,516/A/. 10 Nov 1992. Filed date 31 May 1988. USA Patent Application 7-200,110. Int. Cl. C12N

15/12. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An isolated DNA fragment encoding bacterial alcohol dehydrogenase is described.

Properties and Composition

239 **Fluorescence analyzer for lignin.** Berthold, J.W.; Malito, M.L.; Jeffers, L. To Babcock and Wilcox Co., New Orleans. LA (US). USA Patent 5,216,483/A/. 1 Jun 1993. Filed date 23 Sep 1991. USA Patent Application 7-763,712. Int. Cl. G01J 3/30; G01N 21/64; D21C 7/14. [10] DOE Contract FC05-90CE40905. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An apparatus for measuring lignin concentration with time resolved fluorescence in an undiluted wood pulp or black liquor sample, on a real-time, in situ basis is described, comprising: light source means for applying excitation light pulses at a selected wavelength and at known time intervals to the undiluted sample for causing the lignin concentration to produce fluorescent emission light with a fluorescence intensity that monotonically decreases in a quenched fluorescence regime; light detector means for measuring the emission light at the known time intervals and establishing signals indicative thereof; switching means for turning said light detector means on at precise specified time intervals after each excitation light pulse; and signal processing means connected to the light source means and the light detector means for comparing intensities of the emission light from the lignin in the quenched fluorescence regime to the intensities of the excitation light pulses on a time resolved basis for providing a measurement of the lignin concentration in the undiluted sample as a function of the time resolved emission light intensity.

10 SYNTHETIC FUELS

Production

Refer also to citation(s) 224

240 **Methanol synthesis using a catalyst combination of alkali or alkaline earth salts and reduced copper chromite for methanol synthesis.** Tierney, J.W.; Wender, I.; Palekar, V.M. To Univ. of Pittsburgh, PA (US). USA Patent 5,221,652/A/. 22 Jun 1993. Filed date 26 Mar 1991. USA Patent Application 7-675,139. Int. Cl. B01J 23/02; B01J 23/26; B01J 23/72. [10] DOE Contract FG22-89PC89786. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A catalyst combination is described comprising copper chromite and a basic alkali metal compound selected from the group consisting of oxide, hydroxide, formate, carbonate, bicarbonate, chromate, and acetate for use in a process for the slurry synthesis of methanol from a gaseous mixture including carbon monoxide and hydrogen in the presence of a carrier alcohol, said basic alkali metal compound being substantially solubilized in said carrier alcohol during methanol synthesis. A catalyst combination is described comprising copper chromite and a basic alkaline earth compound selected from the group consisting of oxide, hydroxide, formate, carbonate, bicarbonate, chromate, and acetate for use in a process for the slurry synthesis of methanol from a gaseous mixture including carbon monoxide and hydrogen in the presence of a carrier alcohol, said basic alkaline earth metal compound being substantially solubilized in said carrier alcohol during methanol synthesis.

Products and By-Products

241 **Process for preparing phenolic formaldehyde resole resin products derived from fractionated fast-pyrolysis oils.** Chum, H.L.; Kreibich, R.E. To Midwest Research Inst., Kansas City, MO (US). USA Patent 5,091,499/A/. 25 Feb 1992. Filed date 29 Dec 1989. USA Patent Application 7-456,653. Int. Cl. C08G 8/04; C08J 89/06; B32B 21/08. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An improved process is described for preparing phenol-formaldehyde resole resins comprising, replacing a portion of the phenol normally used in making resole resins with a phenol/neutral fractions extract obtained by a process of fractionating fast-pyrolysis oils, wherein the neutral fractions have molecular weights of between about 100 to about 800, and the phenol-containing compositions/neutral fractions extract is soluble in an organic solvent having a solubility parameter of approximately 8.4-9.1 $[cal/cm^3]^{1/2}$ with polar components in the 1.8-3.0 range and hydrogen bonding components in the 2-4.5 range.

14 SOLAR ENERGY

Solar Energy Conversion

242 **Photovoltaic device with increased light absorption and method for its manufacture.** Glatfelter, T.; Vogeli, C.; Can, J.; Hammond, G. To United Solar Systems Corp., Troy, MI (US). USA Patent 5,228,926/A/. 20 Jul 1993. Filed date 15 Oct 1991. USA Patent Application 7-776,659. Int. Cl. H01L 31/052; H01L 31/18. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A photovoltaic cell is described having decreased shading, the cell comprising: a layer of bottom electrode material; a photovoltaic body disposed upon the layer of bottom electrode material; a layer of top electrode material disposed upon the photovoltaic body in a spaced apart relationship with the layer of bottom electrode material so that the photovoltaic body is sandwiched there between; and a layer of transparent, electrically insulating synthetic organic polymeric encapsulating material disposed directly upon the top electrode material so as to substantially cover the top electrode, the encapsulating layer having a pattern of grooves formed integrally therein, the pattern covering substantially all of the active area of the cell and operative to direct light incident thereon so that an increased amount of the light is absorbed within the photovoltaic cell as compared to photovoltaic cells without the encapsulating layer.

22 NUCLEAR REACTOR TECHNOLOGY

Fuel Elements

Refer also to citation(s) 233

Control Systems

243 **Integrated head package for top mounted nuclear instrumentation.** Malandra, L.J.; Hornak, L.P.; Meuschke, R.E. To Westinghouse Electric Corp., Pittsburgh, PA (US). USA Patent 5,225,150/A/. 6 Jul 1993. Filed date 23 Jun 1992. USA Patent Application 7-903,250. Int. Cl. G21C 19/00; G21C 11/00. [10] DOE Contract AC03-90SF18495. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An integrated head package for a nuclear reactor having a reactor vessel containing a nuclear fuel is described, comprising: a reactor vessel head including means for sealingly engaging the reactor vessel; a control rod guide mechanism operable to raise and lower control rods relative to the fuel, the control rod guide mechanism including control rod positioning means movably traversing penetrations in the reactor vessel head, and a control rod drive coupled to the control rod positioning means; at least one instrumentation tube structure including a sensor arrangement disposed in proximity with the fuel, and a coupling for the sensor arrangement extending upwardly, the instrumentation tube structure traversing a penetration in the reactor vessel head and the sensor arrangement being retractable relative to the fuel; and, a shroud attached to the reactor vessel head and substantially enclosing the control rod guide mechanism and at least a portion of the instrumentation tube structure when retracted, the shroud comprising a shielding material of a sufficient thickness to limit passage of nuclear radiation and forming a structural element of sufficient strength to support the vessel head, the control rod guide mechanism and the instrumentation tube structure; whereby the integrated head package is removable from the reactor as a unit for servicing.

24 POWER TRANSMISSION AND DISTRIBUTION

Power System Networks, Transmission and Distribution

244 **Optically triggered high voltage switch network and method for switching a high voltage.** Elsharkawi, M.A.; Andexler, G.; Silberkleit, L.I. To Univ. of Washington, Seattle, WA (US). USA Patent 5,180,963/A/. 19 Jan 1993. Filed date 9 May 1991. USA Patent Application 7-697,673. Int. Cl. G05F 1/70. [10] DOE Contract BI79-87BP65584. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An optically triggered solid state switch and method for switching a high voltage electrical current. A plurality of solid state switches are connected in series for controlling electrical current flow between a compensation capacitor and ground in a reactive power compensator that monitors the voltage and current flowing through each of three distribution lines which are supplying three-phase power to one or more inductive loads. An optical transmitter controlled by the reactive power compensation system produces light pulses that are conveyed over optical fibers to a switch driver that includes a plurality of series connected optical trigger circuits. Each of the optical trigger circuits controls a pair of the solid state switches and includes a plurality of series connected resistors that equalize or balance the potential across the plurality of trigger circuits. The trigger circuits are connected to one of the distribution lines through a trigger capacitor. In each switch driver, the light signals activate a phototransistor so that an electrical current flows from one of the energy reservoir capacitors through a pulse transformer in the trigger circuit, producing gate signals that turn on the pair of serially connected solid state switches.

25 ENERGY STORAGE

Flywheels

245 **Flywheel energy storage with superconductor magnetic bearings.** Weinberger, B.R.; Lynds, L. Jr. To ARCH Development Corporation, Chicago, IL (US). USA Patent 5,214,981/A/. 1 Jun 1993. Filed date 26 Jul 1991. USA Patent Application 7-736,677. Int. Cl. F16C 39/06; F16F 15/00; H01L 39/12. [10] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A system for storing energy in a flywheel suspended by magnetic levitation in a vacuum vessel is described comprising: a rotatable member having a rotation axis in a central shaft said shaft having first and second magnetic tips formed from permanent magnets on opposite ends thereof, superconductor magnetic bearings, positioned to support said first and second magnetic tips and supported in turn by bearing support means, said superconductor magnetic bearings having a main direction of lift; cooling means in thermal contact with said bearing support means; and energy transfer means, connected to said rotatable member, for transferring energy into and extracting energy from said rotatable member, characterized in that: at least one of said superconducting bearings includes a lifting portion comprising melt-processed, directionally solidified material structure having a crystal structure C-axis oriented parallel to said main direction of lift.

Batteries

246 **Solid electrolytes.** Abraham, K.M.; Alamgir, M. To EIC Labs., Inc., Norwood, MA (US). USA Patent 5,219,679/A/. 15 Jun 1993. Filed date 17 Jan 1991. USA Patent Application 7-642,605. Int. Cl. H01M 6/18. [10]

Known licensing contacts for major laboratories are listed on page iv

DOE Contract AC01-89ER80813. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Solid electrolytes with dimensional stability at room temperature composed of solutions of alkali metal salts in a plurality of miscible aprotic organic liquids is described, immobilized in an organic solid polymer matrix which itself can complex with the alkali metal salts wherein the liquids are ethylene carbonate and propylene carbonate and the polymer is selected from the group consisting of polyacrylonitrile and poly-N-vinyl-2-pyrrolidinone.

29 ENERGY PLANNING AND POLICY

Research, Development, Demonstration, and Commercialization

Refer also to citation(s) 271

30 DIRECT ENERGY CONVERSION

Fuel Cells

Refer also to citation(s) 246

247 Carbonate fuel cell anodes. Donado, R.A.; Hrdina, K.E.; Remick, R.J. To Inst. of Gas Technology, Chicago, IL (US). USA Patent 5,206,095/A/. 27 Apr 1993. Filed date 19 Mar 1990. USA Patent Application 7-495,277. Int. Cl. H01M 4/86. [10] DOE Contract AC21-88MC25026. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A molten alkali metal carbonates fuel cell porous anode of lithium ferrite and a metal or metal alloy of nickel, cobalt, nickel/iron, cobalt/iron, nickel/iron/aluminum, cobalt/iron/aluminum and mixtures thereof wherein the total iron content including ferrite and iron of the composite is about 25 to about 80 percent, based upon the total anode, provided aluminum when present is less than about 5 weight percent of the anode. A process is described for production of the lithium ferrite containing anode by slipcasting.

248 Solid oxide fuel cell generator. Draper, R.; George, R.A.; Shockling, L.A. To Westinghouse Electric Corp., Pittsburgh, PA (US). USA Patent 5,200,279/A/. 6 Apr 1993. Filed date 11 Oct 1991. USA Patent Application 7-774,932. Int. Cl. H01M 8/12. [10] DOE Contract AC21-80ET17089. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A solid oxide fuel cell generator has a pair of spaced apart tubesheets in a housing. At least two intermediate barrier walls are between the tubesheets and define a generator chamber between two intermediate buffer chambers. An array of fuel cells have tubes with open ends engaging the tubesheets. Tubular, axially elongated electrochemical cells are supported on the tubes in the generator chamber. Fuel gas and oxidant gas are preheated in the intermediate chambers by the gases flowing on the other side of the tubes. Gas leakage around the tubes through the tubesheets is permitted. The buffer chambers reentrain the leaked fuel gas for reintroduction to the generator chamber.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

Buildings

249 Compact vacuum insulation. Benson, D.K.; Potter, T.F. To Midwest Research Inst., Kansas City, MO (US). USA Patent 5,175,975/A/. 5 Jan 1993. Filed date 23 Mar 1992. USA Patent Application 7-856,840. Int. Cl. E04C 2/34. [10] DOE Contract AC02-83CH10093. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An ultra-thin compact vacuum insulation panel is comprised of two hard, but bendable metal wall sheets closely spaced apart from each other and welded around the edges to enclose a vacuum chamber. Glass or ceramic spacers hold the wall sheets apart. The spacers can be discrete spherical beads or monolithic sheets of glass or ceramic webs with nodules protruding therefrom to form essentially "point" or "line" contacts with the metal wall sheets. In the case of monolithic spacers that form "line" contacts, two such spacers with the line contacts running perpendicular to each other form effectively "point" contacts at the intersections. Corrugations accommodate bending and expansion, tubular insulated pipes and conduits, and preferred applications are also included.

Industrial and Agricultural Processes

250 Controlled catalytic and thermal sequential pyrolysis and hydrolysis of mixed polymer waste streams to sequentially recover monomers or other high value products. Evans, R.J.; Chum, H.L. To Midwest Research Institute, Kansas City, MO (US). USA Patent 5,216,149/A/. 1 Jun 1993. Filed date 7 Jun 1991. USA Patent Application 7-711,546. Int. Cl. C07D 201/12. [10] DOE Contract AC02-83CH10093. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A process of using fast pyrolysis in a carrier gas to convert a polyamide containing a plastic waste feed stream having a mixed polymeric composition in a manner such that pyrolysis of a given polyamide and its high value monomeric constituent or derived high value products occurs prior to pyrolysis of other plastic components is described therein comprising: (a) selecting a first temperature program range to cause pyrolysis of said given polyamide and its high value monomeric constituent prior to a temperature range that causes pyrolysis of other plastic components; (b) selecting a catalyst and a support and treating said feed stream with said catalyst to affect acid or base catalyzed reaction pathways to maximize yield or enhance separation of said high value monomeric constituent or high value product of said polyamide in said first temperature program range; (c) differentially heating said feed stream at a heat rate within the first temperature program range to provide differential pyrolysis for selective recovery of optimum quantities of said high value monomeric constituent or high value product of said polyamide prior to pyrolysis of other plastic components therein; (d) separating said high value monomer constituent or derived high value product of said polyamide; (e) selecting a second higher temperature program range to cause pyrolysis to a different high value monomeric constituent of said plastic waste and differentially heating said feed stream of said higher temperature program range to cause pyrolysis of said plastic into a different high value monomeric constituent or derived product; and (f) separating said different high value monomeric constituent or derived high value product.

251 **Hydrogen and sulfur recovery from hydrogen sulfide wastes.** Harkness, J.B.L.; Gorski, A.J.; Daniels, E.J. To Univ. of Chicago, IL (US). USA Patent 5,211,923/A/. 18 May 1993. Filed date 1 Aug 1991. USA Patent Application 7-739,029. Int. Cl. C01B 17/16. [10] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A process is described for generating hydrogen and elemental sulfur from hydrogen sulfide waste in which the hydrogen sulfide is dissociated under plasma conditions and a portion of the hydrogen output is used in a catalytic reduction unit to convert sulfur- containing impurities to hydrogen sulfide for recycle, the process also including the addition of an ionizing gas such as argon to initiate the plasma reaction at lower energy, a preheater for the input to the reactor and an internal adjustable choke in the reactor for enhanced coupling with the microwave energy input.

252 **Triple-effect absorption refrigeration system with double-condenser coupling.** DeVault, R.C.; Biermann, W.J. To Martin Marietta Energy Systems, Inc., Oak Ridge, TN (US). USA Patent 5,205,136/A/. 27 Apr 1993. Filed date 11 Mar 1992. USA Patent Application 7-850,364. Int. Cl. F25B 15/00. [10] DOE Contract AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A triple effect absorption refrigeration system is provided with a double-condenser coupling and a parallel or series circuit for feeding the refrigerant-containing absorbent solution through the high, medium, and low temperature generators utilized in the triple-effect system. The high temperature condenser receiving vaporous refrigerant from the high temperature generator is double coupled to both the medium temperature generator and the low temperature generator to enhance the internal recovery of heat within the system and thereby increase the thermal efficiency thereof.

253 **Method of draining water through a solid waste site without leaching.** Treat, R.L.; Gee, G.W.; Whyatt, G.A. To Battelle Memorial Inst., Richland, WA (US). USA Patent 5,183,355/A/. 2 Feb 1993. Filed date 12 Nov 1991. USA Patent Application 7-791,746. Int. Cl. B09B 5/00. [10] DOE Contract AC06-76RL01830. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The present invention is a method of preventing water from leaching solid waste sites by preventing atmospheric precipitation from contacting waste as the water flows through a solid waste site. The method comprises placing at least one drain hole through the solid waste site. The drain hole is seated to prevent waste material from entering the drain hole, and the solid waste site cover material is layered and graded to direct water to flow toward the drain hole and to soil beneath the waste site.

33 ADVANCED PROPULSION SYSTEMS

Internal Combustion Engines

254 **High temperature turbine engine structure.** Carruthers, W.D.; Boyd, G.L. To Allied-Signal Inc., Morris Township, NJ (US). USA Patent 5,228,284/A/. 20 Jul 1993. Filed date 27 Feb 1992. USA Patent Application 7-842,870. Int. Cl. F02C 3/00. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A hybrid ceramic/metallic gas turbine is described comprising; a housing defining an inlet, an outlet, and a flow path communicating the inlet with the outlet for conveying a flow of fluid through the housing, a rotor member journaled by the housing in the flow path, the rotor member including a compressor rotor portion rotatively inducting ambient air via the inlet and delivering this air pressurized to the flow path downstream of the compressor rotor, a combustor disposed in the flow path downstream of the compressor receiving the pressurized air along with a supply of fuel to maintain combustion providing a flow of high temperature pressurized combustion products in the flow path downstream thereof, the rotor member including a turbine rotor portion disposed in the flow path downstream of the combustor and rotatively expanding the combustion products toward ambient for flow from the turbine engine via the outlet, the turbine rotor portion providing shaft power driving the compressor rotor portion and an output shaft portion of the rotor member, a disk-like metallic housing portion journaling the rotor member to define a rotational axis therefore, and a disk-like annular ceramic turbine shroud member bounding the flow path downstream of the combustor and circumscribing the turbine rotor portion to define a running clearance therewith, the disk-like ceramic turbine shroud member having a reference axis coaxial with the rotational axis and being spaced axially from the metallic housing portion in mutually parallel concentric relation therewith and a plurality of spacers disposed between ceramic disk-like shroud member and the metallic disk-like housing portion and circumferentially spaced apart, each of the spacers having a first and second end portion having an end surface adjacent the shroud member and the housing portion respectively, the end surfaces having a cylindrical curvature extending transversely relative to the shroud member and the housing portion.

255 **Mounting for ceramic scroll.** Petty, J.D. To General Motors Corp., Detroit, MI (US). USA Patent 5,186,006/A/. 16 Feb 1993. Filed date 19 Mar 1992. USA Patent Application 7-854,103. Int. Cl. F02C 3/04. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Known licensing contacts for major laboratories are listed on page iv

A mounting for a ceramic scroll on a metal engine block of a gas turbine engine includes a first ceramic ring and a pair of cross key connections between the first ceramic ring, the ceramic scroll, and the engine block. The cross key connections support the scroll on the engine block independent of relative radial thermal growth and for bodily movement toward an annular mounting shoulder on the engine. The scroll has an uninterrupted annular shoulder facing the mounting shoulder on the engine block. A second ceramic ring is captured between mounting shoulder and the uninterrupted shoulder on the scroll when the latter is bodily shifted toward the mounting shoulder to define a gas seal between the scroll and the engine block.

36 MATERIALS

Metals and Alloys

Refer also to citation(s) 247

256 Method of making bonded or sintered permanent magnets. McCallum, R.W.; Dennis, K.W.; Lograsso, B.K.; Anderson, I.E. To Iowa State Univ. Research Foundation, Inc., Ames, IA (US). USA Patent 5,240,513/A/. 31 Aug 1993. Filed date 9 Oct 1990. USA Patent Application 7-593,943. Int. Cl. H01F 1/02. [10] DOE Contract W-7405-ENG-82. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An isotropic permanent magnet is made by mixing a thermally responsive, low viscosity binder and atomized rare earth-transition metal (e.g., iron) alloy powder having a carbon-bearing (e.g., graphite) layer thereon that facilitates wetting and bonding of the powder particles by the binder. Prior to mixing with the binder, the atomized alloy powder may be sized or classified to provide a particular particle size fraction having a grain size within a given relatively narrow range. A selected particle size fraction is mixed with the binder and the mixture is molded to a desired complex magnet shape. A molded isotropic permanent magnet is thereby formed. A sintered isotropic permanent magnet can be formed by removing the binder from the molded mixture and thereafter sintering to full density.

257 Iron-aluminum alloys having high room-temperature and method for making same. Sikka, V.K.; McKamey, C.G. To Martin Marietta Energy Systems, Inc., Oak Ridge, TN (US). USA Patent 5,238,645/A/. 24 Aug 1993. Filed date 26 Jun 1992. USA Patent Application 7-904,802. Int. Cl. C21D 8/00; C22C 38/06. [10] DOE Contract AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A wrought and annealed iron-aluminum alloy is described consisting essentially of 8 to 9.5% aluminum, an effective amount of chromium sufficient to promote resistance to aqueous corrosion of the alloy, and an alloying constituent selected from the group of elements consisting of an effective amount of molybdenum sufficient to promote solution hardening of the alloy and resistance of the alloy to pitting when exposed to solutions containing chloride, up to about 0.05% carbon with up to about 0.5% of a carbide former which combines with the carbon to form carbides for controlling grain growth at elevated temperatures, and mixtures thereof, and the balance iron, wherein said alloy has a single disordered α phase crystal structure, is substantially non-susceptible to hydrogen embrittlement, and has a room-temperature ductility of greater than 20%.

258 Atomizing nozzle and process. Anderson, I.E.; Figliola, R.S.; Molnar, H.M. To Iowa State Univ. Research Foundation, Inc., Ames, IA (US). USA Patent 5,228,620/A/. 20 Jul 1993. Filed date 19 Jun 1992. USA Patent Application 7-901,109. Int. Cl. B22F 9/08. [10] DOE Contract W-7405-ENG-82. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

High pressure atomizing nozzle includes a high pressure gas manifold having a divergent expansion chamber between a gas inlet and arcuate manifold segment to minimize standing shock wave patterns in the manifold and thereby improve filling of the manifold with high pressure gas for improved melt atomization. The atomizing nozzle is especially useful in atomizing rare earth-transition metal alloys to form fine powder particles wherein a majority of the powder particles exhibit particle sizes having near-optimum magnetic properties.

259 Niobium-titanium superconductors produced by powder metallurgy having artificial flux pinning centers. Jablonski, P.D.; Larbalestier, D.C. To Wisconsin Alumni Research Foundation, Madison, WI (US). USA Patent 5,226,947/A/. 13 Jul 1993. Filed date 17 Feb 1992. USA Patent Application 7-837,038. Int. Cl. C22C 14/00. [10] DOE Contract AC02-82ER40077. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A superconducting wire structure is described comprising: a matrix comprising body centered cubic niobium-titanium alloy with a second phase of discrete metal inclusions compatible with niobium-titanium providing artificial pinning centers distributed therein, at least some second phase inclusions having sizes in the range of 1 to 10 nm, the second phase comprising between 5 to 50% by volume of the total matrix and second phase, wherein the second phase is selected from the group consisting of niobium, vanadium, tantalum, hafnium, zirconium, titanium, tungsten, molybdenum, chromium, copper, silver, gold and alloys thereof, and wherein the wire structure is formed by deforming and drawing a billet comprising a mixture of a first phase powder comprising the body centered cubic niobium-titanium alloy with a second phase powder of the metal compatible with niobium-titanium, the second phase comprising from 5% to 50% by volume of the mixture, the mixture pressed and sintered to provide a bond between the powder particles without significant diffusion of the second phase into the first phase or significant diffusion of the first phase into the second phase.

260 High strength, light weight Ti-Y composites and method of making same. Verhoeven, J.D.; Ellis, T.W.; Russell, A.M.; Jones, L.L. To Iowa State Univ. Research Foundation, Inc., Ames, IA (US). USA Patent 5,200,004/A/. 6 Apr 1993. Filed date 16 Dec 1991. USA Patent Application 7-808,363. Int. Cl. B22F 7/00. [10] DOE

Contract W-7405-ENG-82. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A high strength, light weight "in-situ" Ti-Y composite is produced by deformation processing a cast body having Ti and Y phase components distributed therein. The composite comprises elongated, ribbon-shaped Ti and Y phase components aligned along an axis of the deformed body.

261 Device and method for skull-melting depth measurement. Lauf, R.J.; Heestand, R.L. To Martin Marietta Energy Systems, Inc., Oak Ridge, TN (US). USA Patent 5,185,031/A/. 9 Feb 1993. Filed date 31 Dec 1991. USA Patent Application 7-815,465. Int. Cl. C22B 4/00. [10] DOE Contract AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method of skull-melting comprises the steps of: (a) providing a vessel adapted for a skull-melting process, the vessel having an interior, an underside, and an orifice connecting the interior and the underside; (b) disposing a waveguide in the orifice so that the waveguide protrudes sufficiently into the interior to interact with the skull-melting process; (c) providing a signal energy transducer in signal communication with the waveguide; (d) introducing into the vessel a molten working material; (e) carrying out the skull-melting process so that a solidified skull of the working material is formed, the skull and the vessel having an interface therebetween, the skull becoming fused to the waveguide so the signal energy can be transmitted through the waveguide and the skull without interference from the interface; (f) activating the signal energy transducer so that a signal is propagated through the waveguide; and, (g) controlling at least one variable of the skull-melting process utilizing feedback information derived from the propagated signal energy.

Ceramics, Cermets, and Refractories

Refer also to citation(s) 263, 292

262 Microporous alumina ceramic membranes. Anderson, M.A.; Guangyao Sheng. To Wisconsin Alumni Research Foundation, Madison, WI (US). USA Patent 5,208,190/A/. 4 May 1993. Filed date 8 Oct 1991. USA Patent Application 7-773,168. Int. Cl. C04B 35/10. [10] DOE Contract AS07-86ID12626. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Several methods are disclosed for the preparation microporous alumina ceramic membranes. For the first time, porous alumina membranes are made which have mean pore sizes less than 100 Angstroms and substantially no pores larger than that size. The methods are based on improved sol-gel techniques.

Other Materials

Refer also to citation(s) 246, 286

263 Diorganosilacetylene-alt-diorganosilvinylene polymers and a process of preparation. Barton, T.J.; Ijadi-Maghsoodi, S.; Yi Pang. To Iowa State Univ. Research Foundation, Inc., Ames, IA (US). USA Patent 5,241,029/A/. 31 Aug 1993. Filed date 7 Jan 1992. USA Patent Application 7-817,602. Int. Cl. C08G 77/00. [10] DOE Contract W-7405-ENG-82. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The present invention provides linear organosilicon polymers including acetylene and vinylene moieties, and a process for their preparation. These diorganosilacetylene-alt-diorganosilvinylene linear polymers can be represented by the formula: $-[-(R^1)(R^2)Si-C{\equiv}C-(R^3)(R^4)Si-CH{=}CH-]_n-$, wherein $n \geq 2$; each R^1, R^2, R^3, and R^4 is independently selected from the group consisting of hydrogen, halogen, alkyl, alkenyl, aryl, and aralkyl radicals. The polymers are soluble in organic solvents, air stable, and can be pulled into fibers or cast into films. They can be thermally converted into silicon carbide ceramic materials.

264 High density crystalline boron prepared by hot isostatic pressing in refractory metal containers. Hoenig, C.L. To Univ. of California, Oakland, CA (US). USA Patent 5,240,691/A/. 31 Aug 1993. Filed date 18 Jun 1990. USA Patent Application 7-539,392. Int. Cl. C04B 35/64; C04B 35/56; C01B 21/06. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Boron powder is hot isostatically pressed in a refractory metal container to produce a solid boron monolith with a bulk density at least 2.22 g/cc and up to or greater than 2.34 g/cc. The refractory metal container is formed of tantalum, niobium, tungsten, molybdenum or alloys thereof in the form of a canister or alternatively plasma sprayed or chemical vapor deposited onto a powder compact. Hot isostatic pressing at 1,800 C and 30 PSI (206.8 MPa) argon pressure for four hours produces a bulk density of 2.34 g/cc. Complex shapes can be made.

265 Zinc oxide varistors and/or resistors. Arnold, W.D. Jr.; Bond, W.D.; Lauf, R.J. To Cooper Industries, Inc., Houston, TX (US). USA Patent 5,231,370/A/. 27 Jul 1993. Filed date 2 Aug 1991. USA Patent Application 7-739,867. Int. Cl. H01C 7/10; H01C 10/16. [10] DOE Contract AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Varistors and/or resistors are described that include doped zinc oxide gel microspheres. The doped zinc oxide gel microspheres preferably have from about 60 to about 95% by weight zinc oxide and from about 5 to about 40% by weight dopants based on the weight of the zinc oxide. The dopants are a plurality of dopants selected from silver salts, boron oxide, silicon oxide and hydrons oxides of aluminum, bismuth, cobalt, chromium, manganese, nickel, and antimony.

266 Method of fabricating a multilayer insulation blanket. Gonczy, J.D.; Niemann, R.C.; Boroski, W.N. To Universities Research Association, Inc., Washington, DC (US). USA Patent 5,224,832/A/. 6 Jul 1993. Filed date 2 Oct 1991. USA Patent Application 7-770,163. Int. Cl. D05B 1/00. [10] DOE Contract AC02-76CH03000. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An improved multilayer insulation blanket for insulating cryogenic structures operating at very low temperatures is disclosed. An apparatus and method for fabricating the improved blanket are also disclosed. In the improved blanket, each successive layer of insulating material is greater in

Known licensing contacts for major laboratories are listed on page iv

length and width than the preceding layer so as to accommodate thermal contraction of the layers closest to the cryogenic structure. The fabricating apparatus has a rotatable cylindrical mandrel having an outer surface of fixed radius that is substantially arcuate, preferably convex, in cross-section. The method of fabricating the improved blanket comprises (a) winding a continuous sheet of thermally reflective material around the circumference of the mandrel to form multiple layers, (b) binding the layers along two lines substantially parallel to the edges of the circumference of the mandrel, (c) cutting the layers along a line parallel to the axle of the mandrel, and (d) removing the bound layers from the mandrel.

267 **Phenolic compounds containing/neutral fractions extract and products derived therefrom from fractionated fast-pyrolysis oils.** Chum, H.L.; Black, S.K.; Diebold, J.P.; Kreibich, R.E. To Midwest Research Inst. Ventures, Inc., Kansas City, MO (US). USA Patent 5,223,601/A/. 29 Jun 1993. Filed date 29 Jan 1991. USA Patent Application 7-647,020. Int. Cl. C07C 37/20; C08G 14/02. [10] DOE Contract AC02-83CH10093. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A process is described for preparing phenol-formaldehyde novolak resins and molding compositions in which portions of the phenol normally contained in said resins are replaced by a phenol/neutral fractions extract obtained from fractionating fast-pyrolysis oils. The fractionation consists of a neutralization stage which can be carried out with aqueous solutions of bases or appropriate bases in the dry state, followed by solvent extraction with an organic solvent having at least a moderate solubility parameter and good hydrogen bonding capacity. Phenolic compounds-containing/neutral fractions extracts obtained by fractionating fast-pyrolysis oils from a lignocellulosic material, is such that the oil is initially in the pH range of 2-4, being neutralized with an aqueous bicarbonate base, and extracted into a solvent having a solubility parameter of approximately 8.4-9.11 $[cal/cm^3]^{\frac{1}{2}}$ with polar components in the 1.8-3.0 range and hydrogen bonding components in the 2-4.8 range and the recovery of the product extract from the solvent with no further purification being needed for use in adhesives and molding compounds. The product extract is characterized as being a mixture of very different compounds having a wide variety of chemical functionalities, including phenolic, carbonyl, aldehyde, methoxyl, vinyl and hydroxyl. The use of the product extract on phenol-formaldehyde thermosetting resins is shown to have advantages over the conventional phenol-formaldehyde resins.

268 **Method of making carbon-carbon composites.** Engle, G.B. To Nuclear and Aerospace Materials Corp. (United States). USA Patent 5,217,657/A/. 8 Jun 1993. Filed date 28 Oct 1991. USA Patent Application 7-783,577. Int. Cl. B29C 43/18; C01B 31/04. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method for fabricating a high-strength, high-modulus and high thermal and electrical conducting 2D laminate carbon-carbon composite is described comprising the steps of: (a) forming a green laminate composite comprising: (1) graphitizible carbon cloth plies, (2) fine graphitizible pitch powder; said cloth plies comprising mesophase derived pitch fiber tow with moduli in a range of 25 to 140 Msi, and (3) thermal conductivity enhancers; (b) heating the green laminate composite to a temperature high enough to cause the pitch powder to soften and pressing the composite to form a pressed green laminate composite comprised of graphitizible carbon cloth, pitch matrix and thermal conductivity enhancers; (c) heating the pressed green composite to at least 500 C. to: (1) carbonize the pitch, (2) form a carbon matrix and (3) shrink and crack the matrix carbon; (d) impregnating the composite with additional graphitizible pitch by covering the composite with the pitch and heating the covered composite to at least 200 C. to melt the pitch and permit it to flow into the composite and then increasing the pressure to at least 15 Psi; (e) heating the composites to at least 900 C.; (f) repeating steps d and e at least once; (g) heating the composite to between 2,400 to 3,100 C to graphitize the fibers and the pitch matrix carbon in the composites to produce a graphitized composite having cracks and pores; and (h) reimpregnating the graphitized composites by infiltrating the cracks and pores of the composites with a hydrocarbon gas at a temperature in the range 982 to 1,490 C. and depositing pyrolytic carbon in the pores and cracks.

269 **Method for minimizing decarburization and other high temperature oxygen reactions in a plasma sprayed material.** Lenling, W.J.; Henfling, J.A.; Smith, M.F. To Fisher-Barton Inc., Watertown, WI (US). USA Patent 5,217,746/A/. 8 Jun 1993. Filed date 13 Dec 1990. USA Patent Application 7-627,060. Int. Cl. B05D 1/00; B05D 3/02. [10] Contract 05-0957. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method is disclosed for spray coating material which employs a plasma gun that has a cathode, an anode, an arc gas inlet, a first powder injection port, and a second powder injection port. A suitable arc gas is introduced through the arc gas inlet, and ionization of the arc gas between the cathode and the anode forms a plasma. The plasma is directed to emanate from an open-ended chamber defined by the boundary of the anode. A coating is deposited upon a base metal part by suspending a binder powder within a carrier gas that is fed into the plasma through the first powder injection port; a material subject to degradation by high temperature oxygen reactions is suspended within a carrier gas that is fed into the plasma through the second injection port. The material fed through the second injection port experiences a cooler portion of the plasma and has a shorter dwell time within the plasma to minimize high temperature oxygen reactions. The material of the first port and the material of the second port intermingle within the plasma to form a uniform coating having constituent percentages related to the powder-feed rates of the materials through the respective ports.

270 **Energy curable compositions having improved cure speeds.** Halm, L.W. To Minnesota Mining and Manufacturing Co., St. Paul, MN (US). USA Patent 5,212,210/A/. 18 May 1993. Filed date 18 Mar 1992. USA Patent Application 7-853,570. Int. Cl. C08G 18/22. [10]

DOE Contract AC04-88ID12692. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The composition and method provide improved physical properties and cure speed of polyurethane precursors, with or without free radical polymerizable monomers or oligomers present, by use of a two component catalyst system. The resin blend can be activated with a latent organometallic catalyst combined with an organic peroxide which can be a hydroperoxide or an acyl peroxide to decrease the cure time while increasing the break energy and tangent modulus of the system.

271 **Dry powder mixes comprising phase change materials.** Salyer, I.O. To Univ. of Dayton, Dayton, OH (US). USA Patent 5,211,949/A/. 18 May 1993. Filed date 18 Feb 1992. USA Patent Application 7-835,854. Int. Cl. A01N 25/34. [10] DOE Contract FG03-86SF16308. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Free flowing, conformable powder-like mix of silica particles and a phase change material (p.c.m.) is disclosed. The silica particles have a critical size of about 7×10^{-3} to about 7×10^{-2} microns and the p.c.m. must be added to the silica in an amount of 80 wt. % or less p.c.m. per combined weight of silica and p.c.m. The powder-like mix can be used in tableware items, medical wraps, tree wraps, garments, quilts and blankets, and in cementitious compositions of the type in which it is beneficial to use a p.c.m. material. The silica-p.c.m. mix can also be admixed with soil to provide a soil warming effect and placed about a tree, flower, or shrub.

272 **Microcellular carbon foam and method.** Simandl, R.F.; Brown, J.D. To Martin Marietta Energy Systems, Inc., Oak Ridge, TN (US). USA Patent 5,208,003/A/. 4 May 1993. Filed date 13 Oct 1992. USA Patent Application 7-960,600. Int. Cl. C01B 31/00; C01B 31/02; C08J 9/36. [10] DOE Contract AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A microcellular carbon foam is characterized by a density in the range of about 30 to 1,000 mg/cm^3, substantially uniform distribution of cell sizes of diameters less than 100 μm with a majority of the cells being of a diameter of less than about 10 μm. The foam has a well interconnected strut morphology providing open porosity, and an expanded d(002) X-ray turbostatic spacing greater than 3.50 angstroms. The precursor for the carbon foam is prepared by the phase inversion of polyacrylonitrile in a solution consisting essentially of at least one alkali metal halide and a phase inversion solvent for the polyacrylonitrile.

273 **Magnetron sputtered boron films and Ti/B multilayer structures.** Makowiecki, D.M.; Jankowski, A.F. To Univ. of California, Oakland, CA (US). USA Patent 5,203,977/A/. 20 Apr 1993. Filed date 11 Mar 1991. USA Patent Application 7-666,971. Int. Cl. C23C 14/35. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method is described for the production of thin boron and titanium/boron films by magnetron sputter deposition. The amorphous boron films contain no morphological growth features, unlike those found when thin films are prepared by various physical vapor deposition processes. Magnetron sputter deposition method requires the use of a high density crystalline boron sputter target which is prepared by hot isostatic pressing. Thin boron films prepared by this method are useful for ultra-thin band pass filters as well as the low Z element in low Z/high Z mirrors which enhance reflectivity from grazing to normal incidence.

274 **Strain tolerant microfilamentary superconducting wire.** Finnemore, D.K.; Miller, T.A.; Ostenson, J.E.; Schwartzkopf, L.A.; Sanders, S.C. To Iowa State Univ. Research Foundation, Inc., Ames, IA (US). USA Patent 5,189,260/A/. 23 Feb 1993. Filed date 6 Feb 1991. USA Patent Application 7-651,551. Int. Cl. H01B 12/00. [10] DOE Contract W-7405-ENG-82. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A strain tolerant microfilamentary wire capable of carrying superconducting currents is provided comprising a plurality of discontinuous filaments formed from a high temperature superconducting material. The discontinuous filaments have a length at least several orders of magnitude greater than the filament diameter and are sufficiently strong while in an amorphous state to withstand compaction. A normal metal is interposed between and binds the discontinuous filaments to form a normal metal matrix capable of withstanding heat treatment for converting the filaments to a superconducting state. The geometry of the filaments within the normal metal matrix provides substantial filament-to-filament overlap, and the normal metal is sufficiently thin to allow supercurrent transfer between the overlapped discontinuous filaments but is also sufficiently thick to provide strain relief to the filaments.

40 CHEMISTRY

Analytical and Separations Chemistry

Refer also to citation(s) 313

275 **Neural network system and methods for analysis of organic materials and structures using spectral data.** Meyer, B.J.; Sellers, J.P.; Thomsen, J.U. To Univ. of Georgia Research Foundation, Inc., Athens, GA (US). USA Patent 5,218,529/A/. 8 Jun 1993. Filed date 30 Jul 1990. USA Patent Application 7-559,649. Int. Cl. G06F 15/42. [10] DOE Contract FG09-85ER13426 ;FG09-87ER13810. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Apparatus and processes are described for recognizing and identifying materials. Characteristic spectra are obtained for the materials via spectroscopy techniques including nuclear magnetic resonance spectroscopy, infrared absorption analysis, x-ray analysis, mass spectroscopy and gas chromatography. Desired portions of the spectra may be selected and then placed in proper form and format for presentation to a number of input layer neurons in an offline neural network. The network is first trained according to a predetermined training process; it may then be employed to identify particular materials. Such apparatus and processes are particularly useful for recognizing and identifying organic compounds such as complex carbohydrates, whose spectra conventionally require a high level of training and many hours of hard work to identify, and are frequently indistinguishable from one another by human interpretation.

276 Apparatus and method for measuring fluorescence intensities at a plurality of wavelengths and lifetimes. Buican, T.N. To Univ. of California, Alameda, CA (US). USA Patent 5,208,651/A/. 4 May 1993. Filed date 16 Jul 1991. USA Patent Application 7-731,070. Int. Cl. G01B 9/02. [10] DOE Contract W-7405-ENG-36. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Apparatus and method is described for measuring intensities at a plurality of wavelengths and lifetimes. A source of multiple-wavelength electromagnetic radiation is passed through a first interferometer modulated at a first frequency, the output thereof being directed into a sample to be investigated. The light emitted from the sample as a result of the interaction thereof with the excitation radiation is directed into a second interferometer modulated at a second frequency, and the output detected and analyzed. In this manner excitation, emission, and lifetime information may be obtained for a multiplicity of fluorochromes in the sample.

277 Universal collisional activation ion trap mass spectrometry. McLuckey, S.A.; Goeringer, D.E.; Glish, G.L. To Martin Marietta Energy Systems, Inc., Oak Ridge, TN (US). USA Patent 5,206,509/A/. 27 Apr 1993. Filed date 11 Dec 1991. USA Patent Application 7-805,442. Int. Cl. B01D 59/44; H01J 49/00. [10] DOE Contract AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A universal collisional activation ion trap comprises an ion trapping means containing a bath gas and having connected thereto a noise signal generator. A method of operating a universal collisional activation ion trap comprises the steps of: providing an ion trapping means; introducing into the ion trapping means a bath gas; and, generating a noise signal within the ion trapping means; introducing into the ion trapping means a substance that, when acted upon by the noise signal, undergoes collisional activation to form product ions.

278 Method and apparatus for atomic imaging. Saldin, D.K.; Andres Rodriquez, P.L. de. To Univ. of Wisconsin, Milwaukee, WI (US). USA Patent 5,200,618/A/. 6 Apr 1993. Filed date 9 Mar 1990. USA Patent Application 7-490,847. Int. Cl. H01J 37/26. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method and apparatus for three dimensional imaging of the atomic environment of disordered adsorbate atoms are disclosed. The method includes detecting and measuring the intensity of a diffuse low energy electron diffraction pattern formed by directing a beam of low energy electrons against the surface of a crystal. Data corresponding to reconstructed amplitudes of a wave form are generated by operating on the intensity data. The data corresponding to the reconstructed amplitudes are capable of being displayed as a three dimensional image of an adsorbate atom. The apparatus includes a source of a beam of low energy electrons and a detector for detecting the intensity distribution of a DLEED pattern formed at the detector when the beam of low energy electrons is directed onto the surface of a crystal. A device responsive to the intensity distribution generates a signal corresponding to the distribution which represents a reconstructed amplitude of a wave form and is capable of being converted into a three dimensional image of the atomic environment of an adsorbate atom on the crystal surface.

279 Hidden explosives detector employing pulsed neutron and x-ray interrogation. Schultz, F.J.; Caldwell, J.T. To Martin Marietta Energy Systems, Inc., Oak Ridge, TN (US). USA Patent 5,200,626/A/. 6 Apr 1993. Filed date 28 Mar 1990. USA Patent Application 7-500,165. Int. Cl. G01N 23/222. [10] DOE Contract AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Methods and systems for the detection of small amounts of modern, highly-explosive nitrogen-based explosives, such as plastic explosives, hidden in airline baggage. Several techniques are employed either individually or combined in a hybrid system. One technique employed in combination is X-ray imaging. Another technique is interrogation with a pulsed neutron source in a two-phase mode of operation to image both nitrogen and oxygen densities. Another technique employed in combination is neutron interrogation to form a hydrogen density image or three-dimensional map. In addition, deliberately-placed neutron-absorbing materials can be detected.

280 Means and method of detection in chemical separation procedures. Yeung, E.S.; Koutny, L.B.; Hogan, B.L.; Cheung, C.K.; Yinfa Ma. To Iowa State Univ. Research Foundation, Inc., Ames, IA (US). USA Patent 5,192,407/A/. 9 Mar 1993. Filed date 30 Jan 1990. USA Patent Application 7-472,315. Int. Cl. G01N 27/26; G01N 27/447; B01D 57/02. [10] DOE Contract W-7405-ENG-82. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A means and method are described for indirect detection of constituent components of a mixture separated in a chemical separation process. Fluorescing ions are distributed across the area in which separation of the mixture will occur to provide a generally uniform background fluorescence intensity. For example, the mixture is comprised of one or more charged analytes which displace fluorescing ions where its constituent components separate to. Fluorescing ions of the same charge as the charged analyte components cause a displacement. The displacement results in the location of the separated components having a reduced fluorescence intensity to the remainder of the background. Detection of the lower fluorescence intensity areas can be visually, by photographic means and methods, or by automated laser scanning.

281 Charged particle mobility refrigerant analyzer. Allman, S.L.; Chunghsuan Chen; Chen, F.C. To Martin Marietta Energy Systems, Inc., Oak Ridge, TN (US). USA Patent 5,184,015/A/. 2 Feb 1993. Filed date 27 Sep 1991. USA Patent Application 7-766,542. Int. Cl. B01D 59/44;

H01J 49/00. [10] DOE Contract AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method for analyzing a gaseous electronegative species comprises the steps of providing an analysis chamber; providing an electric field of known potential within the analysis chamber; admitting into the analysis chamber a gaseous sample containing the gaseous electronegative species; providing a pulse of free electrons within the electric field so that the pulse of free electrons interacts with the gaseous electronegative species so that a swarm of electrically charged particles is produced within the electric field; and, measuring the mobility of the electrically charged particles within the electric field.

Inorganic, Organic, and Physical Chemistry

Refer also to citation(s) 229, 240, 263

282 Synthetic route to meso-tetra hydrocarbyl or substituted hydrocarbyl porphyrins and derivatives. Wijesekera, T.P.; Wagner, R.W. To Sun Co., Inc. (R and M), Philadelphia, PA (US). USA Patent 5,241,062/A/. 31 Aug 1993. Filed date 19 Jan 1993. USA Patent Application 8-005,702. Int. Cl. C07D 487/22. [10] DOE Contract FC21-90MC26029. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The hydroxyl group in a pyrrolic compound having in the 2-position thereof a group having the formula R(OH)CH-R is hydrocarbyl or substituted hydrocarbyl, is replaced by a group, for example a p-nitrobenzoate group, having better leaving properties than those of hydroxyl for a subsequent self-condensation and cyclization of the pyrrolic compound to form a meso-hydrocarbyl or meso-substituted hydrocarbyl porphyrin.

283 Compact anhydrous HCl to aqueous HCl conversion system. Grossman, M.W.; Speer, R. To GTE Products Corp., Danvers, MA (US). USA Patent 5,215,723/A/. 1 Jun 1993. Filed date 20 Dec 1990. USA Patent Application 7-631,196. Int. Cl. B01J 8/02. [10] DOE Contract AC03-76SF00098. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The present invention is directed to an inexpensive and compact apparatus adapted for use with a ^{196}Hg isotope separation process and the conversion of anhydrous HCl to aqueous HCl without the use of air flow to carry the HCl vapor into the converter system.

284 Cyano- and polycyanometallo-porphyrins as catalysts for alkane oxidation. Ellis, P.E. Jr.; Lyons, J.E. To Sun Co., Inc. (R and M), Philadelphia, PA (US). USA Patent 5,212,300/A/. 18 May 1993. Filed date 2 Jun 1992. USA Patent Application 7-892,107. Int. Cl. C07D 487/22. [10] DOE Contract FC21-90MC26029. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

New compositions of matter comprising cyano-substituted metal complexes of porphyrins are catalysts for the oxidation of alkanes. The metal is iron, chromium, manganese, ruthenium, copper or cobalt. The porphyrin ring has cyano groups attached thereto in meso- and/or β-pyrrolic positions.

285 Process of ^{196}Hg enrichment. Grossman, M.W.; Mellor, C.E. To GTE Products Corp., Danvers, MA (US). USA Patent 5,205,913/A/. 27 Apr 1993. Filed date 18 Jul 1991. USA Patent Application 7-732,866. Int. Cl. B01D 5/00. [10] DOE Contract AC03-76SF00098. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A simple rate equation model shows that by increasing the length of the photochemical reactor and/or by increasing the photon intensity in said reactor, the feedstock utilization of ^{196}Hg will be increased. Two preferred embodiments of the present invention are described, namely (1) long reactors using long photochemical lamps and vapor filters; and (2) quartz reactors with external UV reflecting films. These embodiments have each been constructed and operated, demonstrating the enhanced utilization process dictated by the mathematical model (also provided).

286 Solid-gel precursor solutions and methods for the fabrication of polymetallicsiloxane coating films. Toshifumi Sugama. To Associated Universities, Inc., Washington, DC (US). USA Patent 5,200,237/A/. 6 Apr 1993. Filed date 28 Oct 1991. USA Patent Application 7-783,169. Int. Cl. B05D 3/02. [10] DOE Contract AC02-76CH00016. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Solutions and preparation methods necessary for the fabrication of metal oxide cross-linked polysiloxane coating films are disclosed. The films are useful in provide heat resistance against oxidation, wear resistance, thermal insulation, and corrosion resistance of substrates. The sol-gel precursor solution comprises a mixture of a monomeric organoalkoxysilane, a metal alkoxide $M(OR)_n$ (wherein M is Ti, Zr, Ge or Al; R is CH_3, C_2H_5 or C_3H_7; and n is 3 or 4), methanol, water, HCl and NaOH. The invention provides a sol-gel solution, and a method of use thereof, which can be applied and processed at low temperatures (i.e., < 1,000 C.). The substrate can be coated by immersing it in the above mentioned solution at ambient temperature. The substrate is then withdrawn from the solution. Next, the coated substrate is heated for a time sufficient and at a temperature sufficient to yield a solid coating. The coated substrate is then heated for a time sufficient, and temperature sufficient to produce a polymetallicsiloxane coating.

287 Method of controlling the mercury vapor pressure in a photo-chemical lamp or vapor filter used for Hg^{196} enrichment. Grossman, M.W. To GTE Products Corp., Danvers, MA (US). USA Patent 5,187,804/A/. 16 Feb 1993. Filed date 30 May 1991. USA Patent Application 7-708,798. Int. Cl. H01J 9/395; H01J 61/24; H01J 61/20. [10] DOE Contract AC03-76SF00098. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The present invention is directed to a method of eliminating the cold spot zones presently used on Hg^{196} isotope separation lamps and filters by the use of a mercury amalgams, preferably mercury - indium amalgams. The use of an amalgam affords optimization of the mercury density in the lamp and filter of a mercury enrichment reactor, particularly multilamp enrichment reactors. Moreover, the use of an amalgam in such lamps and/or filters affords the ability to control the spectral line width of radiation emitted from lamps, a requirement for mercury enrichment.

Known licensing contacts for major laboratories are listed on page iv

288 Tungsten-188/carrier-free rhenium-188 perrhenic acid generator system. Knapp, F.F. Jr.; Lisic, E.C.; Mirzadeh, S.; Callahan, A.P. To Martin Marietta Energy Systems, Inc., Oak Ridge, TN (US). USA Patent 5,186,913/A/. 16 Feb 1993. Filed date 26 Apr 1991. USA Patent Application 7-692,110. Int. Cl. C01G 41/00; C01G 47/00. [10] DOE Contract AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A generator system for providing a carrier-free radioisotope in the form of an acid comprises a chromatography column in tandem fluid connection with an ion exchange column, the chromatography column containing a charge of a radioactive parent isotope. The chromatography column, charged with a parent isotope, is eluted with an alkali metal salt solution to generate the radioisotope in the form of an intermediate solution, which is passed through the ion-exchange column to convert the radioisotope to a carrier-free acid form.

Photochemistry

Refer also to citation(s) 285

Radiochemistry and Nuclear Chemistry

Refer also to citation(s) 287, 288, 321

289 Production of selenium-72 and arsenic-72. Phillips, D.R. To Univ. of California, Alameda, CA (US). USA Patent 5,204,072/A/. 20 Apr 1993. Filed date 6 Sep 1991. USA Patent Application 7-756,022. Int. Cl. C01G 57/00; C01G 28/00. [10] DOE Contract W-7405-ENG-36. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Methods are described for producing selenium-72, separating it from its daughter isotope arsenic-72, and generating multiple portions of a solution containing arsenic-72 from a reusable parent substance comprised of selenium-72.

42 ENGINEERING

Facilities, Equipment, and Techniques

290 Error-eliminating rapid ultrasonic firing. Borenstein, J.; Koren, Y. To Univ. of Michigan, Ann Arbor, MI (US). USA Patent 5,239,515/A/. 24 Aug 1993. Filed date 26 Nov 1991. USA Patent Application 7-798,094. Int. Cl. G01S 15/00. [10] DOE Contract FG02-86NE37969. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A system for producing reliable navigation data for a mobile vehicle, such as a robot, combines multiple range samples to increase the "confidence" of the algorithm in the existence of an obstacle. At higher vehicle speed, it is crucial to sample each sensor quickly and repeatedly to gather multiple samples in time to avoid a collision. Erroneous data is rejected by delaying the issuance of an ultrasonic energy pulse by a predetermined wait-period, which may be different during alternate ultrasonic firing cycles. Consecutive readings are compared, and the corresponding data is rejected if the readings differ by more than a predetermined amount. The rejection rate for the data is monitored and the operating speed of the navigation system is reduced if the data rejection rate is increased. This is useful to distinguish and eliminate noise from the data which truly represents the existence of an article in the field of operation of the vehicle.

291 Electromagnetic induction pump for pumping liquid metals and other conductive liquids. Smither, R.K. To Univ. of Chicago, Chicago, IL (US). USA Patent 5,209,646/A/. 11 May 1993. Filed date 16 Oct 1991. USA Patent Application 7-778,456. Int. Cl. H02K 44/02. [10] DOE Contract W-31109-ENG-38. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An electromagnetic induction pump is described in which an electrically conductive liquid is made to flow by means of a force created by interaction of a permanent magnetic field and a DC current. The pump achieves high efficiency through combination of: powerful permanent magnet materials which provide a high strength field that is uniform and constant; steel tubing formed into a coil which is constructed to carry conducting liquids with minimal electrical resistance and heat; and application of a voltage to induce a DC current which continuously produces a force in the direction of the desired flow.

Materials Testing

292 Apparatus for tensile testing plate-type ceramic specimens. Liu, K.C. To Martin Marietta Energy Systems, Inc., Oak Ridge, TN (US). USA Patent 5,237,876/A/. 24 Aug 1993. Filed date 29 Jul 1992. USA Patent Application 7-922,451. Int. Cl. G01N 3/08. [10] DOE Contract AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Apparatus is described for gripping a plate-type tensile specimen having generally T-shaped end regions in a dynamic tension fatigue testing apparatus comprising an annular housing having an open-ended elongated cavity therein, a plurality of hydraulic piston means supported by the housing in a spaced array about the cavity, and a specimen-supporting plate means overlying the piston means at one end of the elongated cavity and displaceable by said piston means in a longitudinal direction with respect to the longitudinal axis of the cavity, said apparatus for gripping a flat plate-type tensile specimen comprising: a pair of elongated pull rods each having oppositely disposed first and second end regions; a pair of mounting means carried by said plate means with each mounting means for pivotally attaching the first end region of each of said pull rods in a central region of said plate means for supporting said pair of elongated pull rods in a side-by-side relationship along a common longitudinal centerline within said cavity; recess means in the second end region of each of said pull rods in adjacently disposed surface regions thereof with said recess means facing one another and each adapted to receive one side of one of the generally T-shaped end regions of the plate-type tensile specimen; and load-bearing means positionable in each of said recess means and adapted to bear against a shoulder on each side of the generally T-shaped end region of the plate-type tensile specimen when a tensile loading is applied thereon.

293 Noninvasive valve monitor using constant magnetic and/or DC electromagnetic field. Casada, D.A.; Haynes, H.D. To Martin Marietta Energy Systems, Inc., Oak Ridge, TN (US). USA Patent 5,236,011/A/. 17 Aug 1993. Filed date 20 Jun 1991. USA Patent Application 7-718,058. Int. Cl. F16K 37/00; G01B 7/14. [10] DOE Contract AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

One or more sources of steady magnetic field are carefully located on the outside of a valve body. The constant magnetic field is transmitted into the valve body and valve internals. A magnetic field detector carefully located on the outside of the valve body detects the intensity of the magnetic field at its location. As the position of a valve internal part is changed, there is an alteration in the magnetic field in the valve, and a consequent change in the detected magnetic field. Changes in the detected signal provide an indication of the position and motion of the valve internals.

294 Ultrasonic tomography for in-process measurements of temperature in a multi-phase medium. Beller, L.S. To EG and G Idaho, Inc., Idaho Falls, ID (US). USA Patent 5,181,778/A/. 26 Jan 1993. Filed date 30 Sep 1991. USA Patent Application 7-767,901. Int. Cl. G01K 11/24. [10] DOE Contract AC07-76ID01570. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method and apparatus are described for the in-process measurement of internal particulate temperature utilizing ultrasonic tomography techniques to determine the speed of sound through a specimen material. Ultrasonic pulses are transmitted through a material, which can be a multi-phase material, over known flight paths and the ultrasonic pulse transit times through all sectors of the specimen are measured to determine the speed of sound. The speed of sound being a function of temperature, it is possible to establish the correlation between speed of sound and temperature, throughout a cross-section of the material, which correlation is programmed into a computer to provide for a continuous in-process measurement of temperature throughout the specimen.

Components, Electron Devices and Circuits

Refer also to citation(s) 265, 327, 329

295 High power, high beam quality regenerative amplifier. Hackel, L.A.; Dane, C.B. To Univ. of California, Oakland, CA (US). USA Patent 5,239,408/A/. 24 Aug 1993. Filed date 22 Sep 1992. USA Patent Application 7-948,488. Int. Cl. H01S 3/98; H01S 3/093. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A laser amplifier, comprising: a gain medium; a polarization rotator; a passive polarizer; a plurality of reflectors configured to define an optical path through the gain medium, the passive polarizer, and the polarization rotator; and a phase conjugator configured to receive a beam from the optical path after the pulse has proceeded one or more transits through the optical path, the phase conjugator further configured to return the beam with reversed phase to the optical path to proceed an equal number of transits of the optical path in an opposite direction before exiting the optical path; wherein a transit of the beam through the optical path includes a plurality of passes through the gain medium and only one pass through the polarization rotator and the passive polarizer.

296 Ultrasonic transducer for extreme temperature environments. Light, G.M.; Cervantes, R.A.; Alcazar, D.G. To Southwest Research Inst., San Antonio, TX (US). USA Patent 5,195,373/A/. 23 Mar 1993. Filed date 17 Apr 1991. USA Patent Application 7-686,694. Int. Cl. G01N 29/24. [10] Project 15-2236. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An ultrasonic piezoelectric transducer that is operable in very high and very low temperatures. The transducer has a dual housing structure that isolates the expansion and contraction of the piezoelectric element from the expansion and contraction of the housing. Also, the internal components are made from materials having similar coefficients of expansion so that they do not interfere with the motion of the piezoelectric element.

297 Method and apparatus for stabilizing pulsed microwave amplifiers. Hopkins, D.B. To Univ. of Calif., Oakland, CA (US). USA Patent 5,182,524/A/. 26 Jan 1993. Filed date 10 Mar 1992. USA Patent Application 7-850,456. Int. Cl. H03F 1/32. [10] DOE Contract AC03-76SF00098. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Phase and amplitude variations at the output of a high power pulsed microwave amplifier arising from instabilities of the driving electron beam are suppressed with a feed-forward system that can stabilize pulses which are too brief for regulation by conventional feedback techniques. Such variations tend to be similar during successive pulses. The variations are detected during each pulse by comparing the amplifier output with the low power input signal to obtain phase and amplitude error signals. This enables storage of phase and amplitude correction signals which are used to make compensating changes in the low power input signal during the following amplifier output pulse which suppress the variations. In the preferred form of the invention, successive increments of the correction signals for each pulse are stored in separate channels of a multi-channel storage. Sequential readout of the increments during the next pulse provides variable control voltages to a voltage controlled phase shifter and voltage controlled amplitude modulator in the amplifier input signal path.

298 Microoptic lenses. Snyder, J.J. To Univ. of California, Livermore, CA (US). USA Patent 5,181,224/A/. 19 Jan 1993. Filed date 10 May 1991. USA Patent Application 7-697,974. Int. Cl. H01S 3/08. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The present invention provides several novel diffraction limited microlens configurations which are especially valuable for use in conjunction with laser diodes, and optical

Known licensing contacts for major laboratories are listed on page iv

fibers. Collimators, circularizers and focusers (couplers) are provided.

299 **Composite lead for conducting an electric current between 75–80 K and 4.5 K temperatures.** McConeghy, R.J.; Negm, Y.; Zimmerman, O.; Powers, R.E.; Kaplan, A. To Universities Research Association, Inc. 1992. Filed date 4 Apr 1992. USA Patent Application 7-866,595. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. (SSCL-ORTA–18). Source: Superconducting Super Collider Lab., 2550 Beckleymeade Ave., Dallas, TX 75237 (United States); Contact: Graw, Leroy H. ((214)708-1069).

This technology can be used to manufacture an article which allows the user to bridge and join electrical circuits which are functional at room temperatures (300K) or helium temperatures (4.5 K). The composite lead article provides multiple electrical leads and is capable of conducting 100 amperes or more of electrical current between the different temperature regions, it minimizes the heat conduction and reduces heating in the electrically conductive leads. The composite lead spaced co-axially from one another, each element being composed of at least one high transition temperature superconductor. The co-axially spaced superconductive elements are encapsulated by an electrically non-conductive filler material covering. This filler material is resistant to the effects of temperature differences from about 75–80 K to about 4.5 K.

300 **Phase-locked loop with control phase slippage.** Mestha, L.K. To Universities Research Association, Inc. 1991. Filed date 13 Dec 1991. USA Patent Application 7-807,144. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. (SSCL-ORTA–4). Source: Superconducting Super Collider Lab., 2550 Beckleymeade Ave., Dallas, TN 75237 (United States); Contact: Graw, Leroy H. ((214)708-1069).

This system synchronizes a first subsystem sweeping from a first frequency to a second frequency, with the second subsystem sweeping operating at fixed second frequency. This synchronization is achieved by measuring the phase between the two subsystems with a phase detector and this is compared with a database which stores the reference phases of the system for a particular instant of time, and generates an error signal. A feedback of the error signal is used to modulate the sweep frequency and obtain phase lock with the fixed frequency. This technique improves upon the noise performance and opens up the abilities to use good filters or feedback controllers to achieve robustness in the loop. With this invention it is possible to achieve phase lock of the oscillators to a very wide range of frequencies. Conventionally used phase locking mechanisms monitor phase lock of a varying or sweep frequency source and incur very large phase error.

44 INSTRUMENTATION

Radiation Instrumentation

301 **Neutron coincidence detectors employing heterogeneous materials.** Czirr, J.B.; Jensen, G.L. To Brigham Young Univ., Provo, UT (US). USA Patent 5,231,290/A/. 27 Jul 1993. Filed date 16 Jun 1992. USA Patent Application 7-899,031. Int. Cl. G01T 3/06. [10] DOE Contract FG02-90ER12105 ;FG02-87ER13787. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A neutron detector is described comprising: (a) a first scintillating material producing a first electromagnetic radiation pulse upon interaction with each of one or more incident neutrons; (b) a second scintillating material producing a second electromagnetic radiation pulse upon interaction with each of said one or more incident neutrons, said second scintillating material producing, with each interaction, said second electromagnetic pulse of a distinct energy corresponding to neutron capture events within said second scintillating material; (c) said second scintillating material optically separated from said first scintillating material so that electromagnetic radiation pulses generated in one of said scintillating materials are not transmitted to the other of said first and second scintillating materials; (d) a first detector device positioned to receive at least said first electromagnetic radiation pulse and generating a first electrical signal corresponding thereto; (e) a second detector device positioned to receive at least said second electromagnetic radiation pulse and generating a second electrical signal corresponding thereto; (f) an electronic circuit responsive to a coincidence detection of said first and second electrical signals, said electronic circuit storing information for determining at least one of the energy or number of said incident neutrons corresponding to said coincidence detection.

302 **Self-filling and self-purging apparatus for detecting spontaneous radiation from substances in fluids.** Larson, I.L.; Chiles, M.M.; Miller, V.C. To Martin Marietta Energy Systems, Inc., Oak Ridge, TN (US). USA Patent 5,229,604/A/. 20 Jul 1993. Filed date 27 Jan 1992. USA Patent Application 7-825,749. Int. Cl. G01N 31/00. [10] DOE Contract AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A detector of spontaneous radiation is described comprising: (a) a cell for in situ immersion in a source of fluid having substances which emit said spontaneous radiation, said cell having at least first and second faces transparent to said radiation, said cell further having an inlet and an outlet aperture connected to its interior; (b) inlet and outlet tubes for transporting said fluid between said source and said interior of said cell, said inlet and outlet tubes having internal ends respectively coupled to said inlet and outlet apertures and external ends exposed to ambient pressure such that said cell is self-filling and self purging of said fluid; (c) a sensor array adjacent said cell for generating continuous real-time signals in response to said radiation transmitted through said at least first and second faces; (d) circuitry coupled to said sensor array to transmit said signals to a display; and (e) a protective casing enclosing said cell, said sensor array and said circuitry.

303 Environmental radiation detection via thermoluminescence. Miller, S.D. To Battelle Memorial Inst., Richland, WA (US). USA Patent 5,196,704/A/. 23 Mar 1993. Filed date 27 Sep 1991. USA Patent Application 7-766,685. Int. Cl. G01T 1/115. [10] DOE Contract AC06-76RL01830. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

The method and apparatus of the present invention relate to cryogenically cooling a thermoluminescent material, exposing it to a low level of radiation (less than about 1 R) while it is at the cooled temperature, warming the thermoluminescent material to "room temperature" and counting the photons emitted during heating. Sufficient sensitivity is achieved without exposing the thermoluminescent material to ultraviolet light thereby simplifying the measurements.

304 Alternating current long range alpha particle detector. MacArthur, D.W.; McAtee, J.L. To Univ. of California, Alameda, CA (US). USA Patent 5,187,370/A/. 16 Feb 1993. Filed date 27 Nov 1991. USA Patent Application 7-799,464. Int. Cl. G01T 1/185. [10] DOE Contract W-7405-ENG-36. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An alpha particle detector, utilizing alternating currents, which is capable of detecting alpha particles from distinct sources. The use of alternating currents allows use of simpler ac circuits which, in turn, are not susceptible to dc error components. It also allows the benefit of gas gain, if desired. In the invention, a voltage source creates an electric field between two conductive grids, and between the grids and a conductive enclosure. Air containing air ions created by collision with alpha particles is drawn into the enclosure and detected. In some embodiments, the air flow into the enclosure is interrupted, creating an alternating flow of ions. In another embodiment, a modulated voltage is applied to the grid, also modulating the detection of ions.

Well Logging Instrumentation

305 Methods of operation of apparatus measuring formation resistivity from within a cased well having one measurement and two compensation steps. Vail, W.B. III. To Para Magnetic Logging, Inc., Woodinville, WA (US). USA Patent 5,223,794/A/. 29 Jun 1993. Filed date 4 Sep 1991. USA Patent Application 7-754,965. Int. Cl. G01V 3/20. [10] DOE Contract FG22-88BC14243. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method is described of determining the resistivity of geological formations from within a cased well that provides three independent measurements including a current leakage measurement quantity, first order error information, and second order error information to provide an accurate determination of the resistivity of a geological formation adjacent to a cased well, comprising: providing three spaced electrode means that electrically engage a particular section of casing with a first resistance being defined between first and second electrode means and a second resistance being defined between second and third electrode means; providing current conducting means and current generating means causing a first current to flow into the geological formation from the particular section of casing and causing a second current to flow along the particular section of casing; obtaining a current leakage measurement quantity relating to first current flow into the formation and the magnitudes of the first and second resistances; obtaining first order error information related to second current flow along the casing and any differences between the first and second resistances; obtaining second order error information related to any first current flow into formation and any differences between the first and second resistances; and determining a magnitude relating to the resistivity of the geological formation by compensating said current leakage measurement quantity with said first order error information and with said second order error information to provide information useful for the accurate determination of the resistivity of the geological formation adjacent to cased the cased well.

306 Electromechanical transducer for acoustic telemetry system. Drumheller, D.S. To Teleco Oilfield Services Inc., Meriden, CT (US). USA Patent 5,222,049/A/. 22 Jun 1993. Filed date 29 Oct 1990. USA Patent Application 7-605,084. Int. Cl. G01V 1/40. [10] DOE Contract AC04-76DP00789. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An improved electromechanical transducer is provided for use in an acoustic telemetry system. The transducer of this invention comprises a stack of ferroelectric ceramic disks interleaved with a plurality of spaced electrodes which are used to electrically pole the ceramic disks. The ceramic stack is housed in a metal tubular drill collar segment. The electrodes are preferably alternatively connected to ground potential and driving potential. This alternating connection of electrodes to ground and driving potential subjects each disk to an equal electric field; and the direction of the field alternates to match the alternating direction of polarization of the ceramic disks. Preferably, a thin metal foil is sandwiched between electrodes to facilitate the electrical connection. Alternatively, a thicker metal spacer plate is selectively used in place of the metal foil in order to promote thermal cooling of the ceramic stack.

Thermal Instrumentation

307 Dual-mode self-validating resistance/Johnson noise thermometer system. Shepard, R.L.; Blalock, T.V.; Roberts, M.J. To Martin Marietta Energy Systems, Inc., Oak Ridge, TN (US). USA Patent 5,228,780/A/. 20 Jul 1993. Filed date 30 Oct 1992. USA Patent Application 7-969,057. Int. Cl. G01K 7/30; G01K 7/16. [10] DOE Contract AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A temperature measuring system is described comprising: a sensor having a resistor; first signal processor means, having a current source constantly coupled to the sensor, for continuously producing a first temperature signal based on the DC resistance of the sensor resistor; and second signal processor means, coupled to the sensor, for continuously producing a second temperature signal based exclusively on the AC Johnson noise generated by the sensor resistor, said sensor simultaneously and independently measuring DC resistance and AC Johnson noise voltage.

Known licensing contacts for major laboratories are listed on page iv

308 Internal temperature monitor for work pieces. Berthold, J.W. To Babcock and Wilcox Co., New Orleans, LA (US). USA Patent 5,226,730/A/. 13 Jul 1993. Filed date 27 May 1992. USA Patent Application 7-889,217. Int. Cl. G01K 11/24; G01K 11/22. [10] DOE Contract FC07-89ID12875. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method and apparatus for measuring the internal temperature of a work piece comprises an excitation laser for generating laser pulses which are directed through a water cooled probe, and in an optical fiber, to a first surface of the work piece. The laser is of sufficient intensity to ablate the surface of the work piece, producing a displacement and a resulting ultrasonic pulse which propagates within the thickness of the work piece to an opposite surface. The ultrasonic pulse is reflected from the opposite surface and returns to the first surface to create a second displacement. A second continuous laser also shines its light through an optical fiber in the probe into the first surface and is used in conjunction with signal processing equipment to measure the time between the first and second displacements. This time is proportional to the time-of-flight of the ultrasonic pulse in the work piece which, with a known or detected thickness of the work piece, can be used to calculate the internal temperature of the work piece.

Optical Instrumentation

309 Beam shuttering interferometer and method. Deason, V.A.; Lassahn, G.D. To EG and G Idaho, Inc., Idaho Falls, ID (US). USA Patent 5,231,468/A/. 27 Jul 1993. Filed date 6 Nov 1991. USA Patent Application 7-788,395. Int. Cl. G01B 11/24. [10] DOE Contract AC07-76ID01570. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method and apparatus resulting in the simplification of phase shifting interferometry by eliminating the requirement to know the phase shift between interferograms or to keep the phase shift between interferograms constant. The present invention provides a simple, inexpensive means to shutter each independent beam of the interferometer in order to facilitate the data acquisition requirements for optical interferometry and phase shifting interferometry. By eliminating the requirement to know the phase shift between interferograms or to keep the phase shift constant, a simple, economical means and apparatus for performing the technique of phase shifting interferometry is provide which, by thermally expanding a fiber optical cable changes the optical path distance of one incident beam relative to another.

Miscellaneous Instrumentation

Refer also to citation(s) 276, 296

310 Force sensor. Grahn, A.R. To Bonneville Scientific, Salt Lake City, UT (US). USA Patent 5,209,126/A/. 11 May 1993. Filed date 4 Jan 1991. USA Patent Application 7-638,044. Int. Cl. G01L 5/16. [10] DOE Contract AC02-85ER80291. Contract F41622-89-C-1027. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A force sensor and related method for determining force components is described. The force sensor includes a deformable medium having a contact surface against which a force can be applied, a signal generator for generating signals that travel through the deformable medium to the contact surface, a signal receptor for receiving the signal reflected from the contact surface, a generation controller, a reception controller, and a force determination apparatus. The signal generator has one or more signal generation regions for generating the signals. The generation controller selects and activates the signal generation regions. The signal receptor has one or more signal reception regions for receiving signals and for generating detections signals in response thereto. The reception controller selects signal reception regions and detects the detection signals. The force determination apparatus measures signal transit time by timing activation and detection and, optionally, determines force components for selected cross-field intersections. The timer which times by activation and detection can be any means for measuring signal transit time. A cross-field intersection is defined by the overlap of a signal generation region and a signal reception region.

311 Reflection soft X-ray microscope and method. Suckewer, S.; Skinner, C.H.; Rosser, R. To Princeton Univ., NJ (US). USA Patent 5,177,774/A/. 5 Jan 1993. Filed date 23 Aug 1991. USA Patent Application 7-749,277. Int. Cl. G21K 7/00. [10] DOE Contract AC02-76CH03073. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A reflection soft X-ray microscope is provided by generating soft X-ray beams, condensing the X-ray beams to strike a surface of an object at a predetermined angle, and focusing the X-ray beams reflected from the surface onto a detector, for recording an image of the surface or near surface features of the object under observation.

45 MILITARY TECHNOLOGY, WEAPONRY, AND NATIONAL DEFENSE

Chemical Explosions and Explosives

Refer also to citation(s) 279

54 ENVIRONMENTAL SCIENCES

Environmental Sciences, Atmospheric

Refer also to citation(s) 225, 226, 227

312 Nitrogen dioxide detection. Sinha, D.N.; Agnew, S.F.; Christensen, W.H. To Univ. of California Patent, Trademark and Copyright Office, Alameda, CA (US). USA Patent 5,222,388/A/. 29 Jun 1993. Filed date 19 Mar 1991. USA Patent Application 7-671,225. Int. Cl. G01N 27/00. [10] DOE Contract W-7405-ENG-36. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An apparatus is described for detection of nitrogen dioxide in a gas comprised of: (a) sensing element consisting of polystyrene having at least one pair of opposing surfaces, where the conductance and resistance of said sensing element do not vary in response to the presence in said gas of varying amounts of water vapor; (b) a first electrode having at least one surface in contact with a first of said sensing element opposing surfaces; (c) a second electrode having at least one surface in contact with a second of said sensing clement opposing and (d) means for measuring the conductance or resistance of said sensing element between said electrodes.

Environmental Sciences, Terrestrial

Refer also to citation(s) 253

313 **Method of photon spectral analysis.** Gehrke, R.J.; Putnam, M.H.; Killian, E.W.; Helmer, R.G.; Kynaston, R.L.; Goodwin, S.G.; Johnson, L.O. To EG and G Idaho, Inc., Idaho Falls, ID (US). USA Patent 5,206,174/A/. 27 Apr 1993. Filed date 24 Sep 1992. USA Patent Application 7-949,955. Int. Cl. G01N 23/00; G01N 23/223. [10] DOE Contract AC07-76ID01570. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A spectroscopic method to rapidly measure the presence of plutonium in soils, filters, smears, and glass waste forms by measuring the uranium L-shell x-ray emissions associated with the decay of plutonium. In addition, the technique can simultaneously acquire spectra of samples and automatically analyze them for the amount of americium and γ-ray emitting activation and fission products present. The samples are counted with a large area, thin-window, n-type germanium spectrometer which is equally efficient for the detection of low-energy x-rays (10-2,000 keV), as well as high-energy γ rays (>1 MeV). A 8,192- or 16,384 channel analyzer is used to acquire the entire photon spectrum at one time. A dual-energy, time-tagged pulser, that is injected into the test input of the preamplifier to monitor the energy scale, and detector resolution. The L x-ray portion of each spectrum is analyzed by a linear-least-squares spectral fitting technique. The γ-ray portion of each spectrum is analyzed by a standard Ge γ-ray analysis program. This method can be applied to any analysis involving x- and γ-ray analysis in one spectrum and is especially useful when interferences in the x-ray region can be identified from the γ-ray analysis and accommodated during the x-ray analysis.

314 **Root-growth-inhibiting sheet.** Burton, F.G.; Cataldo, D.A.; Cline, J.F.; Skiens, W.E.; Van Voris, P. To Battelle Memorial Inst., Richland, WA (US). USA Patent 5,181,952/A/. 26 Jan 1993. Filed date 11 Jun 1990. USA Patent Application 7-535,494. Int. Cl. A01N 33/06; A01N 33/18. [10] DOE Contract AC06-76RL01830. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

In accordance with this invention, a porous sheet material is provided at intervals with bodies of a polymer which contain a 2,6-dinitroaniline. The sheet material is made porous to permit free passage of water. It may be either a perforated sheet or a woven or non-woven textile material. A particularly desirable embodiment is a non-woven fabric of non-biodegradable material. This type of material is known as a "geotextile" and is used for weed control, prevention of erosion on slopes, and other landscaping purposes. In order to obtain a root repelling property, a dinitroaniline is blended with a polymer which is attached to the geotextile or other porous material.

55 BIOMEDICAL SCIENCES, BASIC STUDIES

Biochemistry

Refer also to citation(s) 236, 237, 238, 318

315 **Antibody-mediated cofactor-driven reactions.** Schultz, P.G. To Univ. of California, Oakland, CA (US). USA Patent 5,219,732/A/. 15 Jun 1993. Filed date 17 Jul 1990. USA Patent Application 7-554,004. Int. Cl. C12P 1/00; C12P 17/18; C12N 9/00. [10] Grant C87-101226. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Chemical reactions capable of being rate-enhanced by auxiliary species which interact with the reactants but do not become chemically bound to them in the formation of the final product are performed in the presence of antibodies which promote the reactions. The antibodies contain regions within their antigen binding sites which recognize the auxiliary species in a conformation which promotes the reaction. The antigen binding site frequently recognizes a particular transition state complex or other high energy complex along the reaction coordinate, thereby promoting the progress of the reaction along the desired route as opposed to other less favorable routes. Various classes of reactions together with appropriate antigen binding site specificities tailored for each are disclosed.

316 **Catalytic and reactive polypeptides and methods for their preparation and use.** Schultz, P. To Univ. of California, Oakland, CA (US). USA Patent 5,215,889/A/. 1 Jun 1993. Filed date 8 Sep 1989. USA Patent Application 7-404,920. Int. Cl. C12N 9/00; C12P 1/00. [10] Grant AI-24695;Contract N-00014-87-K-0256;Grant CHE-8822412;Gran Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Catalytic and reactive polypeptides include a binding site specific for a reactant or reactive intermediate involved in a chemical reaction of interest. The polypeptides further include at least one active functionality proximate to the binding site.

317 **Regioselective chemical modification of monoclonal antibodies.** Ranadive, G.; Rozenzweig, H.S.; Epperly, M.; Bloomer, W. To Univ. of Pittsburgh, PA (US). USA Patent 5,208,008/A/. 4 May 1993. Filed date 14 Nov 1990. USA Patent Application 7-613,127. Int. Cl. A61K 49/02; C07K 15/28; C07K 15/02. [10] DOE Contract FG02-89ER60869. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method is presented of selectively modifying an immunoglobulin having at least one Fab region and at least one Fc region. Each region has an isoelectric point where the isoelectric point of the Fab fragment of the immunoglobulin is different from the isoelectric point of the Fc fragment of the immunoglobulin. The method comprises of a modification of the immunoglobulin at a pH between the respective isoelectric points of the Fab and Fc fragments of the immunoglobulin.

Genetics

318 Physical mapping of complex genomes. Evans, G.A. To Salk Inst. for Biological Studies, San Diego, CA (US). USA Patent 5,219,726/A/. 15 Jun 1993. Filed date 2 Jun 1989. USA Patent Application 7-360,254. Int. Cl. C12Q 1/68; C12N 1/20; G01N 33/566; G01N 33/48. [10] DOE Contract FG03-88ER60694. Grant R01HD18012. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method for the simultaneous identification of overlapping cosmid clones among multiple cosmid clones and the use of the method for mapping complex genomes are provided. A library of cosmid clones that contains the DNA to be mapped is constructed and arranged in a manner such that individual clones can be identified and replicas of the arranged clones prepared. In preferred embodiments, the clones are arranged in a two dimensional matrix. In such embodiments, the cosmid clones in a row are pooled, mixed probes complementary to the ends of the DNA inserts in the pooled clones are synthesized, hybridized to a first replica of the library. Hybridizing clones, which include the pooled row, are identified. A second portion of clones is prepared by pooling cosmid clones that correspond to a column in the matrix. The second pool thereby includes one clone from the first portion pooled clones. This common clone is located on the replica at the intersection of the column and row. Mixed probes complementary to the ends of the DNA inserts in the second pooled portion of clones are prepared and hybridized to a second replica of the library. The hybridization pattern on the first and second replicas of the library are compared and cross-hybridizing clones, other than the clones in the pooled column and row, that hybridize to identical clones in the first and second replicas are identified. These clones necessarily include DNA inserts that overlap with the DNA insert in the common clone located at the intersection of the pooled row and pooled column. The DNA in the entire library may be mapped by pooling the clones in each of the rows and columns of the matrix, preparing mixed end-specific probes and hybridizing the probes from each row or column to a replica of the library. Since all clones in the library are located at the intersection of a column and a row, the overlapping clones for all clones in the library may be identified and a physical map constructed.

Metabolism

319 Useful for cleavage of organic C-S bonds Bacillus sphaericus microorganism. Kilbane, J.J. II. To Inst. of Gas Technology, Chicago, IL (US). USA Patent 5,198,341/A/. 30 Mar 1993. Filed date 14 Jan 1991. USA Patent Application 7-640,931. Int. Cl. C12P 11/00; C12R 1/07; C12R 1/125; C10G 32/00. [10] DOE Contract AC22-85PC81201. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A mutant Bacillus sphaericus strain ATCC No. 53969 which has the property of sulfur removal and sulfur metabolism by selective cleavage of C-S bonds in organic carbonaceous materials.

Agriculture and Food Technology

Refer also to citation(s) 314

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

Radiation Effects

320 Nonhazardous solvent composition and method for cleaning metal surfaces. Googin, J.M.; Simandl, R.F.; Thompson, L.M. To Martin Marietta Energy Systems, Inc., Oak Ridge, TN (US). USA Patent 5,207,838/A/. 4 May 1993. Filed date 29 Aug 1991. USA Patent Application 7-751,912. Int. Cl. C23G 5/024; C23G 5/032; C23G 5/036. [10] DOE Contract AC05-84OR21400. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A solvent composition for displacing greasy and oily contaminants as well as water and/or aqueous residue from metallic surfaces, especially surfaces of radioactive materials so that such surfaces can be wiped clean of the displaced contaminants, water and/or aqueous residue. The solvent composition consists essentially of a blend of nonpolar aliphatic hydrocarbon solvent having a minimum flash point of about 140 F and 2 to 25 volume percent of a polar solvent having a flash point sufficiently high so as to provide the solvent composition with a minimum flash point of at least 140 F. The solvent composition is nonhazardous so that when it is used to clean the surfaces of radioactive materials the waste in the form of paper or cloth wipes, lab coats and the like used in the cleaning operation is not considered to be mixed waste composed of a hazardous solvent and a radioactive material.

Chemicals Metabolism and Toxicology

321 Method of measurement in biological systems. Turteltaub, K.W.; Vogel, J.S.; Felton, J.S.; Gledhill, B.L.: Davis, J.C.; Stanker, L.H. To Univ. of California, Oakland, CA (US). USA Patent 5,209,919/A/. 11 May 1993. Filed date 26 Apr 1991. USA Patent Application 7-693,248. Int. Cl. A61K 43/00; C01G 21/14; A61N 5/00. [10] DOE Contract W-7405-ENG-48. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method is disclosed of quantifying molecules in biological substances, comprising: selecting a biological host in which radioisotopes are present in concentrations equal to or less than those in the ambient biosphere; preparing a long-lived radioisotope labeled reactive chemical specie; administering the chemical specie to the biological host in doses sufficiently low to avoid significant overt damage to the biological system; allowing a period of time to elapse sufficient for dissemination and interaction of the chemical specie with the host throughout the biological system of the host; isolating a reacted fraction of the biological substance from the host in a manner sufficient to avoid contamination of the substance from extraneous sources; converting the fraction of biological substance by suitable means to a material which efficiently produces charged ions in at least one of several possible ion sources without introduction of significant isotopic fractionation; and measuring the radioisotope concentration in the material by means of direct isotopic counting.

66 PHYSICS

Techniques of General Use In Physics

Refer also to citation(s) 266

322 **Method and apparatus for cooling high temperature superconductors with neon-nitrogen mixtures.** Laverman, R.J.; Ban-Yen Lai. To Chicago Bridge and Iron Technical Services Co., Oak Brook, IL (US). USA Patent 5,193,349/A/. 16 Mar 1993. Filed date 5 Aug 1991. USA Patent Application 7-740,072. Int. Cl. F25B 19/00; F25D 17/02. [10] Contract ACK85197. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

Apparatus and methods for cooling high temperature superconducting materials (HTSC) to superconductive temperatures within the range of 27 K to 77 K using a mixed refrigerant consisting of liquefied neon and nitrogen containing up to about ten mole percent neon by contacting and surrounding the HTSC material with the mixed refrigerant so that free convection or forced flow convection heat transfer can be effected.

Nuclear Techniques In Condensed Matter Physics

323 **Determination of interfacial states in solid heterostructures using a variable-energy positron beam.** Asokakumar, P.P.V.; Lynn, K.G. To Associated Universities, Inc., Washington, DC (US). USA Patent 5,200,619/A/. 6 Apr 1993. Filed date 4 Oct 1991. USA Patent Application 7-770,891. Int. Cl. H01J 37/00. [10] DOE Contract AC02-76CH00016. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A method and means is provided for characterizing interfacial electron states in solid heterostructures using a variable energy positron beam to probe the solid heterostructure. The method includes the steps of directing a positron beam having a selected energy level at a point on the solid heterostructure so that the positron beam penetrates into the solid heterostructure and causes positrons to collide with the electrons at an interface of the solid heterostructure. The number and energy of gamma rays emitted from the solid heterostructure as a result of the annihilation of positrons with electrons at the interface are detected. The data is quantified as a function of the Doppler broadening of the photopeak about the 511 keV line created by the annihilation of the positrons and electrons at the interface, preferably, as an S-parameter function; and a normalized S-parameter function of the data is obtained. The function of data obtained is compared with a corresponding function of the Doppler broadening of the annihilation photopeak about 511 keV for a positron beam having a second energy level directed at the same material making up a portion of the solid heterostructure. The comparison of these functions facilitates characterization of the interfacial states of electrons in the solid heterostructure at points corresponding to the penetration of positrons having the particular energy levels into the interface of the solid heterostructure. Accordingly, the invention provides a variable-energy non-destructive probe of solid heterostructures, such as SiO_2/Si, MOS or other semiconductor devices.

Quantum Physics Aspects of Condensed Matter

Refer also to citation(s) 299

324 **Dual control active superconductive devices.** Martens, J.S.; Beyer, J.B.; Nordman, J.E.; Hohenwarter, G.K.G. To Wisconsin Alumni Research Foundation, Madison, WI (US). USA Patent 5,229,655/A/. 20 Jul 1993. Filed date 26 Dec 1991. USA Patent Application 7-816,395. Int. Cl. H03K 3/38; H03K 17/92; H03K 5/08; H01L 39/22. [10] Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

A dual control active superconducting device is described comprising; (a) a first device having a first main conduction channel formed of a film of superconductor on a substrate, an active weak link region interposed in the first main conduction channel, the active weak link region composed of a plurality of links formed of a thin film of superconductor separated by non-superconductive voids, the thickness and lateral dimensions of the links selected such that magnetic flux can propagate across the weak link region when it is superconducting, and a first control line having a portion adjacent to the active weak link region of the first main conduction channel such that current in the first control line will impose a magnetic flux on the weak link region; (b) a second superconducting device having a second main conduction channel formed of a film of superconductor on a substrate, an active weak link region interposed in the second main conduction channel, the active weak link region composed of at least one link formed of a thin film of superconductor separated by non-superconductive voids, the thickness and lateral dimensions of the links selected such that magnetic flux can propagate across the weak link region when it is superconducting, and a second control line having a portion adjacent to the active weak link region such that current in the second control line will impose a magnetic flux on the weak link region in the second main conduction channel; (c) an internal control line electrically connected to receive the current passed through the first main conduction channel and having a portion adjacent to the active weak link region of the second main conduction channel such that a current in the internal control line will impose a magnetic flux on the weak link region; and (d) electrical connectors connected to provide

Known licensing contacts for major laboratories are listed on page iv

input current to the first and second main conduction channels and to conduct the output current.

325 Method for making an electrically conductive contact useful for joining high transition temperature superconductors. McConeghy, R.J.; Negm, Y.; Zimmerman, G.O. To Universities Research Association, Inc. 1992. Filed date 6 Jun 1992. USA Patent Application 7-902,224. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. (SSCL-ORTA-19). Source: Superconducting Super Collider Lab., 2550 Beckleymeade Ave., Dallas, TX 75237 (United States); Contact: Graw, Leroy H. ((214)708-1069).

This describes a method for making an electrically conductive contact of reduced resistance which is very useful for the electrical juncture of a superconductive material. A noble metal is obtained in a fragmented form and is applied on a chosen surface of a high transition superconductive material. It is then heated to a temperature till the noble metal becomes embedded in the superconductive material. Then additional noble metal fragments are added as a final external coating over the treated area of the superconductive material and heated again. Any high transition superconductive material may be employed to form an electrically conductive contact which provides minimal electrical resistance for the union and function. A typical resistance provided by the conductive contact formed is a 1 exp(-7) ohms/sqr(cm). The present methodology may be employed and practiced to deposit the contact either before annealing or after annealing with oxygen unlike the conventionally known methods. This methodology has no need for the vacuum vapor deposition equipment or vacuum techniques due to which there is no limitation on the size or the dimensions of the superconductive material which is to be provided with an electrical contact.

99 GENERAL AND MISCELLANEOUS

Mathematics and Computers

Refer also to citation(s) 275

326 Digital programmable level-1 trigger with 3D-flow assembly. Crosetto, D.B. To Universities Research Association, Inc. [1993]. Filed date 8 Aug 1993. USA Patent Application 7-101,489. [10] Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. (SSCL-ORTA-60). Source: Superconducting Super Collider Lab., 2550 Beckleymeade Ave., Dallas, TX 75237 (United States); Contact: Graw, Leroy H. ((214)708-1069).

The system makes use of standard rack assembly for implementing 3-D flow parallel processing systems. It allows efficient interconnection of standard data acquisition systems assembly to a stack of boards of 3-D flow parallel processing system at a 90 degree angle between the two systems. This allows implementation of a number of different topologies (e.g. planar, cylindrical, spherical etc.), and a very high communication bandwidth at low cost. The interconnection among the processors in the parallel processing system can be in six directions, with a time difference between any two signals received by a processor being less than 1 nano second. The interconnection topology allows equal cable length and time which is a feature which cannot be found in the conventional systems. High speeds and low power consumption are achieved using this feature. This invention is useful in particle identification in high energy physics (calorimeter data filtering, processing and data reduction, track funding and rejection), pattern recognition in radar systems, biological molecular studies, graphic processors, high rate data acquisition.

327 Double domino driver. Vanstraelen, G.F. To Universities Research Association, Inc. 1992. Filed date 12 Dec 1992. USA Patent Application 7-997,593. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. (SSCL-ORTA-21). Source: Superconducting Super Collider Lab., 2550 Beckleymeade Ave., Dallas, TX 75237 (United States); Contact: Graw, Leroy H. ((214)708-1069).

The double domino driver is fully differential and is optimized for low switching noise and power. The noise behavior and power dissipation is improved by limiting the signal swing. The domino driver consists of a combination of mini drivers, each of which is switched on in two steps. In the first step a voltage equal to a fraction of the supply voltage propagates through the chain of mini drivers and turn them partially on. In the second step the voltage is increased to its maximum value and is made to propagate through the chain, turning the mini drivers completely on. The rise and fall time of the output signal can be increased by adding mini drivers. For a 5 volt supply voltage with 5 mini drivers the switching noise in decreased to levels less than 100 micro volts. The power dissipation with this driver is least as compared to ECL and other logic systems. The double domino driver is useful in communication and VLSI systems.

328 Parallel data transfer network controlled by a dynamically reconfigurable serial network. Crosetto, D.B. To Universities Research Association, Inc. 1992. Filed date 24 Mar 1992. USA Patent Application 7-856,622. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. (SSCL-ORTA-7). Source: Superconducting Super Collider Lab., 2550 Beckleymeade Ave., Dallas, TX 75237 (United States); Contact: Graw, Leroy H. ((214)708-1069).

This patent is a real time high density data communication system designed to operate efficiently in a dynamically configurable, multiprocessor parallel processing environment. In this design a serial communication network is utilized to disseminate commands from a master processor to the slave processors, to control transmission of high density data, to effect communication protocol, and to monitor the status of each slave processor. A parallel channel communication network is utilized in conjunction with two triple port memories at each processor node in the system to efficiently transmit high density data for sustained or burst intervals without having to interleave communication control messages. Each processor node includes a transputer, a digital signal processor, a parallel transfer controller. A very low software overhead time for starting and ending the transfer of data is incurred using this design in contrast with a scalable coherent interface system in which 25% of transmission time is devoted to the communication protocol.

329 **Communication switch for serial and parallel network.** Crosetto, D.B. To Universities Research Association, Inc. 1992. Filed date 6 Dec 1992. USA Patent Application 7-898,081. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. (SSCL-ORTA-16). Source: Superconducting Super Collider Lab., 2500 Beckleymeade Ave., Dallas, TX 75237 (United States); Contact: Graw, Leroy H. ((214)708-1069).

This is a communication switch apparatus and a method for use in a geographically extensive serial, parallel or hybrid communication network, linking a multiprocessor or parallel processing system. It has a very low software processing overhead and accommodates random burst of high density data. Each processor has a communication switch which may have a data source, data destination, sensor or a robot associated with it. The configuration of the switches are coordinated through a master processor node and depends on the operational phase of the multiprocessor network:data acquisition, data processing and data exchange. The communication system design maximizes data routing while maintaining data integrity which is achieved through the reduction of communication protocol overhead and amplification of signals.

330 **Parallel processing architecture.** Crosetto, D.B. To Universities Research Association, Inc. 1992. Filed date 12 Dec 1992. USA Patent Application 8-043,776. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. (SSCL-ORTA-32). Source: Superconducting Super Collider Lab., 2550 Beckleymeade Ave., Dallas, TX 75237 (United States); Contact: Graw, Leroy H. ((214)708-1069).

The parallel processing architecture provides a processor array which accepts input data at a faster rate that its processing elements are able to execute. The main features of this architecture are its programmability, scalability, high bandwidth communication and low cost. It provides high connectivity while maintaining minimum distance between processor elements. This architecture enables construction of a parallel processing with high bandwidth communication in six directions among the neighboring processors. It provides for future growth into more complex and optimized algorithms, and facilitiates incorporation of hardware advances with little effect on currently installed systems. Parallel processing architecture is useful for data sharing in an array, pattern recognition within a data array and sustaining a data input rate which is higher than the pattern recognition algorithm execution time (particle identification in high energy physics).

331 **Three dimensional flow processor.** Crosetto, D.B. To Universities Research Association, Inc. 1992. Filed date 12 Dec 1992. USA Patent Application 7-993,383. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. (SSCL-ORTA-24). Source: Superconducting Super Collider Lab., 2550 Beckleymeade Ave., Dallas, TX 75237 (United States); Contact: Graw, Leroy H. ((214)708-1069).

The 3D-flow processor is a general purpose programmable data stream pipelined device that allows fast data movement in six directions for digital signal processing applications such as identifying objects in a matrix in a programmable form. The 3D-flow processor can be used in one dimensional, two dimensional, and three dimensional topologies capable of sustaining an input data rate of up to 100 million data (or frames) per second in a parallel processing system.

332 **Communication link with constant delay.** Miller, S.A. To Universities Research Association, Inc. 1991. Filed date 13 Dec 1991. USA Patent Application 7-807,141. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. (SSCL-ORTA-1). Source: Superconducting Super Collider Lab., 2550 Beckleymeade Ave., Dallas, TX 75237 (United States); Contact: Graw, Leroy H. ((214)708-1069).

This is a technique that enables the transmission of data on a transmission and reception of data. A programmable delay element is fixed in the transmission line and programmed to add or subtract an appropriate amount of delay to compensate for changes and thereby maintain the overall delay at a predetermined value. The electrical transmission system is coupled via an optical coupler to a fiber optic line. The destination of the fiber optic line is equipped with a means for reflecting a portion of the transmitted information so as to provide an indication of a round trip delay at the transmitting end. By using continuous time compensation, the communication does not distort information as a phase compensated system would do, and also allows higher accuracy for synchronization between transmitter and receiver.

Information Handling

Refer also to citation(s) 326

333 **Apparatus and method for loading and unloading multiple digital tape cassettes utilizing a removable magazine.** Lindenmeyer, C.W. To Universities Research Association, Inc., Washington, DC (US). USA Patent 5,182,686/A/. 26 Jan 1993. Filed date 4 Apr 1990. USA Patent Application 7-504,439. Int. Cl. G11B 15/68; B65D 85/672. [10] DOE Contract AC02-76CH03000. Source: Patent and Trademark Office, Box 9, Washington, DC 20232 (US).

An apparatus and method to automate the handling of multiple digital tape cassettes for processing by commercially available cassette tape readers and recorders. A removable magazine rack stores a plurality of tape cassettes, and cooperates with a shuttle device that automatically inserts and removes cassettes from the magazine to the reader and vice-versa. Photocells are used to identify and index to the desired location.

334 **Analog-to-digital converter with data processing.** Jones, A. To Universities Research Association, Inc. 1993. Filed date 7 Jul 1993. USA Patent Application 7-088,164. 47p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC35-89ER40486. (SSCL-ORTA–28). Source: Superconducting Super Collider Lab., 2550 Beckleymeade Ave., Dallas, TX 75237 (United States); Contact: Graw, Leroy H. ((214)708-1069).

This device incorporates an analog-digital converter including a data processing section which can be used to perform data processing on digitized data as is generated, off-line from the system processor. It consists of a 12 bit analog to digital converter for generating discrete digital data representative of an input analog signal, a data bus coupled to receive the digital data as is generated, a 512 Kbyte memory RAM to store the digitized data, and a system bus coupled to the data processing element for outputting the result of the performed operation. This is the first device with analog to digital converters and memory. It is the first module to be designed to the VXIbus format. This device is the first to incorporate an averaging circuit in the design. It has a sealed analog module (outputs the sum and difference of the log signals for both the X and the Y axis of the beam position module), memory channels, four averaging channels the programmable trigger and digitizer clock logic, and a VXIbus interface. This device is useful in the fields of data acquisition, data processing, communication systems, instrumentation and electronics.

Inventor Index

In this index the name of the individual to whom a patent was granted is indexed in the form appearing in the publication cited. In cases where the patent was granted in more than one name, an entry is provided for each inventor. The entry for the primary inventor (first inventor listed on the abstracted document) includes the full document title, abstract number, and the patent number which is given in parentheses. Entries for other inventors provide a cross-reference to the first inventor entry. Accent marks are not input because of computer alphabetization. Spelling and transliteration follow standard conventions.

A

Abraham, K.M., Solid electrolytes, 93:246 (USA Patent 5,219,679/A/)
Ackerman, J.P., Plutonium recovery from spent reactor fuel by uranium displacement, 93:20 (USA patent application 7-703,641)
Agnew, S.F., *See* Sinha, D.N., 93:312
Alamgir, M., *See* Abraham, K.M., 93:246
Albaugh, E.W., *See* Davis, B.E., 93:11
Alcazar, D.G., *See* Light, G.M., 93:296
Allman, S.L., Charged particle mobility refrigerant analyzer, 93:281 (USA Patent 5,184,015/A/)
Almon, A.C., Voltammetric analysis apparatus and method, 93:103 (USA Patent 5,217,112/A/)
Alonso, C.T., Oil/gas separator for installation at burning wells, 93:18 (USA Patent 5,191,940/A/)
Anderson, I.E., Atomizing nozzle and process, 93:258 (USA Patent 5,228,620/A/)
See McCallum, R.W., 93:256
Anderson, M.A., Microporous alumina ceramic membranes, 93:262 (USA Patent 5,208,190/A/)
Andexler, G., *See* Elsharkawi, M.A., 93:244
Andres Rodriquez, P.L. d, *See* Saldin, D.K., 93:278
Angel, S.M., *See* Myrick, M.L., 93:106
Anthony, R.G., Crystalline titanate catalyst supports, 93:17 (USA Patent 5,177,045/A/)
Apel, W.A., Clay enhancement of methane, low molecular weight hydrocarbon and halocarbon conversion by methanotrophic bacteria, 93:38 (USA patent application 7-738,001)
Arganbright, R.P., *See* Smith, L.A. Jr., 93:231
Argo, P.E., Fading channel simulator, 93:161 (USA Patent 5,191,594/A/)
Arnold, J.W., Asynchronous parallel status comparator, 93:138 (USA patent application 7-678,428)
Arnold, W.D. Jr., Zinc oxide varistors and/or resistors, 93:265 (USA Patent 5,231,370/A/)
Asay, J.R., *See* Hawke, R.S., 93:199
Ashley, C.S., Process for making solid-state radiation-emitting composition, 93:116 (USA Patent 5,240,647/A/)
Asokakumar, P.P.V., Determination of interfacial states in solid heterostructures using a variable-energy positron beam, 93:323 (USA Patent 5,200,619/A/)
Atimtay, A.T., *See* Gasper-Galvin, L.D., 93:14

B

Babcock, W.C., *See* Friesen, D.T., 93:232
Baker, E.G., Method of upgrading oils containing hydroxyaromatic hydrocarbon compounds to highly aromatic gasoline, 93:223 (USA Patent 5,180,868/A/)
Baker, J.D., Tritium monitor and collection system, 93:202 (USA patent application 7-674,981)
Ball, D.G., Coupling apparatus for a metal vapor laser, 93:162 (USA Patent 5,189,678/A/)
Magnetic compression laser driving circuit, 93:167 (USA Patent 5,177,754/A/)
Ban-Yen Lai, *See* Laverman, R.J., 93:322
Barton, T.J., Diorganosilacetylene-alt-diorganosilvinylene polymers and a process of preparation, 93:263 (USA Patent 5,241,029/A/)
Bauer, H.F., *See* Cha, C.H., 93:235
Baumann, E.W., Colorimetric determination of pH, 93:97 (USA patent application 7-681,297)
Bechtel, T.F., Water augmented indirectly-fired gas turbine system and method, 93:73 (USA patent application 7-709,567)
Beeckman, J.W., *See* Ziebarth, M.S., 93:227
Bein, T., *See* Frye, G.C., 93:107
Beller, L.S., Ultrasonic tomography for in-process measurements of temperature in a multi-phase medium, 93:294 (USA Patent 5,181,778/A/)
Bender, D.A., *See* Alonso, C.T., 93:18
Benicewicz, B.C., Polyamide thermosets, 93:111 (USA Patent 5,198,551/A/)
Bennett, G.A., Compact acoustic refrigerator, 93:178 (USA patent application 7-710,207)
Bennett, T., *See* Zonca, F., 93:195
Benson, D.K., Compact vacuum insulation, 93:249 (USA Patent 5,175,975/A/)
Microwave impregnation of porous materials with thermal energy storage materials, 93:46 (USA Patent 5,202,150/A/)
See Stafford, B.L., 93:93
Bernhardt, A., *See* Rasmussen, P., 93:150
Bernhardt, A.F., Microchannel cooling of face down bonded chips, 93:152 (USA Patent 5,218,515/A/)
Three dimensional, multi-chip module, 93:144 (USA Patent 5,241,450/A/)
Berry, G.F., Method and apparatus for transporting liquid slurries, 93:130 (USA Patent 5,193,942/A/)
Berta, V.T., Simulated nuclear reactor fuel assembly, 93:51 (USA Patent 5,200,144/A/)
Berthold, J.W., Fluorescence analyzer for lignin, 93:239 (USA Patent 5,216,483/A/)
Internal temperature monitor for work pieces, 93:308 (USA Patent 5,226,730/A/)
Beyer, J.B., *See* Martens, J.S., 93:324
Bibler, J.P., Method and apparatus for removing ions from soil, 93:205 (USA Patent 5,190,628/A/)
Bieg, L.F., Vortex nozzle for segmenting and transporting metal chips from turning operations, 93:69 (USA Patent 5,203,509/A/)
X-Z-Theta cutting method, 93:80 (USA Patent 5,178,498/A/)
Biermann, W.J., *See* DeVault, R.C., 93:252
Birx, D., *See* Ball, D.G., 93:167
Bissett, L.A., *See* Strickland, L.D., 93:12
Black, S.K., *See* Chum, H.L., 93:39, 93:267
Blair, D.S., Method and apparatus for acoustic plate mode liquid-solid phase transition detection, 93:136 (USA Patent 5,187,980/A/)
Blake, R.D., Microwave sintering of multiple articles, 93:83 (USA Patent 5,227,600/A/)
Blalock, T.V., *See* Shepard, R.L., 93:307
Bloom, I.D., Method of electrode fabrication and an electrode for metal chloride battery, 93:58 (USA Patent 5,194,343/A/)
Solid-oxide fuel cell electrolyte, 93:63 (USA Patent 5,213,911/A/)
See Krumpelt, M., 93:62
Bloomer, W., *See* Ranadive, G., 93:317
Bond, W.D., *See* Arnold, W.D. Jr., 93:265

Borenstein, J., Error-eliminating rapid ultrasonic firing, 93:290 (USA Patent 5,239,515/A/)
Boroski, W.N., *See* Gonczy, J.D., 93:266
Bourne, G.L., *See* Baker, J.D., 93:202
Bowman, B.R., *See* Alonso, C.T., 93:18
Boyd, G.L., *See* Carruthers, W.D., 93:254
Bradbury, E.M., *See* Crissman, H.A., 93:211
Breault, R.W., *See* Mathur, V.K., 93:225
Brinker, C.J., *See* Ashley, C.S., 93:116
See Frye, G.C., 93:107
Britton, C.L. Jr., Method and apparatus for providing pulse pile-up correction in charge quantizing radiation detection systems, 93:176 (USA Patent 5,225,682/A/)
Broekaert, W.F., *See* Raikhel, N.V., 93:236
Brown, J.D., *See* Simandl, R.F., 93:272
Brucker, J.P., High voltage feed through bushing, 93:156 (USA Patent 5,200,578/A/)
Bryan, C.S., Selectable fragmentation warhead, 93:201 (USA Patent 5,229,542/A/)
Buchanan, B.R., Fiber optic hydrogen sensor, 93:96 (USA patent application 7-678,520)
See Baumann, E.W., 93:97
Buelow, S.J., *See* Rofer, C.K., 93:64
Buican, T.N., Apparatus and method for measuring fluorescence intensities at a plurality of wavelengths and lifetimes, 93:276 (USA Patent 5,208,651/A/)
Programmable spectral imaging method and apparatus, 93:98 (USA patent application 7-693,466)
Burnham, A.K., *See* Alonso, C.T., 93:18
Burns, C.J., *See* Van Der Sluys, W.G., 93:114
Burrows, R.W., *See* Benson, D.K., 93:46
Burton, F.G., Root-growth-inhibiting sheet, 93:314 (USA Patent 5,181,952/A/)
Byers, J.A., *See* Stallard, B.W., 93:221

C

Caldwell, J.T., *See* Schultz, F.J., 93:279
Callahan, A.P., *See* Knapp, F.F. Jr., 93:288
Can, J., *See* Glatfelter, T., 93:242
Carasso, M., *See* Jorgensen, G.J., 93:45
Carlson, D.O., Glovebox plug for glove changing, 93:121 (USA patent application 7-680,975)
Material containment enclosure, 93:118 (USA patent application 7-678,387)
See Martell, C.J., 93:127
Carruthers, W.D., High temperature turbine engine structure, 93:254 (USA Patent 5,228,284/A/)
Carson, R.F., Integrated optical tamper sensor with planar waveguide, 93:34 (USA Patent 5,177,352/A/)
Casada, D.A., Noninvasive valve monitor using constant magnetic and/or DC electromagnetic field, 93:293 (USA Patent 5,236,011/A/)
Casalnuovo, S.A., *See* Carson, R.F., 93:34
Cataldo, D.A., *See* Burton, F.G., 93:314
Ceglio, N.M., *See* Hawryluk, A.M., 93:166, 93:168
Cervantes, R.A., *See* Light, G.M., 93:296
Cha, C.H., Low-cost process for hydrogen production, 93:235 (USA Patent 5,198,084/A/)
Chastagner, P., Noise reduction in negative-ion quadrupole mass spectrometry, 93:104 (USA Patent 5,204,530/A/)
Chastgner, P., Elimination of "memory" from sample handling and inlet system of a mass spectrometer, 93:100 (USA patent application 7-697,042)
Chen, Chung-Hsuan, Machinable dissolved metal oxide superconductors, 93:82 (USA patent application 7-696,881)
Chen, F.C., *See* Allman, S.L., 93:281
Chesnut, D.A., *See* Alonso, C.T., 93:18
Cheung, C.K., *See* Yeung, E.S., 93:280
Chiang, C.J., Photovoltaic solar concentrator module, 93:44 (USA patent application 7-700,813)
Chienping Ju, *See* Gruen, D.M., 93:94
Chiles, M.M., *See* Larson, I.L., 93:302
Chisheng Wang, *See* Berry, G.F., 93:130
Christensen, W.H., *See* Sinha, D.N., 93:312
Chum, H.L., Phenolic compounds containing/neutral fractions extract and products derived therefrom from fractionated fast-pyrolysis oils, 93:267 (USA Patent 5,223,601/A/)
Process for preparing phenolic formaldehyde resole resin products derived from fractionated fast-pyrolysis oils, 93:241 (USA Patent 5,091,499/A/)
Resole resin products derived from fractionated organic and aqueous condensates made by fast-pyrolysis of biomass materials, 93:39 (USA Patent 5,235,021/A/)
See Evans, R.J., 93:250
Chunghsuan Chen, *See* Allman, S.L., 93:281
Church, J.P., Nuclear reactor flow control method and apparatus, 93:54 (USA patent application 7-689,425)
Nuclear reactor flow control method and apparatus, 93:55 (USA Patent 5,198,185/A/)
Clark, M.C., Method and split cavity oscillator/modulator to generate pulsed particle beams and electromagnetic fields, 93:146 (USA Patent 5,235,248/A/)
Cline, J.F., *See* Burton, F.G., 93:314
Cochran, H.D. Jr., Separation processes using expulsion from dilute supercritical solutions, 93:110 (USA Patent 5,204,003/A/)
Coffey, H.T., Propulsion and stabilization system for magnetically levitated vehicles, 93:75 (USA Patent 5,222,436/A/)
Cohen, G.H., *See* Schrum, P.B., 93:128
Cohen, M.R., Regenerative process and system for the simultaneous removal of particulates and the oxides of sulfur and nitrogen from a gas stream, 93:226 (USA Patent 5,202,101/A/)
Cohen, S.A., *See* Zonca, F., 93:195
Cole, C.M., Disposable sludge dewatering container and method, 93:67 (USA Patent 5,232,599/A/)
Coleman, P.D., *See* Clark, M.C., 93:146
Comaskey, B.J., *See* Paisner, J.A., 93:113
Comer, B.E., *See* Martell, C.J., 93:127
Comfort, W.J. III, *See* Alonso, C.T., 93:18
Conway, T., *See* Ingram, L.O., 93:238
Cook, E.G., *See* Ball, D.G., 93:167
Coops, M.S., Lithium metal reduction of plutonium oxide to produce plutonium metal, 93:79 (USA patent application 7-689,423)
Coppa, N.V., Superconducting microcircuitry by the microlithographic patterning of superconducting compounds and related materials, 93:218 (USA Patent 5,238,913/A/)
Corey, J.C., Flow monitoring and control system for injection wells, 93:31 (USA patent application 7-730,424)
Flow monitoring and control system for injection wells, 93:206 (USA Patent 5,186,255/A/)
In-situ remediation system for groundwater and soils, 93:30 (USA patent application 7-711,686)
Coughlin, P.K., *See* Rabo, J.A., 93:224
Crawford, D.L., Bacterial extracellular lignin peroxidase, 93:237 (USA Patent 5,232,845/A/)
Crissman, H.A., Method for distinguishing normal and transformed cells using G1 kinase inhibitors, 93:211 (USA Patent 5,185,260/A/)
Crosetto, D.B., Communication switch for serial and parallel network, 93:329 (USA patent application 7-898,081)
Digital programmable level-1 trigger with 3D-flow assembly, 93:326 (USA patent application 7-101,489)
Parallel data transfer network controlled by a dynamically reconfigurable serial network, 93:328 (USA patent application 7-856,622)
Parallel processing architecture, 93:330 (USA patent application 8-043,776)
Three dimensional flow processor, 93:331 (USA patent application 7-993,383)
Cucchiara, A.L., *See* MacArthur, D.W., 93:177
Czirr, J.B., Neutron coincidence detectors employing heterogeneous materials, 93:301 (USA Patent 5,231,290/A/)

D

Dahlby, J.W., *See* Martell, C.J., 93:127
Dane, C.B., *See* Hackel, L.A., 93:295
Daniels, E.J., *See* Harkness, J.B.L., 93:251
Davis, B.E., Process for treating moisture laden coal fines, 93:11 (USA Patent 5,231,797/A/)

Davis, J.C., *See* Roberts, M.L., 93:169
Deason, V.A., Beam shuttering interferometer and method, 93:309 (USA Patent 5,231,468/A/)
Deis, G.A., *See* Schlueter, R.D., 93:170
Delnick, F.M., Chloromethyl chlorosulfate as a voltage delay inhibitor in lithium cells, 93:57 (USA Patent 5,202,203/A/)
Dennis, K.W., *See* McCallum, R.W., 93:256
DeRossi, R.S., *See* Nachbar, H.D., 93:48
DeVault, J., *See* Mei, J.S., 93:28
DeVault, R.C., Triple-effect absorption refrigeration system with double-condenser coupling, 93:252 (USA Patent 5,205,136/A/)
DeWald, A.P., *See* Gruen, D.M., 93:94
Diebold, J.P., *See* Chum, H.L., 93:39, 93:267
Dietz, M.L., *See* Horwitz, E.P., 93:25
Dodson, B.W., Method of producing strained-layer semiconductor devices via subsurface-patterning, 93:149 (USA Patent 5,225,368/A/)
Donado, R.A., Carbonate fuel cell anodes, 93:247 (USA Patent 5,206,095/A/)
Dosch, R.G., *See* Anthony, R.G., 93:17
Doughty, D.H., *See* Frye, G.C., 93:107
Draper, R., Solid oxide fuel cell generator, 93:248 (USA Patent 5,200,279/A/)
Drumheller, D.S., Electromechanical transducer for acoustic telemetry system, 93:306 (USA Patent 5,222,049/A/)
Dugan, P.R., *See* Apel, W.A., 93:38
Duncan, R.V., Quantitative method for measuring heat flux emitted from a cryogenic object, 93:217 (USA Patent 5,193,909/A/)
Dunham, M.E., Cavity resonance absorption in ultra-high bandwidth CRT deflection structure by a resistive load, 93:153 (USA Patent 5,210,464/A/)
Dyer, R.B., *See* Rofer, C.K., 93:64

E

Eastman, J.A., Microwave sintering of nanophase ceramics without concomitant grain growth, 93:84 (USA Patent 5,223,186/A/)
Edlund, D.J., Hydrogen-permeable composite metal membrane and uses thereof, 93:234 (USA Patent 5,217,506/A/)
See Friesen, D.T., 93:232
Eggert, J.H., *See* Paisner, J.A., 93:113
Eldredge, P.A., *See* Farcasiu, M., 93:109
Elliott, D.C., *See* Baker, E.G., 93:223
Ellis, P.E. Jr., Cyano- and polycyanometallo-porphyrins as catalysts for alkane oxidation, 93:284 (USA Patent 5,212,300/A/)
Ellis, T.W., *See* Verhoeven, J.D., 93:260
Elsharkawi, M.A., Optically triggered high voltage switch network and method for switching a high voltage, 93:244 (USA Patent 5,180,963/A/)
Ely, W.E., *See* Baker, J.D., 93:202
Engle, G.B., Method of making carbon-carbon composites, 93:268 (USA Patent 5,217,657/A/)
Engler, B.P., Advanced motor driven clamped borehole seismic receiver, 93:215 (USA Patent 5,189,262/A/)
Epperly, M., *See* Ranadive, G., 93:317
Evans, C.J., *See* Lundin, R.L., 93:119
Evans, G.A., Physical mapping of complex genomes, 93:318 (USA Patent 5,219,726/A/)
Evans, R.J., Controlled catalytic and thermal sequential pyrolysis and hydrolysis of mixed polymer waste streams to sequentially recover monomers or other high value products, 93:250 (USA Patent 5,216,149/A/)

F

Farcasiu, M., Synthesis of iron based hydrocracking catalysts, 93:109 (USA Patent 5,214,015/A/)
Fasching, G.E., Three-axis particle impact probe, 93:188 (USA patent application 7-679,488)
See Smith, N.S. Jr., 93:189
Felde, D.K., Ball feeder for replenishing evaporator feed, 93:129 (USA Patent 5,195,651/A/)
Feldman, E.M., *See* Menkhaus, D.E., 93:26
Feldman, M., *See* Hackel, R.P., 93:163
Felker, B., High power, high frequency, vacuum flange, 93:159 (USA Patent 5,196,814/A/)
Felton, J.S., *See* Turteltaub, K.W., 93:321
Figliola, R.S., *See* Anderson, I.E., 93:258
Finnemore, D.K., Strain tolerant microfilamentary superconducting wire, 93:274 (USA Patent 5,189,260/A/)
Fitzgerald, T.J., *See* Argo, P.E., 93:161
Frank, A.J., *See* Gratzel, M., 93:108
See Weaver, P.F., 93:210
Freye, G.C., *See* Blair, D.S., 93:136
Friesen, D.T., Nitrogen sorption, 93:232 (USA Patent 5,225,174/A/)
See Edlund, D.J., 93:234
Froeschner, K.E., Shock destruction armor system, 93:197 (USA Patent 5,214,235/A/)
Frye, G.C., Coatings with controlled porosity and chemical properties, 93:107 (USA Patent 5,224,972/A/)
Fu Jann Pern, *See* Gratzel, M., 93:108
Fuller, K.R., *See* Thornton, G.W., 93:173
Fungming Kong, Low density carbonized composite foams, 93:89 (USA Patent 5,232,772/A/)
Furth, H., *See* Ono, Masayuki, 93:220

G

Gadbois, D.M., *See* Crissman, H.A., 93:211
Gal, E., *See* Cohen, M.R., 93:226
Gallimore, B.F., *See* Martell, C.J., 93:127
Gasper-Galvin, L.D., Sorbent for use in hot gas desulfurization, 93:14 (USA Patent 5,227,351/A/)
Gee, G.W., *See* Treat, R.L., 93:253
Gehrke, R.J., Method of photon spectral analysis, 93:313 (USA Patent 5,206,174/A/)
George, R.A., *See* Draper, R., 93:248
Gettemy, D.J., Laser cutting with chemical reaction assist, 93:122 (USA patent application 7-681,293)
Glatfelter, T., Photovoltaic device with increased light absorption and method for its manufacture, 93:242 (USA Patent 5,228,926/A/)
Glatzmaier, G.C., Manufacture of silicon carbide using solar energy, 93:81 (USA patent application 7-681,296)
Gledhill, B.L.: Davis, J, *See* Turteltaub, K.W., 93:321
Glenn, D.F., Ice electrode electrolytic cell, 93:71 (USA Patent 5,200,054/A/)
Gliebe, R.J., Method and apparatus for detecting timing errors in a system oscillator, 93:147 (USA Patent 5,229,752/A/)
Glish, G.L., *See* McLuckey, S.A., 93:277
Glowka, D.A., Downhole material injector for lost circulation control, 93:137 (USA patent application 7-686,442)
Godshall, N.A., Micro-machined resonator, 93:158 (USA Patent 5,198,716/A/)
Goeringer, D.E., *See* McLuckey, S.A., 93:277
Gonczy, J.D., Method of fabricating a multilayer insulation blanket, 93:266 (USA Patent 5,224,832/A/)
Goodwin, S.G., *See* Gehrke, R.J., 93:313
Googin, J.M., Nonhazardous solvent composition and method for cleaning metal surfaces, 93:320 (USA Patent 5,207,838/A/)
Goretta, K.C., Fracture toughness for copper oxide superconductors, 93:85 (USA Patent 5,202,306/A/)
Goron, R.H., *See* Semans, J.P., 93:134
Gorski, A.J., *See* Harkness, J.B.L., 93:251
Gottesfeld, S., *See* Zawodzinski, T.A., 93:207
Grafe, V.G., Sequencing and fan-out mechanism for causing a set of at least two sequential instructions to be performed in a data flow processing computer, 93:222 (USA Patent 5,226,131/A/)
Grafwaller, E.G., *See* Baker, J.D., 93:202
Grahn, A.R., Force sensor, 93:310 (USA Patent 5,209,126/A/)
Granstaff, V.E., Method for simultaneous measurement of mass loading and fluid property changes using a quartz crystal microbalance, 93:196 (USA Patent 5,201,215/A/)
Gratzel, M., Molecular water oxidation catalyst, 93:108 (USA Patent 5,223,634/A/)
Grey, A.E., Detection device for high explosives, 93:200 (USA patent application 7-707,414)
Grimes, R.W., *See* Cha, C.H., 93:235
Grimm, U., *See* Logan, R.G., 93:184

Gritton, D.G., Non-contact tamper sensing by electronic means, 93:33 (USA Patent 5,237,307/A/)
Secure distance ranging by electronic means, 93:32 (USA patent application 7-727,036)
Grohmann, K., Two-stage dilute acid prehydrolysis of biomass, 93:37 (USA patent application 7-681,299)
See Lastick, S.M., 93:36
Gross, K.C., Expert system for online surveillance of nuclear reactor coolant pumps, 93:53 (USA Patent 5,223,207/A/)
Grossman, M.W., Compact anhydrous HCl to aqueous HCl conversion system, 93:283 (USA Patent 5,215,723/A/)
Method of controlling the mercury vapor pressure in a photo-chemical lamp or vapor filter used for Hg^{196} enrichment, 93:287 (USA Patent 5,187,804/A/)
Process of ^{196}Hg enrichment, 93:285 (USA Patent 5,205,913/A/)
Gruen, D.M., Method of bonding metals to ceramics and other materials, 93:94 (USA Patent 5,176,950/A/)
Guangyao Sheng, *See* Anderson, M.A., 93:262
Gunter, L.W., Safety harness, 93:29 (USA patent application 7-681,291)
Guymon, L.G., *See* Alonso, C.T., 93:18

H

Hackel, L.A., High power, high beam quality regenerative amplifier, 93:295 (USA Patent 5,239,408/A/)
Hackel, R.P., Wavelength meter having single mode fiber optics multiplexed inputs, 93:163 (USA Patent 5,189,485/A/)
Hager, M.J., *See* Ziebarth, M.S., 93:227
Hall, C.A., *See* Hawke, R.S., 93:199
Halm, L.W., Energy curable compositions having improved cure speeds, 93:270 (USA Patent 5,212,210/A/)
Halow, J.S., *See* Mei, J.S., 93:28
Hamilton, V.T., *See* Phillips, D.R., 93:117
Hammer, J.H., Plasma plume MHD power generator and method, 93:60 (USA Patent 5,234,183/A/)
Hammond, G., *See* Glatfelter, T., 93:242
Hapstack, M., Gripping device, 93:124 (USA patent application 7-682,788)
Piping inspection instrument carriage, 93:49 (USA patent application 7-730,425)
Harkness, J.B.L., Hydrogen and sulfur recovery from hydrogen sulfide wastes, 93:251 (USA Patent 5,211,923/A/)
Harris, T.L., *See* Glenn, D.F., 93:71
Hart, M.M., *See* Arnold, J.W., 93:138
Hash, M.C., *See* Bloom, I.D., 93:63
Hawke, R.S., Hybrid armature projectile, 93:199 (USA Patent 5,191,164/A/)
Hawryluk, A.M., Virtually distortion-free imaging system for large field, high resolution lithography using electrons, ions or other particle beams, 93:166 (USA Patent 5,178,974/A/)
Virtually distortion-free imaging system for large field, high resolution lithography, 93:168 (USA Patent 5,176,970/A/)
Hawsey, R.A., Non-intrusive beam power monitor for high power pulsed or continuous wave lasers, 93:164 (USA Patent 5,184,189/A/)
Hay, G.D., *See* Semans, J.P., 93:134
Haynam, C.A., *See* Paisner, J.A., 93:113
Haynes, H.D., *See* Casada, D.A., 93:293
Hearn, D., *See* Smith, L. Jr., 93:230
See Smith, L.A. Jr., 93:229, 93:231
Heckendorn, F.M. II, *See* Hapstack, M., 93:49
Heestand, R.L., *See* Lauf, R.J., 93:261
Heim, J.R., Method of preloading superconducting coils by using materials with different thermal expansion coefficients, 93:219 (USA Patent 5,187,859/A/)
Helmer, R.G., *See* Gehrke, R.J., 93:313
Henfling, J.A., *See* Lenling, W.J., 93:269
Henning, C.D., Oil/gas collector/separator for underwater oil leaks, 93:19 (USA Patent 5,213,444/A/)
See Alonso, C.T., 93:18
Henning, S.A., *See* Upadhye, R.S., 93:90
Henry, R.M., *See* Davis, B.E., 93:11
Hietala, V.M., Digitally controlled distributed phase shifter, 93:145 (USA Patent 5,237,629/A/)
See Martens, J.S., 93:194
Hoch, J.E., *See* Grafe, V.G., 93:222
Hoenig, C.L., High density crystalline boron prepared by hot isostatic pressing in refractory metal containers, 93:264 (USA Patent 5,240,691/A/)
Hogan, B.L., *See* Yeung, E.S., 93:280
Hohenwarter, G.K.G., *See* Martens, J.S., 93:194, 93:324
Holt, J.B., Combustion synthesis method and products, 93:86 (USA Patent 5,198,188/A/)
Hopkins, D.B., Method and apparatus for stabilizing pulsed microwave amplifiers, 93:297 (USA Patent 5,182,524/A/)
Hornak, L.P., *See* Malandra, L.J., 93:243
Horwitz, E.P., Combined transuranic-strontium extraction process, 93:25 (USA patent application 7-717,426)
Hoyt, A.E., *See* Benicewicz, B.C., 93:111
Hrdina, K.E., *See* Donado, R.A., 93:247
Huchton, R.L., *See* MacArthur, D.W., 93:177
Hudson, C.L., *See* Dunham, M.E., 93:153
Hughes, R.C., *See* Blair, D.S., 93:136
Hughes, W.J., Sensor/source electrometer circuit, 93:193 (USA patent application 7-723,120)
Humenik, K.E., *See* Gross, K.C., 93:53

I

Ijadi-Maghsoodi, S., *See* Barton, T.J., 93:263
Ingram, J.C., *See* Glenn, D.F., 93:71
Ingram, L.O., Cloning and sequencing of the alcohol dehydrogenase II gene from Zymomonas Mobilis, 93:238 (USA Patent 5,162,516/A/)

J

Jablonski, P.D., Niobium-titanium superconductors produced by powder metallurgy having artificial flux pinning centers, 93:259 (USA Patent 5,226,947/A/)
Jackson, K.J., *See* Knauss, K.G., 93:101
Jamriska, D.J. Sr., *See* Phillips, D.R., 93:117
Jankowski, A.F., *See* Makowiecki, D.M., 93:273
Jantzen, C.M., Method for making glass, 93:87 (USA patent application 7-690,046)
Jauhuei Tang, *See* Norris, J.R., 93:172
Jeffers, L., *See* Berthold, J.W., 93:239
Jensen, G.L., *See* Czirr, J.B., 93:301
Johnson, G.K., *See* Poa, D.S., 93:102
Johnson, L.O., *See* Gehrke, R.J., 93:313
Johnson, P.G., *See* Semans, J.P., 93:134
Jones, A., Analog-to-digital converter with data processing, 93:334 (USA patent application 7-088,164)
Jones, E.M. Jr., *See* Smith, L. Jr., 93:230
See Smith, L.A. Jr., 93:229
Jones, L.L., *See* Verhoeven, J.D., 93:260
Jorgensen, D.K., Drill string enclosure, 93:72 (USA Patent 5,191,156/A/)
Jorgensen, G.J., Method and apparatus for uniformly concentrating solar flux for photovoltaic applications, 93:45 (USA patent application 7-712,812)

K

Kaback, D.S., *See* Corey, J.C., 93:30
Kaplan, A., *See* McConeghy, R.J., 93:299
Karnowsky, M.M., Irreversible magnetic switch, 93:140 (USA patent application 7-713,206)
Katz, J.D., *See* Blake, R.D., 93:83
See Eastman, J.A., 93:84
Kelly, M., *See* Holt, J.B., 93:86
Kikta, T.J., A method and apparatus for tube crevice detection and measurement, 93:191 (USA patent application 7-707,538)
Kilbane, J.J. II, Useful for cleavage of organic C-S bonds Bacillus sphaericus microorganism, 93:319 (USA Patent 5,198,341/A/)
Killian, E.W., *See* Gehrke, R.J., 93:313
Killian, M.A., *See* Minichan, R.L., 93:123, 93:132
Klingler, R.J., *See* Rathke, J.W., 93:16

Knapp, F.F. Jr., Tungsten-188/carrier-free rhenium-188 perrhenic acid generator system, 93:288 (USA Patent 5,186,913/A/)
Knauss, K.G., Measurement of pH in high ionic strength solutions, 93:101 (USA patent application 7-702,527)
Koehler, D.R., *See* Godshall, N.A., 93:158
Konrad, C.H., *See* Hawke, R.S., 93:199
Koren, Y., *See* Borenstein, J., 93:290
Kotlyar, O.M., Borehole data transmission apparatus, 93:180 (USA Patent 5,197,040/A/)
Fast-acting nuclear reactor control device, 93:52 (USA Patent 5,232,656/A/)
Kotsubo, V.Y., *See* Swift, G.W., 93:216
Koutny, L.B., *See* Yeung, E.S., 93:280
Kramer, W.R., *See* Gliebe, R.J., 93:147
Krauss, A.R., *See* Gruen, D.M., 93:94
Kravitz, S.H., *See* Hietala, V.M., 93:145
Kreibich, R.E., *See* Chum, H.L., 93:39, 93:241, 93:267
Kreider, K.G., Method for bonding thin film thermocouples to ceramics, 93:74 (USA Patent 5,215,597/A/)
Kromka, J.A., *See* Semans, J.P., 93:134
Kronberg, J.W., Adjustable-angle pipe fitting, 93:125 (USA patent application 7-724,662)
Atomic line emission analyzer for hydrogen isotopes, 93:99 (USA patent application 7-697,032)
Atomic line emission analyzer for hydrogen isotopes, 93:105 (USA Patent 5,198,870/A/)
Compact biomedical pulsed signal generator for bone tissue stimulation, 93:213 (USA Patent 5,217,009/A/)
False color viewing device, 93:182 (USA patent application 7-697,158)
Random one-of-N selector, 93:155 (USA Patent 5,204,671/A/)
Remote two-wire data entry method and device, 93:142 (USA patent application 7-720,128)
Solder for oxide layer-building metals and alloys, 93:77 (USA patent application 7-681,290)
Solid state safety jumper cables, 93:59 (USA Patent 5,189,359/A/)
Surface coating for prevention of crust formation, 93:88 (USA patent application 7-730,423)
Wastewater heat recovery method and apparatus, 93:65 (USA patent application 7-718,518)
Krumpelt, M., Ionic conductors for solid oxide fuel cells, 93:62 (USA Patent 5,232,794/A/)
See Bloom, I.D., 93:63
Kucera, E.H., *See* Smith, J.L., 93:61
Kuhns, D.J., *See* Jorgensen, D.K., 93:72
Kuklo, T.C., Monolithic dye laser amplifier, 93:157 (USA Patent 5,199,040/A/)
Kullberg, M.L., *See* Goretta, K.C., 93:85
Kurtz, S.R., *See* Olson, J.M., 93:43
Kush, A., *See* Raikhel, N.V., 93:236
Kynaston, R.L., *See* Gehrke, R.J., 93:313

L

Ladner, E.P., *See* Farcasiu, M., 93:109
Langner, G.H. Jr., Automatically processed alpha-track radon monitor, 93:174 (USA patent application 7-694,738)
Larbalestier, D.C., *See* Jablonski, P.D., 93:259
Larson, I.L., Self-filling and self-purging apparatus for detecting spontaneous radiation from substances in fluids, 93:302 (USA Patent 5,229,604/A/)
Lassahn, G.D., *See* Deason, V.A., 93:309
Lastick, S.M., Combined enzyme mediated fermentation of cellulose and xylose to ethanol, 93:36 (USA patent application 7-672,984)
Lauf, R.J., Device and method for skull-melting depth measurement, 93:261 (USA Patent 5,185,031/A/)
See Arnold, W.D. Jr., 93:265
Laverman, R.J., Method and apparatus for cooling high temperature superconductors with neon-nitrogen mixtures, 93:322 (USA Patent 5,193,349/A/)
LeBoeuf, R.F., *See* Semans, J.P., 93:134
Lenling, W.J., Method for minimizing decarburization and other high temperature oxygen reactions in a plasma sprayed material, 93:269 (USA Patent 5,217,746/A/)
Leong, R., Electrical receptacle, 93:56 (USA Patent 5,221,211/A/)
Lewandowski, A.A., *See* Jorgensen, G.J., 93:45
Lewis, D.R., Fail-safe storage rack for irradiated fuel rod assemblies, 93:23 (USA Patent 5,196,161/A/)
Liang, A.Y., *See* Godshall, N.A., 93:158
Liburdy, R.P., Electromagnetic field triggered drug and chemical delivery via liposomes, 93:212 (USA Patent 5,190,761/A/)
Light, G.M., Ultrasonic transducer for extreme temperature environments, 93:296 (USA Patent 5,195,373/A/)
Lin Chen, *See* Norris, J.R., 93:172
Lindenmeyer, C.W., Apparatus and method for loading and unloading multiple digital tape cassettes utilizing a removable magazine, 93:333 (USA Patent 5,182,686/A/)
Lisic, E.C., *See* Knapp, F.F. Jr., 93:288
Liu, K.C., Apparatus for tensile testing plate-type ceramic specimens, 93:292 (USA Patent 5,237,876/A/)
Logan, R.G., Apparatus for preventing particle deposition from process streams on optical access windows, 93:184 (USA Patent 5,217,510/A/)
Lograsso, B.K., *See* McCallum, R.W., 93:256
Loomis, G.G., *See* Menkhaus, D.E., 93:26
Looney, B.B., *See* Corey, J.C., 93:30
Lundin, R.L., Diamond tool machining of materials which react with diamond, 93:119 (USA patent application 7-678,488)
Lyczkowski, R.W., *See* Berry, G.F., 93:130
Lynds, L. Jr., *See* Weinberger, B.R., 93:245
Lynn, K.G., *See* Asokakumar, P.P.V., 93:323
Lyons, J.E., *See* Ellis, P.E. Jr., 93:284

M

MacArthur, D.W., Alternating current long range alpha particle detector, 93:304 (USA Patent 5,187,370/A/)
Long range alpha particle detector, 93:177 (USA Patent 5,184,019/A/)
Makowiecki, D.M., Magnetron sputtered boron films and Ti/B multilayer structures, 93:273 (USA Patent 5,203,977/A/)
Makowski, M.A., *See* Stallard, B.W., 93:221
Malandra, L.J., Integrated head package for top mounted nuclear instrumentation, 93:243 (USA Patent 5,225,150/A/)
Malito, M.L., *See* Berthold, J.W., 93:239
Maltrud, H.R., *See* Baker, J.D., 93:202
Marder, B.M., *See* Clark, M.C., 93:146
Marrone, B.L., Optical probe for the cytochrome P-450 cholesterol side chain cleavage enzyme, 93:209 (USA Patent 5,208,332/A/)
Martell, C.J., Material isolation enclosure, 93:127 (USA Patent 5,205,624/A/)
Martens, J.S., Apparatus and method for measuring and imaging surface resistance, 93:194 (USA Patent 5,239,269/A/)
Dual control active superconductive devices, 93:324 (USA Patent 5,229,655/A/)
Martin, S.J., Multiple-frequency acoustic wave devices for chemical sensing and materials characterization in both gas and liquid phase, 93:135 (USA Patent 5,235,235/A/)
See Blair, D.S., 93:136
See Granstaff, V.E., 93:196
Massie, N.A., *See* Shao, M., 93:186
Mathur, V.K., NOx reduction by sulfur tolerant coronal-catalytic apparatus and method, 93:225 (USA Patent 5,240,575/A/)
McAtee, J.L., *See* MacArthur, D.W., 93:177, 93:304
McCallum, R.W., Method of making bonded or sintered permanent magnets, 93:256 (USA Patent 5,240,513/A/)
McComas, D.J., Linear electric field mass spectrometry, 93:95 (USA patent application 7-678,081)
McConeghy, R.J., Composite lead for conducting an electric current between 75–80 K and 4.5 K temperatures, 93:299 (USA patent application 7-866,595)
Method for making an electrically conductive contact useful for joining high transition temperature superconductors, 93:325 (USA patent application 7-902,224)
McDaniel, M.R., *See* Felker, B., 93:159
McIntyre, P.M., Gigatron microwave amplifier, 93:148 (USA Patent 5,227,701/A/)
McKamey, C.G., *See* Sikka, V.K., 93:257

McKibbin, T.T., Determination of actinides in urine and fecal samples, 93:214 (USA Patent 5,190,881/A/)
McKoon, R.H., *See* Felde, D.K., 93:129
McLarnon, C.R., *See* Mathur, V.K., 93:225
McLuckey, S.A., Universal collisional activation ion trap mass spectrometry, 93:277 (USA Patent 5,206,509/A/)
Medros, F.G., *See* Mathur, V.K., 93:225
Mei, J.S., Gas stream clean-up filter and method for forming same, 93:28 (USA Patent 5,198,002/A/)
Meikrantz, D.H., *See* Baker, J.D., 93:202
Meixler, L.D., Low volume flow meter, 93:190 (USA patent application 7-694,176)
Melendres, C.A., *See* Nagy, Z., 93:112
Mellor, C.E., *See* Grossman, M.W., 93:285
Menkhaus, D.E., System to control contamination during retrieval of buried TRU waste, 93:26 (USA Patent 5,203,644/A/)
Mensink, D.L., Swirling structure for mixing two concentric fluid flows at nozzle outlet, 93:133 (USA Patent 5,228,624/A/)
Meskanick, G.R., Inflatable containment diaphragm for sealing and removing stacks, 93:70 (USA Patent 5,201,345/A/)
Mestha, L.K., Phase-locked loop with control phase slippage, 93:300 (USA patent application 7-807,144)
Meuschke, R.E., *See* Malandra, L.J., 93:243
Meyer, B.J., Neural network system and methods for analysis of organic materials and structures using spectral data, 93:275 (USA Patent 5,218,529/A/)
Meyer, L.C., *See* Menkhaus, D.E., 93:26
Meyer, R.E., Magnetic gripper device, 93:131 (USA Patent 5,192,155/A/)
Michelangelo, D., Simplified flangeless unisex waveguide coupler assembly, 93:154 (USA Patent 5,208,569/A/)
Miller, J.L., *See* Ball, D.G., 93:162
Miller, S.A., Communication link with constant delay, 93:332 (USA patent application 7-807,141)
Miller, S.D., Environmental radiation detection via thermoluminescence, 93:303 (USA Patent 5,196,704/A/)
Miller, T.A., *See* Finnemore, D.K., 93:274
See Jorgensen, D.K., 93:72
Miller, V.C., *See* Larson, I.L., 93:302
Miller, W.K., *See* Friesen, D.T., 93:232
Minichan, R.L., Gripper deploying and inverting linkage, 93:123 (USA patent application 7-681,294)
Gripper deploying and inverting linkage, 93:132 (USA Patent 5,190,333/A/)
Mirzadeh, S., *See* Knapp, F.F. Jr., 93:288
Mitchell, R.D., *See* Kikta, T.J., 93:191
Moeller, C.P., *See* Michelangelo, D., 93:154
Mohagheghi, A., *See* Lastick, S.M., 93:36
Moller, K., *See* Frye, G.C., 93:107
Molnar, H.M., *See* Anderson, I.E., 93:258
Montoya, N.I., *See* Bryan, C.S., 93:201
Moore, W.E., Two stage sorption of sulfur compounds, 93:47 (USA patent application 7-697,041)
Mulcahey, T.P., *See* Poa, D.S., 93:102
Mullen, C.K., *See* Menkhaus, D.E., 93:26
Mullins, L.E., *See* Nachbar, H.D., 93:48
Munavalli, S., *See* Gratzel, M., 93:108
Myles, K.M., *See* Krumpelt, M., 93:62
Myrick, M.L., Fiber-optic apparatus and method for measurement of luminescence and Raman scattering, 93:106 (USA Patent 5,194,913/A/)

N

Nachbar, H.D., Automated robotic equipment for ultrasonic inspection of pressurizer heater wells, 93:48 (USA Patent 5,194,215/A/)
Nagy, Z., Electrochemical cell, 93:112 (USA patent application 7-689,426)
Nambai Chua, *See* Raikhel, N.V., 93:236
Negm, Y., *See* McConeghy, R.J., 93:299, 93:325
Nelson, A.J., *See* Stafford, B.L., 93:93
Nelson, M.A., A fiber optically isolated and remotely stabilized data transmission system, 93:179 (USA patent application 7-717,580)
Nelson, P.A., *See* Bloom, I.D., 93:58
Newman, D.F., Method and apparatus for close packing of nuclear fuel assemblies, 93:233 (USA Patent 5,198,183/A/)
Newnam, B.E., *See* Viswanathan, V.K., 93:185
Niemann, R.C., *See* Gonczy, J.D., 93:266
Nordholt, J.E., *See* McComas, D.J., 93:95
Nordman, J.E., *See* Martens, J.S., 93:324
Norris, J.R., Single-bunch synchrotron shutter, 93:172 (USA Patent 5,225,788/A/)
Notestein, J.E., Grate assembly for fixed-bed coal gasifier, 93:13 (USA Patent 5,230,716/A/)
Shielded fluid stream injector for particle bed reactor, 93:66 (USA Patent 5,232,673/A/)

O

Odell, D.M.C., Audible radiation monitor, 93:175 (USA Patent 5,231,288/A/)
Olson, J.M., Current-matched high-efficiency, multijunction monolithic solar cells, 93:43 (USA Patent 5,223,043/A/)
Ono, Masayuki, Injection of electrons with predominantly perpendicular energy into an area of toroidal field ripple in a tokamak plasma to improve plasma confinement, 93:220 (USA Patent 5,225,146/A/)
Ortiz, M.G., Electrical network method for the thermal or structural characterization of a conducting material sample or structure, 93:151 (USA Patent 5,217,304/A/)
Ostenson, J.E., *See* Finnemore, D.K., 93:274

P

Paisley, D.L., *See* Bryan, C.S., 93:201
Paisner, J.A., Gadolinium photoionization process, 93:113 (USA Patent 5,202,005/A/)
Palekar, V.M., *See* Tierney, J.W., 93:240
Paris, R.D., *See* Hackel, R.P., 93:163
Park, L.R., *See* Hapstack, M., 93:49
Parsons, E.J. Jr., *See* Bechtel, T.F., 93:73
Partin, J.K., *See* Grey, A.E., 93:200
Patterson, F.G., *See* Perry, M.D., 93:139
Peacock, H.B., Method and device for frictional welding, 93:22 (USA patent application 7-724,660)
Pedersen, K.B., *See* Alonso, C.T., 93:18
Perry, M.D., Ring regenerative laser amplifier, 93:139 (USA patent application 7-704,590)
Perry, R.A., NO reduction using sublimation of cyanuric acid, 93:15 (USA Patent 5,180,565/A/)
Petersen, R.W., *See* Bernhardt, A.F., 93:144
Peterson, C.G., Circular zig-zag scan video format, 93:181 (USA patent application 7-672,983)
Petty, J.D., Mounting for ceramic scroll, 93:255 (USA Patent 5,186,006/A/)
Phillips, D.R., Production of selenium-72 and arsenic-72, 93:289 (USA Patent 5,204,072/A/)
Recovery of germanium-68 from irradiated targets, 93:117 (USA Patent 5,190,735/A/)
Pierce, R.D., *See* Poa, D.S., 93:102
Piltch, M.S., Explosive laser light initiation of propellants, 93:198 (USA Patent 5,212,339/A/)
Plecha, S., *See* Ziebarth, M.S., 93:227
Poa, D.S., Electrowinning process with electrode compartment to avoid contamination of electrolyte, 93:102 (USA Patent 5,225,051/A/)
Potter, T.F., *See* Benson, D.K., 93:249
Powers, R.E., *See* McConeghy, R.J., 93:299
Prather, W.S., *See* Buchanan, B.R., 93:96
Pullockaran, J.D., *See* Krumpelt, M., 93:62
Putnam, M.H., *See* Gehrke, R.J., 93:313

R

Rabo, J.A., Catalysts for conversion of syngas to liquid motor fuels, 93:224 (USA Patent 4,652,538/A/)
Raikhel, N.V., cDNA encoding a polypeptide including a hevein sequence, 93:236 (USA Patent 5,187,262/A/)
Ramachandra, M., *See* Crawford, D.L., 93:237

Ranadive, G., Regioselective chemical modification of monoclonal antibodies, 93:317 (USA Patent 5,208,008/A/)
Rasmussen, P., Coherence delay augmented laser beam homogenizer, 93:150 (USA Patent 5,224,200/A/)
Rathke, J.W., Cobalt carbonyl catalyzed olefin hydroformylation in supercritical carbon dioxide, 93:16 (USA Patent 5,198,589/A/)
Reed, S., *See* Ashley, C.S., 93:116
Remick, R.J., *See* Donado, R.A., 93:247
Ricco, A.J., *See* Blair, D.S., 93:136
See Martin, S.J., 93:135
Rigsbee, J.M., *See* Gruen, D.M., 93:94
Rishpon, J., *See* Zawodzinski, T.A., 93:207
Roberts, M.J., *See* Shepard, R.L., 93:307
Roberts, M.L., Small system for tritium accelerator mass spectrometry, 93:169 (USA Patent 5,189,302/A/)
Rofer, C.K., Conversion of hazardous materials using supercritical water oxidation, 93:64 (USA patent application 7-677,738)
Rosser, R., *See* Suckewer, S., 93:311
Rossing, T.D., Expansion joint for guideway for magnetic levitation transportation system, 93:76 (USA Patent 5,184,557/A/)
Rosso, D.T., *See* Meskanick, G.R., 93:70
Rothman, A.J., Tungsten-yttria carbide coating for conveying copper, 93:160 (USA Patent 5,194,218/A/)
Rozenzweig, H.S., *See* Ranadive, G., 93:317
Russell, A.M., *See* Verhoeven, J.D., 93:260

S

Saldin, D.K., Method and apparatus for atomic imaging, 93:278 (USA Patent 5,200,618/A/)
Salyer, I.O., Dry powder mixes comprising phase change materials, 93:271 (USA Patent 5,211,949/A/)
Samsel, E.G., Enantioselective synthesis of L-(-)-4-boronophenylalanine (L-BPA), 93:115 (USA patent application 7-710,208)
Sanders, S.C., *See* Finnemore, D.K., 93:274
Sauer, N.N., Actinide metal processing, 93:24 (USA patent application 7-680,972)
Sauve, G.L., *See* Hawke, R.S., 93:199
Schlueter, R.D., Tunability enhanced electromagnetic wiggler, 93:170 (USA patent application 7-672,308)
Schrum, P.B., Underwater manipulator, 93:128 (USA Patent 5,203,645/A/)
Schultz, F.J., Hidden explosives detector employing pulsed neutron and x-ray interrogation, 93:279 (USA Patent 5,200,626/A/)
Schultz, P., Catalytic and reactive polypeptides and methods for their preparation and use, 93:316 (USA Patent 5,215,889/A/)
Schultz, P.G., Antibody-mediated cofactor-driven reactions, 93:315 (USA Patent 5,219,732/A/)
Schurman, W.R., Method and apparatus for continuous lamination of sheet material, 93:141 (USA patent application 7-713,208)
Schwartzkopf, L.A., *See* Finnemore, D.K., 93:274
Scott, D.W., *See* Menkhaus, D.E., 93:26
Scudiere, M.B., *See* Hawsey, R.A., 93:164
Sefcik, J.A., *See* Alonso, C.T., 93:18
Sellers, J.P., *See* Meyer, B.J., 93:275
Semans, J.P., Basic fluid system trainer, 93:134 (USA Patent 5,178,543/A/)
Shahinpoor, M., *See* Hawke, R.S., 93:199
Shalkowski, E. Jr., *See* Carlson, D.O., 93:121
Shao, M., Laser metrology for coherent multi-telescope arrays, 93:186 (USA Patent 5,208,654/A/)
Shapiro, C., High speed door assembly, 93:204 (USA Patent 5,205,069/A/)
Sheinberg, H., High strength and density tungsten-uranium alloys, 93:78 (USA patent application 7-681,295)
Shepard, R.L., Dual-mode self-validating resistance/Johnson noise thermometer system, 93:307 (USA Patent 5,228,780/A/)
Shera, E.B., Ordered transport and identification of particles, 93:208 (USA Patent 5,209,834/A/)
Shockling, L.A., *See* Draper, R., 93:248
Sickafus, K.E., *See* Eastman, J.A., 93:84
Sikka, V.K., Iron-aluminum alloys having high room-temperature and method for making same, 93:257 (USA Patent 5,238,645/A/)
Silberkleit, L.I., *See* Elsharkawi, M.A., 93:244
Simandl, R.F., Microcellular carbon foam and method, 93:272 (USA Patent 5,208,003/A/)
See Googin, J.M., 93:320
Simmons, C.M., *See* Peterson, C.G., 93:181
Simpson, D.J., *See* Marrone, B.L., 93:209
Singer, R.M., *See* Gross, K.C., 93:53
Sinha, D.N., Nitrogen dioxide detection, 93:312 (USA Patent 5,222,388/A/)
Siriwardane, R.V., Catalysts for conversion of methane to higher hydrocarbons, 93:41 (USA Patent 5,177,294/A/)
Skiens, W.E., *See* Burton, F.G., 93:314
Skinner, C.H., *See* Suckewer, S., 93:311
Sleefe, G.E., *See* Engler, B.P., 93:215
Smith, B.K., *See* Godshall, N.A., 93:158
Smith, D.C., *See* Van Der Sluys, W.G., 93:114
Smith, J.A., *See* Alonso, C.T., 93:18
Smith, J.L., All ceramic structure for molten carbonate fuel cell, 93:61 (USA patent application 7-685,759)
Smith, L. Jr., Method for conducting exothermic reactions, 93:230 (USA Patent 5,177,289/A/)
Smith, L.A. Jr., Alkylation of organic aromatic compounds, 93:231 (USA Patent 5,176,883/A/)
Reactor for exothermic reactions, 93:229 (USA Patent 5,190,730/A/)
Smith, M.F., *See* Lenling, W.J., 93:269
Smith, N.S. Jr., Three axis velocity probe system, 93:189 (USA patent application 7-683,014)
See Fasching, G.E., 93:188
Smither, R.K., Electromagnetic induction pump for pumping liquid metals and other conductive liquids, 93:291 (USA Patent 5,209,646/A/)
Snyder, J.J., Active imaging system with Faraday filter, 93:187 (USA Patent 5,202,741/A/)
Microoptic lenses, 93:298 (USA Patent 5,181,224/A/)
Sopori, B.L., Apparatus for synthesis of a solar spectrum, 93:183 (USA Patent 5,217,285/A/)
Controlled metal-semiconductor sintering/alloying by one-directional reverse illumination, 93:91 (USA Patent 5,223,453/A/)
Speer, R., *See* Grossman, M.W., 93:283
Stafford, B.L., High rate chemical vapor deposition of carbon films using fluorinated gases, 93:93 (USA Patent 5,198,263/A/)
Stahl, D.B., *See* Bryan, C.S., 93:201
Stallard, B.W., Apparatus for conversion of whispering-gallery modes into a free space Gaussian like beam, 93:221 (USA patent application 7-711,693)
Stanker, L.H., *See* Turteltaub, K.W., 93:321
Steinmeyer, P.A., Multiple wavelength x-ray monochromators, 93:192 (USA patent application 7-714,805)
Stewart, D.D., *See* Lundin, R.L., 93:119
Stone, M.L., *See* Grey, A.E., 93:200
Stone, W.A., *See* Martell, C.J., 93:127
Strauch, M.S., *See* Alonso, C.T., 93:18
Strickland, L.D., Two-stage fixed-bed gasifier with selectable middle gas off-take point, 93:12 (USA patent application 7-697,033)
Striker, R.P., *See* Engler, B.P., 93:215
Sturcken, E.F., Metal recovery from porous materials, 93:21 (USA patent application 7-723,122)
Suciu, D.F., *See* Glenn, D.F., 93:71
Suckewer, S., Reflection soft X-ray microscope and method, 93:311 (USA Patent 5,177,774/A/)
Susoeff, A.R., *See* Hawke, R.S., 93:199
Swift, G.W., Superfluid thermodynamic cycle refrigerator, 93:216 (USA patent application 7-679,498)

T

Talarek, T.R., *See* Hapstack, M., 93:49
Thompson, L.M., *See* Googin, J.M., 93:320
Thompson, R.E., Method for enhanced atomization of liquids, 93:68 (USA Patent 5,217,362/A/)
Thomsen, J.U., *See* Meyer, B.J., 93:275
Thornton, G.W., High resolution data acquisition, 93:173 (USA Patent 5,200,933/A/)
Thurnauer, M., *See* Norris, J.R., 93:172
Tierney, J.W., Methanol synthesis using a catalyst combination of alkali or alkaline earth salts and reduced copper chromite for methanol synthesis, 93:240 (USA Patent 5,221,652/A/)
Timberlake, J.R., *See* Zonca, F., 93:195

Tobey, R.A., *See* Crissman, H.A., 93:211
Toews, H.G., *See* Whitehead, J.C., 93:126
Torget, R.W., *See* Grohmann, K., 93:37
Toshifumi Sugama, Solid-gel precursor solutions and methods for the fabrication of polymetallicsiloxane coating films, 93:286 (USA Patent 5,200,237/A/)
Tracy, C.E., *See* Stafford, B.L., 93:93
Treat, R.L., Method of draining water through a solid waste site without leaching, 93:253 (USA Patent 5,183,355/A/)
Trivett, G.S., *See* Davis, B.E., 93:11
Tucker, M.P., *See* Lastick, S.M., 93:36
Tuggle, D.G., *See* Baker, J.D., 93:202
Turteltaub, K.W., Method of measurement in biological systems, 93:321 (USA Patent 5,209,919/A/)

U

Underwood, D.G., Particle beam generator using a radioactive source, 93:35 (USA Patent 5,198,674/A/)
Unkefer, C.J., *See* Marrone, B.L., 93:209
Unruh, W.P., *See* MacArthur, D.W., 93:177
Upadhye, R.S., Production of hollow aerogel microspheres, 93:90 (USA Patent 5,227,239/A/)
Utt, C.E., *See* Fasching, G.E., 93:188
See Smith, N.S. Jr., 93:189

V

Vail, W.B. III, Measuring resistivity changes from within a first cased well to monitor fluids injected into oil bearing geological formations from a second cased well while passing electrical current between the two cased wells, 93:228 (USA Patent 5,187,440/A/)
Methods of operation of apparatus measuring formation resistivity from within a cased well having one measurement and two compensation steps, 93:305 (USA Patent 5,223,794/A/)
Van Der Sluys, W.G., Synthesis of actinide nitrides, phosphides, sulfides and oxides, 93:114 (USA patent application 7-679,487)
Van Voris, P., *See* Burton, F.G., 93:314
Vann, C.S., Laser focus compensating sensing and imaging device, 93:143 (USA Patent 5,241,557/A/)
Vanstraelen, G.F., Double domino driver, 93:327 (USA patent application 7-997,593)
Vawter, G.A., *See* Hietala, V.M., 93:145
Verhoeven, J.D., High strength, light weight Ti-Y composites and method of making same, 93:260 (USA Patent 5,200,004/A/)
Vissers, D.R., *See* Bloom, I.D., 93:58
Viswanathan, V.K., Reflective optical imaging system for extreme ultraviolet wavelengths, 93:185 (USA Patent 5,212,588/A/)
Vogel, J.S., *See* Turteltaub, K.W., 93:321
Vogeli, C., *See* Glatfelter, T., 93:242
Von Wandruslka, R.M., *See* Grey, A.E., 93:200

W

Wagner, R.W., *See* Wijesekera, T.P., 93:282
Walko, R.J., *See* Ashley, C.S., 93:116
Wander, J.D., *See* Rofer, C.K., 93:64
Wang, Sou-Tien, Correction coil cable, 93:171 (USA patent application 7-682,833)
Wanlass, M.W., Improved monolithic tandem solar cell, 93:42 (USA patent application 7-689,566)
Watkin, J.G., *See* Sauer, N.N., 93:24
Weaver, P.F., Reversibly immobilized biological materials in monolayer films on electrodes, 93:210 (USA Patent 5,208,154/A/)
Weinberger, B.R., Flywheel energy storage with superconductor magnetic bearings, 93:245 (USA Patent 5,214,981/A/)
Wendelin, T.J., *See* Jorgensen, G.J., 93:45
Wender, I., *See* Tierney, J.W., 93:240
West, P.B., *See* Kotlyar, O.M., 93:52
Whaley, T.W., *See* Marrone, B.L., 93:209
White, J.R., *See* Thompson, R.E., 93:68
Whitehead, J.C., Fluid-driven reciprocating apparatus and valving for controlling same, 93:126 (USA Patent 5,222,873/A/)
Whyatt, G.A., *See* Treat, R.L., 93:253
Wickham, K.L., *See* Baker, J.D., 93:202
Wiersholm, O., *See* Jorgensen, D.K., 93:72
Wijesekera, T.P., Synthetic route to meso-tetra hydrocarbyl or substituted hydrocarbyl porphyrins and derivatives, 93:282 (USA Patent 5,241,062/A/)
Willard, H.J. Jr., Spring design for use in the core of a nuclear reactor, 93:50 (USA Patent 5,226,633/A/)
Williams, D.A., High-flexibility, noncollapsing lightweight hose, 93:27 (USA Patent 5,203,378/A/)
Wilson, M.S., *See* Zawodzinski, T.A., 93:207
Wintenberg, A.L., *See* Britton, C.L. Jr., 93:176
Wolery, T.J., *See* Knauss, K.G., 93:101
Wolf, M.A., *See* MacArthur, D.W., 93:177
Wright, G.T., Cooler and particulate separator for an off-gas stack, 93:203 (USA patent application 7-681,292)
Wyman, C.E., Sterilization of fermentation vessels by ethanol/water mixtures, 93:40 (USA patent application 7-672,286)

Y

Yeechun Lee, Micro-valve pump light valve display, 93:165 (USA Patent 5,181,016/A/)
Yeung, E.S., Means and method of detection in chemical separation procedures, 93:280 (USA Patent 5,192,407/A/)
Yi Pang, *See* Barton, T.J., 93:263
Yinfa Ma, *See* Yeung, E.S., 93:280
Yonco, R.M., *See* Nagy, Z., 93:112
Yoshida, T.M., *See* Buican, T.N., 93:98
Yost, F.G., *See* Karnowsky, M.M., 93:140
You, Hoydoo, *See* Nagy, Z., 93:112

Z

Zawodzinski, T.A., Catalyzed enzyme electrodes, 93:207 (USA Patent 5,227,042/A/)
Zeigler, J.M., Hybrid sol-gel optical materials, 93:92 (USA Patent 5,204,381/A/)
Ziebarth, M.S., SOx/NOx sorbent and process of use, 93:227 (USA Patent 5,180,703/A/)
Zimmerman, G.O., *See* McConeghy, R.J., 93:325
Zimmerman, O., *See* McConeghy, R.J., 93:299
Zollinger, W.T., Pipe crawler with extendable legs, 93:120 (USA patent application 7-679,497)
See Hapstack, M., 93:49
Zonca, F., Plasma momentum meter for momentum flux measurements, 93:195 (USA Patent 5,239,563/A/)

Subject Index

This index is arranged by subject descriptors selected from those assigned to each citation in this publication. Subject descriptors are selected from a controlled thesaurus of terms, ETDE/PUB–2, *International Energy: Subject Thesaurus.* In order to enhance indexing, subject descriptor entries generally consist of a pair of descriptors: a main term and a qualifier term. Each entry includes the full title (which may be followed by supplementary descriptive information in parentheses) and the citation number. Additional information given in parentheses indicates the document type (an abbreviation such as B for book), the country of publication (such as DE for Federal Republic of Germany), and the language if non-English.

See references guide users from synonymous terms to the descriptors selected for the concept. *See also* references indicate subject concepts that are more specific than a particular descriptor. To gain complete subject coverage, all such terms should be reviewed.

A

ACIDITY
See PH VALUE
ACTINIDE COMPOUNDS
Actinide metal processing, 93:24 (USA patent application 7-680,972)
Synthesis of actinide nitrides, phosphides, sulfides and oxides, 93:114 (USA patent application 7-679,487)
ACTINIDES
See also AMERICIUM
PLUTONIUM
URANIUM
Actinide metal processing, 93:24 (USA patent application 7-680,972)
ADHESIVES
Phenolic compounds containing/neutral fractions extract and products derived therefrom from fractionated fast-pyrolysis oils, 93:267 (USA Patent 5,223,601/A/)
ADSORBENTS
Nitrogen sorption, 93:232 (USA Patent 5,225,174/A/)
SOx/NOx sorbent and process of use, 93:227 (USA Patent 5,180,703/A/)
Sorbent for use in hot gas desulfurization, 93:14 (USA Patent 5,227,351/A/)
AIR POLLUTION MONITORS
Nitrogen dioxide detection, 93:312 (USA Patent 5,222,388/A/)
AIRBORNE PARTICLES
See PARTICULATES
AIRBORNE PARTICULATES
See PARTICULATES
ALARM DOSEMETERS
See RADIATION MONITORS
ALCOHOL DEHYDROGENASE
Cloning and sequencing of the alcohol dehydrogenase II gene from Zymomonas Mobilis, 93:238 (USA Patent 5,162,516/A/)
ALKALI METAL COMPOUNDS
Two stage sorption of sulfur compounds, 93:47 (USA patent application 7-697,041)
ALKALINE EARTH METAL COMPOUNDS
Two stage sorption of sulfur compounds, 93:47 (USA patent application 7-697,041)
ALKANES
See also ETHANE
METHANE
Cyano- and polycyanometallo-porphyrins as catalysts for alkane oxidation, 93:284 (USA Patent 5,212,300/A/)
ALKENES
See also ETHYLENE
HEXENES
Cobalt carbonyl catalyzed olefin hydroformylation in supercritical carbon dioxide, 93:16 (USA Patent 5,198,589/A/)
Method for conducting exothermic reactions, 93:230 (USA Patent 5,177,289/A/)
Reactor for exothermic reactions, 93:229 (USA Patent 5,190,730/A/)
ALKYLATED AROMATICS
Alkylation of organic aromatic compounds, 93:231 (USA Patent 5,176,883/A/)
ALLOY-MA-956
See IRON BASE ALLOYS
ALPHA DETECTION
Alternating current long range alpha particle detector, 93:304 (USA Patent 5,187,370/A/)
Long range alpha particle detector, 93:177 (USA Patent 5,184,019/A/)
ALPHA-BEARING WASTES
System to control contamination during retrieval of buried TRU waste, 93:26 (USA Patent 5,203,644/A/)
ALUMINIA
See ALUMINIUM OXIDES
ALUMINIUM
Solder for oxide layer-building metals and alloys, 93:77 (USA patent application 7-681,290)
ALUMINIUM ALLOYS
Iron-aluminum alloys having high room-temperature and method for making same, 93:257 (USA Patent 5,238,645/A/)
Solder for oxide layer-building metals and alloys, 93:77 (USA patent application 7-681,290)
ALUMINIUM OXIDES
Method for bonding thin film thermocouples to ceramics, 93:74 (USA Patent 5,215,597/A/)
Microporous alumina ceramic membranes, 93:262 (USA Patent 5,208,190/A/)
Microwave sintering of multiple articles, 93:83 (USA Patent 5,227,600/A/)
ALUMINUM
See ALUMINIUM
AMERICIUM
Determination of actinides in urine and fecal samples, 93:214 (USA Patent 5,190,881/A/)
Method of photon spectral analysis, 93:313 (USA Patent 5,206,174/A/)
AMERICIUM PHOSPHIDES
See PHOSPHIDES
ANALOG-TO-DIGITAL CONVERTERS
Analog-to-digital converter with data processing, 93:334 (USA patent application 7-088,164)
ANIMAL CELLS
Method for distinguishing normal and transformed cells using G1 kinase inhibitors, 93:211 (USA Patent 5,185,260/A/)
ANODES
Carbonate fuel cell anodes, 93:247 (USA Patent 5,206,095/A/)
AQUEOUS SOLUTIONS
Measurement of pH in high ionic strength solutions, 93:101 (USA patent application 7-702,527)
ARMS CONTROL
Detection device for high explosives, 93:200 (USA patent application 7-707,414)
ARRAY PROCESSORS
Communication switch for serial and parallel network, 93:329 (USA patent application 7-898,081)
ARSENIC 72
Production of selenium-72 and arsenic-72, 93:289 (USA Patent 5,204,072/A/)
ATOMIC FLUORESCENCE SPECTROSCOPY
See FLUORESCENCE SPECTROSCOPY

AUTOMOTIVE FUELS
Catalysts for conversion of syngas to liquid motor fuels, 93:224 (USA Patent 4,652,538/A/)
AVG PROCESS
See COAL GASIFICATION

B

BARIUM OXIDES
Fracture toughness for copper oxide superconductors, 93:85 (USA Patent 5,202,306/A/)
BATTERIES (ELECTRIC)
See ELECTRIC BATTERIES
BENZENE
Alkylation of organic aromatic compounds, 93:231 (USA Patent 5,176,883/A/)
BETA BEAMS (POSITRONS)
See POSITRON BEAMS
BIOGAS
See METHANE
BIOLOGICAL MATERIALS
Reversibly immobilized biological materials in monolayer films on electrodes, 93:210 (USA Patent 5,208,154/A/)
BIOLOGICAL REACTORS
See BIOREACTORS
BIOREACTORS
Clay enhancement of methane, low molecular weight hydrocarbon and halocarbon conversion by methanotrophic bacteria, 93:38 (USA patent application 7-738,001)
BLACK LIQUORS
See SPENT LIQUORS
BONE TISSUES
Compact biomedical pulsed signal generator for bone tissue stimulation, 93:213 (USA Patent 5,217,009/A/)
BOREHOLES
Method of draining water through a solid waste site without leaching, 93:253 (USA Patent 5,183,355/A/)
BORON
High density crystalline boron prepared by hot isostatic pressing in refractory metal containers, 93:264 (USA Patent 5,240,691/A/)
Magnetron sputtered boron films and Ti/B multilayer structures, 93:273 (USA Patent 5,203,977/A/)
BOROSILICATE GLASS
Method for making glass, 93:87 (USA patent application 7-690,046)
BOROSILICATES
See BOROSILICATE GLASS
BUBIAG-DIDIER PROCESS
See COAL GASIFICATION
BUILDING MATERIALS
Microwave impregnation of porous materials with thermal energy storage materials, 93:46 (USA Patent 5,202,150/A/)
BUILDINGS (CONTAINMENT)
See CONTAINMENT BUILDINGS

C

CALCIUM OXIDES
Catalysts for conversion of methane to higher hydrocarbons, 93:41 (USA Patent 5,177,294/A/)
CANISTERS
See CONTAINERS
CARBINOL
See METHANOL
CARBON
See also CARBON BLACK
DIAMONDS
High rate chemical vapor deposition of carbon films using fluorinated gases, 93:93 (USA Patent 5,198,263/A/)
Method of making carbon-carbon composites, 93:268 (USA Patent 5,217,657/A/)
Microcellular carbon foam and method, 93:272 (USA Patent 5,208,003/A/)
CARBON BLACK
Low-cost process for hydrogen production, 93:235 (USA Patent 5,198,084/A/)
CARBON DIOXIDE ACCEPTOR PROCESS
See COAL GASIFICATION
CARBON MONOXIDE
Catalysts for conversion of syngas to liquid motor fuels, 93:224 (USA Patent 4,652,538/A/)
Low-cost process for hydrogen production, 93:235 (USA Patent 5,198,084/A/)
Methanol synthesis using a catalyst combination of alkali or alkaline earth salts and reduced copper chromite for methanol synthesis, 93:240 (USA Patent 5,221,652/A/)
CASCADE (EXTRACTION)
See EXTRACTION COLUMNS
CATALYST SUPPORTS
Crystalline titanate catalyst supports, 93:17 (USA Patent 5,177,045/A/)
CATALYSTS
Catalysts for conversion of syngas to liquid motor fuels, 93:224 (USA Patent 4,652,538/A/)
Cyano- and polycyanometallo-porphyrins as catalysts for alkane oxidation, 93:284 (USA Patent 5,212,300/A/)
Energy curable compositions having improved cure speeds, 93:270 (USA Patent 5,212,210/A/)
Methanol synthesis using a catalyst combination of alkali or alkaline earth salts and reduced copper chromite for methanol synthesis, 93:240 (USA Patent 5,221,652/A/)
Molecular water oxidation catalyst, 93:108 (USA Patent 5,223,634/A/)
Synthesis of iron based hydrocracking catalysts, 93:109 (USA Patent 5,214,015/A/)
CATHODE RAY TUBES
Cavity resonance absorption in ultra-high bandwidth CRT deflection structure by a resistive load, 93:153 (USA Patent 5,210,464/A/)
CELL GROWTH (ANIMAL)
See ANIMAL CELLS
CELLS (ANIMAL)
See ANIMAL CELLS
CELLS (ELECTROLYTIC)
See ELECTROLYTIC CELLS
CELLULOSE
Combined enzyme mediated fermentation of cellulose and xylose to ethanol, 93:36 (USA patent application 7-672,984)
CERAMICS
Apparatus for tensile testing plate-type ceramic specimens, 93:292 (USA Patent 5,237,876/A/)
Method of bonding metals to ceramics and other materials, 93:94 (USA Patent 5,176,950/A/)
Microwave sintering of nanophase ceramics without concomitant grain growth, 93:84 (USA Patent 5,223,186/A/)
CHEMICAL EXPLOSIVES
Detection device for high explosives, 93:200 (USA patent application 7-707,414)
Hidden explosives detector employing pulsed neutron and x-ray interrogation, 93:279 (USA Patent 5,200,626/A/)
CHEMICAL PROPERTIES
Multiple-frequency acoustic wave devices for chemical sensing and materials characterization in both gas and liquid phase, 93:135 (USA Patent 5,235,235/A/)
CHEMICAL REACTORS
Method for conducting exothermic reactions, 93:230 (USA Patent 5,177,289/A/)
Process of ^{196}Hg enrichment, 93:285 (USA Patent 5,205,913/A/)
Reactor for exothermic reactions, 93:229 (USA Patent 5,190,730/A/)
Shielded fluid stream injector for particle bed reactor, 93:66 (USA Patent 5,232,673/A/)
CHINA CLAY
See KAOLIN
CHLORINATED ALIPHATIC HYDROCARBONS
Clay enhancement of methane, low molecular weight hydrocarbon and halocarbon conversion by methanotrophic bacteria, 93:38 (USA patent application 7-738,001)
CHOLESTEROL
Optical probe for the cytochrome P-450 cholesterol side chain cleavage enzyme, 93:209 (USA Patent 5,208,332/A/)

CHROMATOGRAPHIC COLUMNS
See EXTRACTION COLUMNS
CIRCUITS (ELECTRONIC)
See ELECTRONIC CIRCUITS
CLOSURES
Glovebox plug for glove changing, 93:121 (USA patent application 7-680,975)
COAL
Process for treating moisture laden coal fines, 93:11 (USA Patent 5,231,797/A/)
COAL GAS
Sorbent for use in hot gas desulfurization, 93:14 (USA Patent 5,227,351/A/)
COAL GASIFICATION
Grate assembly for fixed-bed coal gasifier, 93:13 (USA Patent 5,230,716/A/)
Two-stage fixed-bed gasifier with selectable middle gas off-take point, 93:12 (USA patent application 7-697,033)
COAL LIQUIDS
Method of upgrading oils containing hydroxyaromatic hydrocarbon compounds to highly aromatic gasoline, 93:223 (USA Patent 5,180,868/A/)
COAL-DERIVED GASES
See COAL GAS
COAL-DERIVED LIQUIDS
See COAL LIQUIDS
COAL-OIL MIXTURES
See COAL
COATINGS
See also PROTECTIVE COATINGS
Coatings with controlled porosity and chemical properties, 93:107 (USA Patent 5,224,972/A/)
COILS (MAGNETIC)
See MAGNET COILS
COKE-OVEN GAS
See COAL GAS
COLOGNE SPIRITS
See ETHANOL
COLUMNS (EXTRACTION)
See EXTRACTION COLUMNS
COLUMNS (MECHANICAL)
See MECHANICAL STRUCTURES
COMMUNICATIONS
See also DATA TRANSMISSION
Communication link with constant delay, 93:332 (USA patent application 7-807,141)
Communication switch for serial and parallel network, 93:329 (USA patent application 7-898,081)
COMPOSITE MATERIALS
See also SUPERCONDUCTING COMPOSITES
Low density carbonized composite foams, 93:89 (USA Patent 5,232,772/A/)
Method of bonding metals to ceramics and other materials, 93:94 (USA Patent 5,176,950/A/)
Method of making carbon-carbon composites, 93:268 (USA Patent 5,217,657/A/)
COMPOUNDS (ORGANIC)
See ORGANIC COMPOUNDS
COMPUTERS
Double domino driver, 93:327 (USA patent application 7-997,593)
Remote two-wire data entry method and device, 93:142 (USA patent application 7-720,128)
Sequencing and fan-out mechanism for causing a set of at least two sequential instructions to be performed in a data flow processing computer, 93:222 (USA Patent 5,226,131/A/)
CONDUCTIVITY (ELECTRIC)
See ELECTRIC CONDUCTIVITY
CONDUCTORS (ELECTRIC)
See ELECTRIC CONDUCTORS
CONNECTORS
Composite lead for conducting an electric current between 75–80 K and 4.5 K temperatures, 93:299 (USA patent application 7-866,595)
CONOCO GASIFICATION PROCESS
See COAL GASIFICATION
CONTACTORS
See SWITCHES
CONTACTS (ELECTRIC)
See ELECTRIC CONTACTS
CONTAINERS
See also TANKS
Device and method for skull-melting depth measurement, 93:261 (USA Patent 5,185,031/A/)
Sterilization of fermentation vessels by ethanol/water mixtures, 93:40 (USA patent application 7-672,286)
CONTAINMENT BUILDINGS
System to control contamination during retrieval of buried TRU waste, 93:26 (USA Patent 5,203,644/A/)
CONTAINMENT SYSTEMS
Drill string enclosure, 93:72 (USA Patent 5,191,156/A/)
Material containment enclosure, 93:118 (USA patent application 7-678,387)
CONTROL ROD DRIVES
Fast-acting nuclear reactor control device, 93:52 (USA Patent 5,232,656/A/)
CONVERTERS (ANALOG-DIGITAL)
See ANALOG-TO-DIGITAL CONVERTERS
COOLERS
See HEAT EXCHANGERS
COOLING SYSTEM (REACTOR)
See REACTOR COOLING SYSTEMS
COOLING SYSTEMS
See also REACTOR COOLING SYSTEMS
Quantitative method for measuring heat flux emitted from a cryogenic object, 93:217 (USA Patent 5,193,909/A/)
COPPER OXIDES
Fracture toughness for copper oxide superconductors, 93:85 (USA Patent 5,202,306/A/)
COPPER VAPOR LASERS
See METAL VAPOR LASERS
CORES (REACTOR)
See REACTOR CORES
COUNTERS (RADIATION)
See RADIATION DETECTORS
COUPLINGS
Simplified flangeless unisex waveguide coupler assembly, 93:154 (USA Patent 5,208,569/A/)
CRUDE OIL
See PETROLEUM
CRYOGENIC FLUIDS
Method of fabricating a multilayer insulation blanket, 93:266 (USA Patent 5,224,832/A/)
CRYOGENS
See CRYOGENIC FLUIDS
CUMENE
Alkylation of organic aromatic compounds, 93:231 (USA Patent 5,176,883/A/)
CUTTING TOOLS
Laser cutting with chemical reaction assist, 93:122 (USA patent application 7-681,293)
CYTOCHROMES
Optical probe for the cytochrome P-450 cholesterol side chain cleavage enzyme, 93:209 (USA Patent 5,208,332/A/)

D

DATA ACQUISITION SYSTEMS
Digital programmable level-1 trigger with 3D-flow assembly, 93:326 (USA patent application 7-101,489)
High resolution data acquisition, 93:173 (USA Patent 5,200,933/A/)
Remote two-wire data entry method and device, 93:142 (USA patent application 7-720,128)
DATA DISPLAY DEVICES
See DISPLAY DEVICES
DATA DISPLAY SYSTEMS
See DISPLAY DEVICES

DATA PROCESSING
Analog-to-digital converter with data processing, 93:334 (USA patent application 7-088,164)
DATA TRANSMISSION
Asynchronous parallel status comparator, 93:138 (USA patent application 7-678,428)
Communication link with constant delay, 93:332 (USA patent application 7-807,141)
Parallel data transfer network controlled by a dynamically reconfigurable serial network, 93:328 (USA patent application 7-856,622)
DATA TRANSMISSION SYSTEMS
A fiber optically isolated and remotely stabilized data transmission system, 93:179 (USA patent application 7-717,580)
Borehole data transmission apparatus, 93:180 (USA Patent 5,197,040/A/)
DATA-FLOW PROCESSING
Three dimensional flow processor, 93:331 (USA patent application 7-993,383)
DEBRIS (NUCLEAR)
See FISSION PRODUCTS
DEOXYCYTIDINURIA
See URINE
DEPLETION (ISOTOPIC)
See ISOTOPE SEPARATION
DEPOSITS
Surface coating for prevention of crust formation, 93:88 (USA patent application 7-730,423)
DESERTRON
See SUPERCONDUCTING SUPER COLLIDER
DETECTORS (RADIATION)
See RADIATION DETECTORS
DIAMOND DRILLING EQUIPMENT
See DRILLING EQUIPMENT
DIAMONDS
Diamond tool machining of materials which react with diamond, 93:119 (USA patent application 7-678,488)
DIFFRACTOMETERS
Method and apparatus for atomic imaging, 93:278 (USA Patent 5,200,618/A/)
DIGESTER GAS
See METHANE
DIODES (SEMICONDUCTOR)
See SEMICONDUCTOR DIODES
DISPLAY DEVICES
Micro-valve pump light valve display, 93:165 (USA Patent 5,181,016/A/)
DNA SEQUENCING
Ordered transport and identification of particles, 93:208 (USA Patent 5,209,834/A/)
DOORS
High speed door assembly, 93:204 (USA Patent 5,205,069/A/)
DOW PUSHER 700
See POLYAMIDES
DOWNHOLE INFORMATION SYSTEMS
See MWD SYSTEMS
DRILL HOLES
See BOREHOLES
DRILLING EQUIPMENT
Drill string enclosure, 93:72 (USA Patent 5,191,156/A/)
DRUGS
See also RADIOPHARMACEUTICALS
Electromagnetic field triggered drug and chemical delivery via liposomes, 93:212 (USA Patent 5,190,761/A/)
DYE LASERS
Monolithic dye laser amplifier, 93:157 (USA Patent 5,199,040/A/)
DYMAC SYSTEM
See PLUTONIUM
DYNAMIC MATERIALS ACCOUNTABILITY SYSTEM
See PLUTONIUM

E

EARTHING
See ELECTRIC GROUNDS
EDUCATIONAL TOOLS
Basic fluid system trainer, 93:134 (USA Patent 5,178,543/A/)
ELECTRIC BATTERIES
See also METAL-GAS BATTERIES
Solid state safety jumper cables, 93:59 (USA Patent 5,189,359/A/)
ELECTRIC CONDUCTIVITY
A method and apparatus for tube crevice detection and measurement, 93:191 (USA patent application 7-707,538)
ELECTRIC CONDUCTORS
Electrical network method for the thermal or structural characterization of a conducting material sample or structure, 93:151 (USA Patent 5,217,304/A/)
ELECTRIC CONTACTORS
See SWITCHES
ELECTRIC CONTACTS
Composite lead for conducting an electric current between 75–80 K and 4.5 K temperatures, 93:299 (USA patent application 7-866,595)
Method for making an electrically conductive contact useful for joining high transition temperature superconductors, 93:325 (USA patent application 7-902,224)
ELECTRIC GROUNDS
Electrical receptacle, 93:56 (USA Patent 5,221,211/A/)
ELECTRIC MEASURING INSTRUMENTS
See also ELECTROMETERS
Apparatus and method for measuring and imaging surface resistance, 93:194 (USA Patent 5,239,269/A/)
Force sensor, 93:310 (USA Patent 5,209,126/A/)
ELECTRIC RAILWAYS
Expansion joint for guideway for magnetic levitation transportation system, 93:76 (USA Patent 5,184,557/A/)
ELECTRIC RESISTIVITY
See ELECTRIC CONDUCTIVITY
ELECTRIC SWITCHES
See SWITCHES
ELECTRICAL CONDUCTIVITY
See ELECTRIC CONDUCTIVITY
ELECTRICAL RESISTANCE
See ELECTRIC CONDUCTIVITY
ELECTRICAL RESISTIVITY
See ELECTRIC CONDUCTIVITY
ELECTROCHEMICAL CELLS
See also ELECTRIC BATTERIES
Electrochemical cell, 93:112 (USA patent application 7-689,426)
ELECTRODES
See also ANODES
Method of electrode fabrication and an electrode for metal chloride battery, 93:58 (USA Patent 5,194,343/A/)
ELECTROLYTES
See also SOLID ELECTROLYTES
Chloromethyl chlorosulfate as a voltage delay inhibitor in lithium cells, 93:57 (USA Patent 5,202,203/A/)
ELECTROLYTIC CELLS
Ice electrode electrolytic cell, 93:71 (USA Patent 5,200,054/A/)
ELECTROMAGNETIC FIELDS
Electromagnetic field triggered drug and chemical delivery via liposomes, 93:212 (USA Patent 5,190,761/A/)
ELECTROMAGNETIC PUMPS
Electromagnetic induction pump for pumping liquid metals and other conductive liquids, 93:291 (USA Patent 5,209,646/A/)
ELECTROMETERS
Sensor/source electrometer circuit, 93:193 (USA patent application 7-723,120)
ELECTRON CYCLOTRON MASERS
See MICROWAVE AMPLIFIERS
ELECTRONIC CIRCUITS
See also MICROELECTRONIC CIRCUITS
PRINTED CIRCUITS
SWITCHING CIRCUITS
Compact acoustic refrigerator, 93:178 (USA patent application 7-710,207)

Sensor/source electrometer circuit, 93:193 (USA patent application 7-723,120)
ELECTRONIC DATA PROCESSING
See DATA PROCESSING
ELECTROSTATIC PRECIPITATORS
Apparatus for preventing particle deposition from process streams on optical access windows, 93:184 (USA Patent 5,217,510/A/)
ENDOSTEUM
See BONE TISSUES
ENRICHMENT (ISOTOPIC)
See ISOTOPE SEPARATION
ENZYME INHIBITORS
Method for distinguishing normal and transformed cells using G1 kinase inhibitors, 93:211 (USA Patent 5,185,260/A/)
EPIPHYSIS (BONES)
See BONE TISSUES
ETHANE
Catalysts for conversion of methane to higher hydrocarbons, 93:41 (USA Patent 5,177,294/A/)
ETHANOL
Combined enzyme mediated fermentation of cellulose and xylose to ethanol, 93:36 (USA patent application 7-672,984)
ETHOCEL
See CELLULOSE
ETHYL ALCOHOL
See ETHANOL
ETHYLENE
Catalysts for conversion of methane to higher hydrocarbons, 93:41 (USA Patent 5,177,294/A/)
EVAPORATORS
Ball feeder for replenishing evaporator feed, 93:129 (USA Patent 5,195,651/A/)
EXHAUST GASES
Gas stream clean-up filter and method for forming same, 93:28 (USA Patent 5,198,002/A/)
NO reduction using sublimation of cyanuric acid, 93:15 (USA Patent 5,180,565/A/)
Two stage sorption of sulfur compounds, 93:47 (USA patent application 7-697,041)
EXTRACTION COLUMNS
Tungsten-188/carrier-free rhenium-188 perrhenic acid generator system, 93:288 (USA Patent 5,186,913/A/)

F

FARADAY GENERATORS
See MHD GENERATORS
FECES
Determination of actinides in urine and fecal samples, 93:214 (USA Patent 5,190,881/A/)
FERMENTATION
Sterilization of fermentation vessels by ethanol/water mixtures, 93:40 (USA patent application 7-672,286)
FERMENTATION ALCOHOL
See ETHANOL
FERRIC COMPOUNDS
See IRON COMPOUNDS
FERROUS COMPOUNDS
See IRON COMPOUNDS
FIELDS (ELECTROMAGNETIC)
See ELECTROMAGNETIC FIELDS
FINGERPRINTING (OIL SPILLS)
See OIL SPILLS
FIREDAMP
See METHANE
FISCHER-TROPSCH SYNTHESIS
Catalysts for conversion of syngas to liquid motor fuels, 93:224 (USA Patent 4,652,538/A/)
FISSION PRODUCTS
Method of photon spectral analysis, 93:313 (USA Patent 5,206,174/A/)
FLOW (FLUID)
See FLUID FLOW
FLOW REGULATORS
See also VALVES
Nuclear reactor flow control method and apparatus, 93:55 (USA Patent 5,198,185/A/)
FLOWMETERS
Low volume flow meter, 93:190 (USA patent application 7-694,176)
FLUE GAS
Regenerative process and system for the simultaneous removal of particulates and the oxides of sulfur and nitrogen from a gas stream, 93:226 (USA Patent 5,202,101/A/)
FLUID FLOW
Flow monitoring and control system for injection wells, 93:31 (USA patent application 7-730,424)
FLUID MECHANICS
Basic fluid system trainer, 93:134 (USA Patent 5,178,543/A/)
FLUIDS
See also CRYOGENIC FLUIDS
LIQUIDS
Swirling structure for mixing two concentric fluid flows at nozzle outlet, 93:133 (USA Patent 5,228,624/A/)
FLUORESCENCE SPECTROSCOPY
Programmable spectral imaging method and apparatus, 93:98 (USA patent application 7-693,466)
FLUORIMETRY
See FLUORESCENCE SPECTROSCOPY
FLYWHEEL ENERGY STORAGE
Flywheel energy storage with superconductor magnetic bearings, 93:245 (USA Patent 5,214,981/A/)
FLYWHEELS
Flywheel energy storage with superconductor magnetic bearings, 93:245 (USA Patent 5,214,981/A/)
FOAMS
Low density carbonized composite foams, 93:89 (USA Patent 5,232,772/A/)
Microcellular carbon foam and method, 93:272 (USA Patent 5,208,003/A/)
FRICTION WELDING
Method and device for frictional welding, 93:22 (USA patent application 7-724,660)
FUEL ASSEMBLIES
Method and apparatus for close packing of nuclear fuel assemblies, 93:233 (USA Patent 5,198,183/A/)
Simulated nuclear reactor fuel assembly, 93:51 (USA Patent 5,200,144/A/)
FUEL COOLING INSTALLATIONS
See SPENT FUEL STORAGE
FUEL RACKS
Fail-safe storage rack for irradiated fuel rod assemblies, 93:23 (USA Patent 5,196,161/A/)

G

GADOLINIUM 155
Gadolinium photoionization process, 93:113 (USA Patent 5,202,005/A/)
GADOLINIUM 157
Gadolinium photoionization process, 93:113 (USA Patent 5,202,005/A/)
GADOLINIUM OXIDES
Catalysts for conversion of methane to higher hydrocarbons, 93:41 (USA Patent 5,177,294/A/)
GALLIUM ARSENIDE SOLAR CELLS
Current-matched high-efficiency, multijunction monolithic solar cells, 93:43 (USA Patent 5,223,043/A/)
Improved monolithic tandem solar cell, 93:42 (USA patent application 7-689,566)
GALLIUM PHOSPHIDE SOLAR CELLS
Current-matched high-efficiency, multijunction monolithic solar cells, 93:43 (USA Patent 5,223,043/A/)
GAS ENGINES
See INTERNAL COMBUSTION ENGINES

GAS GENERATORS
Grate assembly for fixed-bed coal gasifier, 93:13 (USA Patent 5,230,716/A/)
GAS SPILLS
Oil/gas collector/separator for underwater oil leaks, 93:19 (USA Patent 5,213,444/A/)
GAS TURBINE ENGINES
High temperature turbine engine structure, 93:254 (USA Patent 5,228,284/A/)
Mounting for ceramic scroll, 93:255 (USA Patent 5,186,006/A/)
GAS TURBINES
Water augmented indirectly-fired gas turbine system and method, 93:73 (USA patent application 7-709,567)
GASOLINE
Method of upgrading oils containing hydroxyaromatic hydrocarbon compounds to highly aromatic gasoline, 93:223 (USA Patent 5,180,868/A/)
GASOLINE ENGINES
See INTERNAL COMBUSTION ENGINES
GELS
Process for making solid-state radiation-emitting composition, 93:116 (USA Patent 5,240,647/A/)
Production of hollow aerogel microspheres, 93:90 (USA Patent 5,227,239/A/)
GENERATORS (STEAM)
See STEAM GENERATORS
GENETIC MAPPING
Physical mapping of complex genomes, 93:318 (USA Patent 5,219,726/A/)
GEOPHONES
See SEISMIC DETECTORS
GERMANIUM 68
Recovery of germanium-68 from irradiated targets, 93:117 (USA Patent 5,190,735/A/)
GLOVEBOXES
Glovebox plug for glove changing, 93:121 (USA patent application 7-680,975)
Material isolation enclosure, 93:127 (USA Patent 5,205,624/A/)
GOBAR GAS
See METHANE
GRAIN ALCOHOL
See ETHANOL
GRANULAR BED FILTERS
Gas stream clean-up filter and method for forming same, 93:28 (USA Patent 5,198,002/A/)
GROUND WATER
Flow monitoring and control system for injection wells, 93:31 (USA patent application 7-730,424)
Flow monitoring and control system for injection wells, 93:206 (USA Patent 5,186,255/A/)
In-situ remediation system for groundwater and soils, 93:30 (USA patent application 7-711,686)
GROUNDS
See ELECTRIC GROUNDS
GROUNDS (ELECTRIC)
See ELECTRIC GROUNDS
GYROTRONS
See MICROWAVE AMPLIFIERS

H

HALL GENERATORS
See MHD GENERATORS
HANDLING (DATA)
See DATA PROCESSING
HAZARDOUS MATERIALS
See also TOXIC MATERIALS
Conversion of hazardous materials using supercritical water oxidation, 93:64 (USA patent application 7-677,738)
High-flexibility, noncollapsing lightweight hose, 93:27 (USA Patent 5,203,378/A/)
Inflatable containment diaphragm for sealing and removing stacks, 93:70 (USA Patent 5,201,345/A/)
Material containment enclosure, 93:118 (USA patent application 7-678,387)
Nonhazardous solvent composition and method for cleaning metal surfaces, 93:320 (USA Patent 5,207,838/A/)
System to control contamination during retrieval of buried TRU waste, 93:26 (USA Patent 5,203,644/A/)
HAZARDOUS MATERIALS SPILLS
High speed door assembly, 93:204 (USA Patent 5,205,069/A/)
HEALTH PHYSICS
See RADIATION PROTECTION
HEAT EXCHANGERS
Wastewater heat recovery method and apparatus, 93:65 (USA patent application 7-718,518)
HEAT FLUX
Quantitative method for measuring heat flux emitted from a cryogenic object, 93:217 (USA Patent 5,193,909/A/)
HEAT STORAGE DEVICES
See THERMAL ENERGY STORAGE EQUIPMENT
HEAT STORAGE SYSTEMS
See THERMAL ENERGY STORAGE EQUIPMENT
HEAVY OILS
See PETROLEUM
HELIUM DILUTION REFRIGERATORS
Superfluid thermodynamic cycle refrigerator, 93:216 (USA patent application 7-679,498)
HEMICELLULOSE
See also XYLANS
Two-stage dilute acid prehydrolysis of biomass, 93:37 (USA patent application 7-681,299)
HETEROJUNCTIONS
Determination of interfacial states in solid heterostructures using a variable-energy positron beam, 93:323 (USA Patent 5,200,619/A/)
HEVEA
cDNA encoding a polypeptide including a hevein sequence, 93:236 (USA Patent 5,187,262/A/)
HEXENES
Crystalline titanate catalyst supports, 93:17 (USA Patent 5,177,045/A/)
HIGH EXPLOSIVES
See CHEMICAL EXPLOSIVES
HIGH-TC SUPERCONDUCTORS
Fracture toughness for copper oxide superconductors, 93:85 (USA Patent 5,202,306/A/)
Machinable dissolved metal oxide superconductors, 93:82 (USA patent application 7-696,881)
Method and apparatus for cooling high temperature superconductors with neon-nitrogen mixtures, 93:322 (USA Patent 5,193,349/A/)
Method for making an electrically conductive contact useful for joining high transition temperature superconductors, 93:325 (USA patent application 7-902,224)
HOFFMAN PROCESS
See COAL GASIFICATION
HOSES
High-flexibility, noncollapsing lightweight hose, 93:27 (USA Patent 5,203,378/A/)
HOT GAS CLEANUP
Sorbent for use in hot gas desulfurization, 93:14 (USA Patent 5,227,351/A/)
HUGENHOLTZ-PINES THEORY
See HYDROGEN
HUMAN CELLS
See ANIMAL CELLS
HYDRAULIC RAMS
See PUMPS
HYDROCARBONS
See also ALKANES
ALKENES
BENZENE
CUMENE
PYRENE
Clay enhancement of methane, low molecular weight hydrocarbon and halocarbon conversion by methanotrophic bacteria, 93:38 (USA patent application 7-738,001)

HYDROCHLORIC ACID
Compact anhydrous HCl to aqueous HCl conversion system, 93:283 (USA Patent 5,215,723/A/)
HYDROGEN
Atomic line emission analyzer for hydrogen isotopes, 93:99 (USA patent application 7-697,032)
Fiber optic hydrogen sensor, 93:96 (USA patent application 7-678,520)
Hydrogen and sulfur recovery from hydrogen sulfide wastes, 93:251 (USA Patent 5,211,923/A/)
Hydrogen-permeable composite metal membrane and uses thereof, 93:234 (USA Patent 5,217,506/A/)
Small system for tritium accelerator mass spectrometry, 93:169 (USA Patent 5,189,302/A/)
HYDROGEN 3
See TRITIUM
HYDROGEN CHLORIDES
See HYDROCHLORIC ACID
HYDROGEN FUEL CELLS
Solid-oxide fuel cell electrolyte, 93:63 (USA Patent 5,213,911/A/)
HYDROGEN HYDROXIDES
See WATER
HYDROGEN ISOTOPES
See also TRITIUM
Atomic line emission analyzer for hydrogen isotopes, 93:105 (USA Patent 5,198,870/A/)
HYDROGEN METERS
Fiber optic hydrogen sensor, 93:96 (USA patent application 7-678,520)
HYDROGEN PRODUCTION
Low-cost process for hydrogen production, 93:235 (USA Patent 5,198,084/A/)
HYDROGEN SULFIDES
Hydrogen and sulfur recovery from hydrogen sulfide wastes, 93:251 (USA Patent 5,211,923/A/)
HYFLEX PROCESS
See COAL GASIFICATION

I

IMMOBILIZED ENZYMES
Catalyzed enzyme electrodes, 93:207 (USA Patent 5,227,042/A/)
IMMUNOGLOBULINS
Antibody-mediated cofactor-driven reactions, 93:315 (USA Patent 5,219,732/A/)
Regioselective chemical modification of monoclonal antibodies, 93:317 (USA Patent 5,208,008/A/)
INDIUM PHOSPHIDE SOLAR CELLS
Current-matched high-efficiency, multijunction monolithic solar cells, 93:43 (USA Patent 5,223,043/A/)
Improved monolithic tandem solar cell, 93:42 (USA patent application 7-689,566)
INHIBITORS (ENZYME)
See ENZYME INHIBITORS
INJECTION WELLS
Flow monitoring and control system for injection wells, 93:206 (USA Patent 5,186,255/A/)
INPUT WELL
See INJECTION WELLS
INSTRUMENTS (MEASURING)
See MEASURING INSTRUMENTS
INSULATION (THERMAL)
See THERMAL INSULATION
INTEGRATED CIRCUITS
Microchannel cooling of face down bonded chips, 93:152 (USA Patent 5,218,515/A/)
Virtually distortion-free imaging system for large field, high resolution lithography, 93:168 (USA Patent 5,176,970/A/)
Virtually distortion-free imaging system for large field, high resolution lithography using electrons, ions or other particle beams, 93:166 (USA Patent 5,178,974/A/)
INTERFACES
Determination of interfacial states in solid heterostructures using a variable-energy positron beam, 93:323 (USA Patent 5,200,619/A/)
INTERFEROMETERS
Apparatus and method for measuring fluorescence intensities at a plurality of wavelengths and lifetimes, 93:276 (USA Patent 5,208,651/A/)
Beam shuttering interferometer and method, 93:309 (USA Patent 5,231,468/A/)
INTERNAL COMBUSTION ENGINES
See also GAS TURBINE ENGINES
Method for bonding thin film thermocouples to ceramics, 93:74 (USA Patent 5,215,597/A/)
INTERPLANETARY SPACE
Linear electric field mass spectrometry, 93:95 (USA patent application 7-678,081)
INTRUSION DETECTION SYSTEMS
Integrated optical tamper sensor with planar waveguide, 93:34 (USA Patent 5,177,352/A/)
ION EXCHANGE MEMBRANES
See MEMBRANES
IRON BASE ALLOYS
Iron-aluminum alloys having high room-temperature and method for making same, 93:257 (USA Patent 5,238,645/A/)
IRON COMPOUNDS
Synthesis of iron based hydrocracking catalysts, 93:109 (USA Patent 5,214,015/A/)
ISOPROPYLBENZENE
See CUMENE
ISOTOPE ENRICHMENT
See ISOTOPE SEPARATION
ISOTOPE SEPARATION
Separation processes using expulsion from dilute supercritical solutions, 93:110 (USA Patent 5,204,003/A/)
ISOTOPIC SEPARATION
See ISOTOPE SEPARATION

J

JOSEPHSON JUNCTIONS
Quantitative method for measuring heat flux emitted from a cryogenic object, 93:217 (USA Patent 5,193,909/A/)

K

KAOLIN
Clay enhancement of methane, low molecular weight hydrocarbon and halocarbon conversion by methanotrophic bacteria, 93:38 (USA patent application 7-738,001)
KINASES
See PHOSPHOTRANSFERASES
KINASES (PHOSPHOTRANSFERASES)
See PHOSPHOTRANSFERASES

L

LAND FILLS
See SANITARY LANDFILLS
LANDFILLS
See SANITARY LANDFILLS
LASER RADIATION
Coherence delay augmented laser beam homogenizer, 93:150 (USA Patent 5,224,200/A/)
Laser focus compensating sensing and imaging device, 93:143 (USA Patent 5,241,557/A/)
Monolithic dye laser amplifier, 93:157 (USA Patent 5,199,040/A/)
Non-intrusive beam power monitor for high power pulsed or continuous wave lasers, 93:164 (USA Patent 5,184,189/A/)
Wavelength meter having single mode fiber optics multiplexed inputs, 93:163 (USA Patent 5,189,485/A/)
LASERS
High power, high beam quality regenerative amplifier, 93:295 (USA Patent 5,239,408/A/)
Magnetic compression laser driving circuit, 93:167 (USA Patent 5,177,754/A/)

Microoptic lenses, 93:298 (USA Patent 5,181,224/A/)
Ring regenerative laser amplifier, 93:139 (USA patent application 7-704,590)

LATHES
Diamond tool machining of materials which react with diamond, 93:119 (USA patent application 7-678,488)

LEVITATED TRAINS
Expansion joint for guideway for magnetic levitation transportation system, 93:76 (USA Patent 5,184,557/A/)

LIGNIN
Bacterial extracellular lignin peroxidase, 93:237 (USA Patent 5,232,845/A/)
Fluorescence analyzer for lignin, 93:239 (USA Patent 5,216,483/A/)

LIPOSOMES
Electromagnetic field triggered drug and chemical delivery via liposomes, 93:212 (USA Patent 5,190,761/A/)

LIQUID METAL COOLANT
See LIQUID METALS

LIQUID METALS
Atomizing nozzle and process, 93:258 (USA Patent 5,228,620/A/)

LIQUIDS
See also COAL LIQUIDS
LIQUID METALS
Method for enhanced atomization of liquids, 93:68 (USA Patent 5,217,362/A/)

LITHIUM-CHLORINE BATTERIES
Chloromethyl chlorosulfate as a voltage delay inhibitor in lithium cells, 93:57 (USA Patent 5,202,203/A/)

LITHIUM-SULFUR BATTERIES
Chloromethyl chlorosulfate as a voltage delay inhibitor in lithium cells, 93:57 (USA Patent 5,202,203/A/)

LNG SPILLS
See GAS SPILLS

LOGGING WHILE DRILLING
See MWD SYSTEMS

LOW-LEVEL RADIOACTIVE WASTES
Gas stream clean-up filter and method for forming same, 93:28 (USA Patent 5,198,002/A/)

M

MA 956
See IRON BASE ALLOYS

MACHINE TOOLS
See also LATHES
Laser focus compensating sensing and imaging device, 93:143 (USA Patent 5,241,557/A/)

MAGNET COILS
Correction coil cable, 93:171 (USA patent application 7-682,833)

MAGNETIC COILS
See MAGNET COILS

MAGNETIC LEVITATED TRAINS
See LEVITATED TRAINS

MAGNETIC TAPES
Apparatus and method for loading and unloading multiple digital tape cassettes utilizing a removable magazine, 93:333 (USA Patent 5,182,686/A/)

MAGNETOHYDRODYNAMIC GENERATORS
See MHD GENERATORS

MANIPULATORS
Gripping device, 93:124 (USA patent application 7-682,788)
Underwater manipulator, 93:128 (USA Patent 5,203,645/A/)

MASS SPECTROMETERS
Elimination of "memory" from sample handling and inlet system of a mass spectrometer, 93:100 (USA patent application 7-697,042)
Linear electric field mass spectrometry, 93:95 (USA patent application 7-678,081)
Noise reduction in negative-ion quadrupole mass spectrometry, 93:104 (USA Patent 5,204,530/A/)
Universal collisional activation ion trap mass spectrometry, 93:277 (USA Patent 5,206,509/A/)

MATERIALS
See also BIOLOGICAL MATERIALS
BUILDING MATERIALS
COMPOSITE MATERIALS
HAZARDOUS MATERIALS
MOLDING MATERIALS
PHASE CHANGE MATERIALS
POROUS MATERIALS
RADIOACTIVE MATERIALS
SEMICONDUCTOR MATERIALS
Apparatus and method for measuring fluorescence intensities at a plurality of wavelengths and lifetimes, 93:276 (USA Patent 5,208,651/A/)
Fiber-optic apparatus and method for measurement of luminescence and Raman scattering, 93:106 (USA Patent 5,194,913/A/)
Method and apparatus for acoustic plate mode liquid-solid phase transition detection, 93:136 (USA Patent 5,187,980/A/)
Multiple-frequency acoustic wave devices for chemical sensing and materials characterization in both gas and liquid phase, 93:135 (USA Patent 5,235,235/A/)
Voltammetric analysis apparatus and method, 93:103 (USA Patent 5,217,112/A/)
X-Z-Theta cutting method, 93:80 (USA Patent 5,178,498/A/)

MATERIALS (BIOLOGICAL)
See BIOLOGICAL MATERIALS

MATERIALS (BUILDING)
See BUILDING MATERIALS

MATERIALS (COMPOSITE)
See COMPOSITE MATERIALS

MATERIALS (POROUS)
See POROUS MATERIALS

MATERIALS (SEMICONDUCTOR)
See SEMICONDUCTOR MATERIALS

MATERIALS HANDLING EQUIPMENT
See also REMOTE HANDLING EQUIPMENT
Ball feeder for replenishing evaporator feed, 93:129 (USA Patent 5,195,651/A/)
Compact anhydrous HCl to aqueous HCl conversion system, 93:283 (USA Patent 5,215,723/A/)
Vortex nozzle for segmenting and transporting metal chips from turning operations, 93:69 (USA Patent 5,203,509/A/)

MCDOWELL-WELLMAN PROCESS
See COAL GASIFICATION

MEASUREMENTS WHILE DRILLING
See MWD SYSTEMS

MEASURING INSTRUMENTS
See also DIFFRACTOMETERS
ELECTRIC MEASURING INSTRUMENTS
INTERFEROMETERS
RADIATION DETECTORS
RANGE FINDERS
SPECTROMETERS
THERMOCOUPLES
THERMOMETERS
VELOCIMETERS
A method and apparatus for tube crevice detection and measurement, 93:191 (USA patent application 7-707,538)
High resolution data acquisition, 93:173 (USA Patent 5,200,933/A/)
Method and apparatus for acoustic plate mode liquid-solid phase transition detection, 93:136 (USA Patent 5,187,980/A/)
Method and apparatus for detecting timing errors in a system oscillator, 93:147 (USA Patent 5,229,752/A/)
Multiple-frequency acoustic wave devices for chemical sensing and materials characterization in both gas and liquid phase, 93:135 (USA Patent 5,235,235/A/)
Ordered transport and identification of particles, 93:208 (USA Patent 5,209,834/A/)
Plasma momentum meter for momentum flux measurements, 93:195 (USA Patent 5,239,563/A/)
Tritium monitor and collection system, 93:202 (USA patent application 7-674,981)
Voltammetric analysis apparatus and method, 93:103 (USA Patent 5,217,112/A/)
Wavelength meter having single mode fiber optics multiplexed inputs, 93:163 (USA Patent 5,189,485/A/)

MECHANICAL STRUCTURES
Magnetic gripper device, 93:131 (USA Patent 5,192,155/A/)
MEDICAL SUPPLIES
Compact biomedical pulsed signal generator for bone tissue stimulation, 93:213 (USA Patent 5,217,009/A/)
MEDICINES
See DRUGS
MELANOCYTES
See ANIMAL CELLS
MEMBRANES
Hydrogen-permeable composite metal membrane and uses thereof, 93:234 (USA Patent 5,217,506/A/)
Method and apparatus for removing ions from soil, 93:205 (USA Patent 5,190,628/A/)
Microporous alumina ceramic membranes, 93:262 (USA Patent 5,208,190/A/)
MERCURY
Method and apparatus for removing ions from soil, 93:205 (USA Patent 5,190,628/A/)
MERCURY 196
Compact anhydrous HCl to aqueous HCl conversion system, 93:283 (USA Patent 5,215,723/A/)
Method of controlling the mercury vapor pressure in a photo-chemical lamp or vapor filter used for Hg^{196} enrichment, 93:287 (USA Patent 5,187,804/A/)
Process of ^{196}Hg enrichment, 93:285 (USA Patent 5,205,913/A/)
METAL VAPOR LASERS
Coupling apparatus for a metal vapor laser, 93:162 (USA Patent 5,189,678/A/)
Tungsten-yttria carbide coating for conveying copper, 93:160 (USA Patent 5,194,218/A/)
METAL-GAS BATTERIES
See also LITHIUM-CHLORINE BATTERIES
Method of electrode fabrication and an electrode for metal chloride battery, 93:58 (USA Patent 5,194,343/A/)
METALS
See also ACTINIDES
ALUMINIUM
LIQUID METALS
MERCURY
Controlled metal-semiconductor sintering/alloying by one-directional reverse illumination, 93:91 (USA Patent 5,223,453/A/)
Electrowinning process with electrode compartment to avoid contamination of electrolyte, 93:102 (USA Patent 5,225,051/A/)
Ice electrode electrolytic cell, 93:71 (USA Patent 5,200,054/A/)
Laser cutting with chemical reaction assist, 93:122 (USA patent application 7-681,293)
Method for minimizing decarburization and other high temperature oxygen reactions in a plasma sprayed material, 93:269 (USA Patent 5,217,746/A/)
Method of bonding metals to ceramics and other materials, 93:94 (USA Patent 5,176,950/A/)
Nonhazardous solvent composition and method for cleaning metal surfaces, 93:320 (USA Patent 5,207,838/A/)
METHANE
Catalysts for conversion of methane to higher hydrocarbons, 93:41 (USA Patent 5,177,294/A/)
Clay enhancement of methane, low molecular weight hydrocarbon and halocarbon conversion by methanotrophic bacteria, 93:38 (USA patent application 7-738,001)
METHANOL
Methanol synthesis using a catalyst combination of alkali or alkaline earth salts and reduced copper chromite for methanol synthesis, 93:240 (USA Patent 5,221,652/A/)
METHYL ALCOHOL
See METHANOL
METHYL-FUEL
See METHANOL
MHD GENERATORS
Plasma plume MHD power generator and method, 93:60 (USA Patent 5,234,183/A/)
MICROELECTRONIC CIRCUITS
See also INTEGRATED CIRCUITS
Coherence delay augmented laser beam homogenizer, 93:150 (USA Patent 5,224,200/A/)
Superconducting microcircuitry by the microlithographic patterning of superconducting compounds and related materials, 93:218 (USA Patent 5,238,913/A/)
Three dimensional, multi-chip module, 93:144 (USA Patent 5,241,450/A/)
MICROSCOPES
Reflection soft X-ray microscope and method, 93:311 (USA Patent 5,177,774/A/)
MICROWAVE AMPLIFIERS
Apparatus for conversion of whispering-gallery modes into a free space Gaussian like beam, 93:221 (USA patent application 7-711,693)
Gigatron microwave amplifier, 93:148 (USA Patent 5,227,701/A/)
Method and apparatus for stabilizing pulsed microwave amplifiers, 93:297 (USA Patent 5,182,524/A/)
MICROWAVE EQUIPMENT
See also MICROWAVE AMPLIFIERS
Method and split cavity oscillator/modulator to generate pulsed particle beams and electromagnetic fields, 93:146 (USA Patent 5,235,248/A/)
MIGRATION (RADIONUCLIDE)
See RADIONUCLIDE MIGRATION
MILL TAILINGS
Vortex nozzle for segmenting and transporting metal chips from turning operations, 93:69 (USA Patent 5,203,509/A/)
MIXTURES
See also SLURRIES
Means and method of detection in chemical separation procedures, 93:280 (USA Patent 5,192,407/A/)
Separation processes using expulsion from dilute supercritical solutions, 93:110 (USA Patent 5,204,003/A/)
Ultrasonic tomography for in-process measurements of temperature in a multi-phase medium, 93:294 (USA Patent 5,181,778/A/)
MOLDING MATERIALS
Phenolic compounds containing/neutral fractions extract and products derived therefrom from fractionated fast-pyrolysis oils, 93:267 (USA Patent 5,223,601/A/)
MOLECULAR FLUORESCENCE SPECTROSCOPY
See FLUORESCENCE SPECTROSCOPY
MOLTEN CARBONATE FUEL CELLS
All ceramic structure for molten carbonate fuel cell, 93:61 (USA patent application 7-685,759)
Carbonate fuel cell anodes, 93:247 (USA Patent 5,206,095/A/)
MONITORS (AIR POLLUTION)
See AIR POLLUTION MONITORS
MONITORS (RADIATION)
See RADIATION MONITORS
MONOCHROMATORS
Multiple wavelength x-ray monochromators, 93:192 (USA patent application 7-714,805)
MONOMERS
Controlled catalytic and thermal sequential pyrolysis and hydrolysis of mixed polymer waste streams to sequentially recover monomers or other high value products, 93:250 (USA Patent 5,216,149/A/)
MOTION DETECTION SYSTEMS
Non-contact tamper sensing by electronic means, 93:33 (USA Patent 5,237,307/A/)
MULTILAMELLAR LIPID VESICLES
See LIPOSOMES
MULTIPROCESSING
See PARALLEL PROCESSING
MULTIPROCESSORS
See ARRAY PROCESSORS
MWD SYSTEMS
Borehole data transmission apparatus, 93:180 (USA Patent 5,197,040/A/)

N

NATURAL GAS
Nitrogen sorption, 93:232 (USA Patent 5,225,174/A/)
Oil/gas separator for installation at burning wells, 93:18 (USA Patent 5,191,940/A/)

NAVIGATION
Error-eliminating rapid ultrasonic firing, 93:290 (USA Patent 5,239,515/A/)
NEURAL NETWORKS
Neural network system and methods for analysis of organic materials and structures using spectral data, 93:275 (USA Patent 5,218,529/A/)
NEUTRALIZATION (CHEMICAL)
See PH VALUE
NEUTRON ABSORBERS.
Method and apparatus for close packing of nuclear fuel assemblies, 93:233 (USA Patent 5,198,183/A/)
NEUTRON DETECTORS
Neutron coincidence detectors employing heterogeneous materials, 93:301 (USA Patent 5,231,290/A/)
NIOBIUM ALLOYS
Niobium-titanium superconductors produced by powder metallurgy having artificial flux pinning centers, 93:259 (USA Patent 5,226,947/A/)
NITRIC OXIDE
NO reduction using sublimation of cyanuric acid, 93:15 (USA Patent 5,180,565/A/)
NITROGEN
Nitrogen sorption, 93:232 (USA Patent 5,225,174/A/)
NITROGEN DIOXIDE
Nitrogen dioxide detection, 93:312 (USA Patent 5,222,388/A/)
NITROGEN NITRIDES
See NITROGEN
NITROGEN OXIDES
See also NITRIC OXIDE
NITROGEN DIOXIDE
NOx reduction by sulfur tolerant coronal-catalytic apparatus and method, 93:225 (USA Patent 5,240,575/A/)
SOx/NOx sorbent and process of use, 93:227 (USA Patent 5,180,703/A/)
NOZZLES
Atomizing nozzle and process, 93:258 (USA Patent 5,228,620/A/)
Swirling structure for mixing two concentric fluid flows at nozzle outlet, 93:133 (USA Patent 5,228,624/A/)
NUCLEAR POWER PLANTS
Nuclear reactor flow control method and apparatus, 93:54 (USA patent application 7-689,425)
NUCLEAR POWER STATIONS
See NUCLEAR POWER PLANTS
NUCLEAR SAFETY
See RADIATION PROTECTION
NUCLEAR WASTES
See RADIOACTIVE WASTES
NUCLEOTIDES
Ordered transport and identification of particles, 93:208 (USA Patent 5,209,834/A/)

O

OFF-GAS SYSTEMS
Cooler and particulate separator for an off-gas stack, 93:203 (USA patent application 7-681,292)
OHMIC RESISTANCE
See ELECTRIC CONDUCTIVITY
OIL SHALE WASTE WATER
See WASTE WATER
OIL SPILL FINGERPRINTING
See OIL SPILLS
OIL SPILLS
Oil/gas collector/separator for underwater oil leaks, 93:19 (USA Patent 5,213,444/A/)
OIL WELLS
Measuring resistivity changes from within a first cased well to monitor fluids injected into oil bearing geological formations from a second cased well while passing electrical current between the two cased wells, 93:228 (USA Patent 5,187,440/A/)
Oil/gas separator for installation at burning wells, 93:18 (USA Patent 5,191,940/A/)
OILS
See also PYROLYTIC OILS
Method of upgrading oils containing hydroxyaromatic hydrocarbon compounds to highly aromatic gasoline, 93:223 (USA Patent 5,180,868/A/)
OLEFINS
See ALKENES
ON-LINE COMPUTERS
See COMPUTERS
ON-LINE MEASUREMENT SYSTEMS
Means and method of detection in chemical separation procedures, 93:280 (USA Patent 5,192,407/A/)
Ultrasonic tomography for in-process measurements of temperature in a multi-phase medium, 93:294 (USA Patent 5,181,778/A/)
OPTICAL EQUIPMENT
Apparatus for preventing particle deposition from process streams on optical access windows, 93:184 (USA Patent 5,217,510/A/)
Optical probe for the cytochrome P-450 cholesterol side chain cleavage enzyme, 93:209 (USA Patent 5,208,332/A/)
OPTICAL FILTERS
False color viewing device, 93:182 (USA patent application 7-697,158)
OPTICAL SPECTROMETERS
Atomic line emission analyzer for hydrogen isotopes, 93:99 (USA patent application 7-697,032)
Fiber optic hydrogen sensor, 93:96 (USA patent application 7-678,520)
OPTICAL SYSTEMS
Active imaging system with Faraday filter, 93:187 (USA Patent 5,202,741/A/)
Microoptic lenses, 93:298 (USA Patent 5,181,224/A/)
Reflective optical imaging system for extreme ultraviolet wavelengths, 93:185 (USA Patent 5,212,588/A/)
Virtually distortion-free imaging system for large field, high resolution lithography, 93:168 (USA Patent 5,176,970/A/)
ORGANIC BORON COMPOUNDS
Enantioselective synthesis of L-(-)-4-boronophenylalanine (L-BPA), 93:115 (USA patent application 7-710,208)
ORGANIC COMPOUNDS
See also HYDROCARBONS
NUCLEOTIDES
ORGANIC BORON COMPOUNDS
ORGANIC SULFUR COMPOUNDS
Bacterial extracellular lignin peroxidase, 93:237 (USA Patent 5,232,845/A/)
Neural network system and methods for analysis of organic materials and structures using spectral data, 93:275 (USA Patent 5,218,529/A/)
ORGANIC SOLVENTS
Nonhazardous solvent composition and method for cleaning metal surfaces, 93:320 (USA Patent 5,207,838/A/)
ORGANIC SULFUR COMPOUNDS
Useful for cleavage of organic C-S bonds Bacillus sphaericus microorganism, 93:319 (USA Patent 5,198,341/A/)
OSCILLATORS
Method and apparatus for detecting timing errors in a system oscillator, 93:147 (USA Patent 5,229,752/A/)
Phase-locked loop with control phase slippage, 93:300 (USA patent application 7-807,144)
OSTEOPOROSIS
Compact biomedical pulsed signal generator for bone tissue stimulation, 93:213 (USA Patent 5,217,009/A/)
OXIDES
See also ALUMINIUM OXIDES
BARIUM OXIDES
CALCIUM OXIDES
COPPER OXIDES
GADOLINIUM OXIDES
NITROGEN OXIDES
PLUTONIUM OXIDES
SULFUR OXIDES
YTTRIUM OXIDES
ZIRCONIUM OXIDES
Actinide metal processing, 93:24 (USA patent application 7-680,972)
Synthesis of actinide nitrides, phosphides, sulfides and oxides, 93:114 (USA patent application 7-679,487)

OXYGEN HYDRIDES
See WATER

P

PALLADIUM
Crystalline titanate catalyst supports, 93:17 (USA Patent 5,177,045/A/)
PANINDCO PROCESS
See COAL GASIFICATION
PARAFFINS
See ALKANES
PARALLEL PROCESSING
Communication switch for serial and parallel network, 93:329 (USA patent application 7-898,081)
Digital programmable level-1 trigger with 3D-flow assembly, 93:326 (USA patent application 7-101,489)
Parallel data transfer network controlled by a dynamically reconfigurable serial network, 93:328 (USA patent application 7-856,622)
Parallel processing architecture, 93:330 (USA patent application 8-043,776)
PARTICLE BEAMS
Particle beam generator using a radioactive source, 93:35 (USA Patent 5,198,674/A/)
PARTICULATES
Cooler and particulate separator for an off-gas stack, 93:203 (USA patent application 7-681,292)
Gas stream clean-up filter and method for forming same, 93:28 (USA Patent 5,198,002/A/)
Three-axis particle impact probe, 93:188 (USA patent application 7-679,488)
Ultrasonic tomography for in-process measurements of temperature in a multi-phase medium, 93:294 (USA Patent 5,181,778/A/)
PERFORATED PIPE DISTRIBUTORS
See SPARGERS
PERIOSTEUM
See BONE TISSUES
PERMANENT MAGNETS
Method of making bonded or sintered permanent magnets, 93:256 (USA Patent 5,240,513/A/)
PEROXIDASES
Bacterial extracellular lignin peroxidase, 93:237 (USA Patent 5,232,845/A/)
PETROLEUM
Oil/gas separator for installation at burning wells, 93:18 (USA Patent 5,191,940/A/)
PH VALUE
Colorimetric determination of pH, 93:97 (USA patent application 7-681,297)
Measurement of pH in high ionic strength solutions, 93:101 (USA patent application 7-702,527)
PHARMACEUTICALS
See DRUGS
PHASE CHANGE MATERIALS
Dry powder mixes comprising phase change materials, 93:271 (USA Patent 5,211,949/A/)
Microwave impregnation of porous materials with thermal energy storage materials, 93:46 (USA Patent 5,202,150/A/)
PHOSPHIDES
Synthesis of actinide nitrides, phosphides, sulfides and oxides, 93:114 (USA patent application 7-679,487)
PHOSPHORYLASES
See PHOSPHOTRANSFERASES
PHOSPHOTRANSFERASES
Method for distinguishing normal and transformed cells using G1 kinase inhibitors, 93:211 (USA Patent 5,185,260/A/)
PHOTODETECTORS
Atomic line emission analyzer for hydrogen isotopes, 93:105 (USA Patent 5,198,870/A/)
PHOTOVOLTAIC CELLS
Photovoltaic device with increased light absorption and method for its manufacture, 93:242 (USA Patent 5,228,926/A/)
PHYSICAL PROPERTIES
Multiple-frequency acoustic wave devices for chemical sensing and materials characterization in both gas and liquid phase, 93:135 (USA Patent 5,235,235/A/)
PIGMENT CELLS
See ANIMAL CELLS
PIPE FITTINGS
Adjustable-angle pipe fitting, 93:125 (USA patent application 7-724,662)
PIPES
Pipe crawler with extendable legs, 93:120 (USA patent application 7-679,497)
Piping inspection instrument carriage, 93:49 (USA patent application 7-730,425)
PLASMA
Linear electric field mass spectrometry, 93:95 (USA patent application 7-678,081)
Plasma momentum meter for momentum flux measurements, 93:195 (USA Patent 5,239,563/A/)
PLASMA ARC SPRAYING
Method for minimizing decarburization and other high temperature oxygen reactions in a plasma sprayed material, 93:269 (USA Patent 5,217,746/A/)
PLATINUM ALLOYS
Method for bonding thin film thermocouples to ceramics, 93:74 (USA Patent 5,215,597/A/)
PLUGS
See CLOSURES
PLUTONIUM
Determination of actinides in urine and fecal samples, 93:214 (USA Patent 5,190,881/A/)
Lithium metal reduction of plutonium oxide to produce plutonium metal, 93:79 (USA patent application 7-689,423)
Metal recovery from porous materials, 93:21 (USA patent application 7-723,122)
Method of photon spectral analysis, 93:313 (USA Patent 5,206,174/A/)
Plutonium recovery from spent reactor fuel by uranium displacement, 93:20 (USA patent application 7-703,641)
PLUTONIUM OXIDES
Lithium metal reduction of plutonium oxide to produce plutonium metal, 93:79 (USA patent application 7-689,423)
POINT CONTACTS
See ELECTRIC CONTACTS
POISONS (CHEMICAL)
See HAZARDOUS MATERIALS
POLLUTION CONTROL EQUIPMENT
See also ELECTROSTATIC PRECIPITATORS
NOx reduction by sulfur tolerant coronal-catalytic apparatus and method, 93:225 (USA Patent 5,240,575/A/)
Oil/gas collector/separator for underwater oil leaks, 93:19 (USA Patent 5,213,444/A/)
System to control contamination during retrieval of buried TRU waste, 93:26 (USA Patent 5,203,644/A/)
POLYAMIDES
See also POLYURETHANES
Polyamide thermosets, 93:111 (USA Patent 5,198,551/A/)
POLYMERS
Controlled catalytic and thermal sequential pyrolysis and hydrolysis of mixed polymer waste streams to sequentially recover monomers or other high value products, 93:250 (USA Patent 5,216,149/A/)
Diorganosilacetylene-alt-diorganosilvinylene polymers and a process of preparation, 93:263 (USA Patent 5,241,029/A/)
Hybrid sol-gel optical materials, 93:92 (USA Patent 5,204,381/A/)
Solid-gel precursor solutions and methods for the fabrication of polymetallicsiloxane coating films, 93:286 (USA Patent 5,200,237/A/)
POLYPEPTIDES
Catalytic and reactive polypeptides and methods for their preparation and use, 93:316 (USA Patent 5,215,889/A/)
cDNA encoding a polypeptide including a hevein sequence, 93:236 (USA Patent 5,187,262/A/)
POLYSULFIDES
See SULFIDES
POLYTHIONATES
See SULFUR COMPOUNDS

POLYTHIONIC ACIDS
See SULFUR COMPOUNDS
POLYURETHANES
Energy curable compositions having improved cure speeds, 93:270 (USA Patent 5,212,210/A/)
POROUS MATERIALS
Root-growth-inhibiting sheet, 93:314 (USA Patent 5,181,952/A/)
PORPHYRINS
Cyano- and polycyanometallo-porphyrins as catalysts for alkane oxidation, 93:284 (USA Patent 5,212,300/A/)
Synthetic route to meso-tetra hydrocarbyl or substituted hydrocarbyl porphyrins and derivatives, 93:282 (USA Patent 5,241,062/A/)
POSITRON BEAMS
Determination of interfacial states in solid heterostructures using a variable-energy positron beam, 93:323 (USA Patent 5,200,619/A/)
POWER AMPLIFIERS
Ring regenerative laser amplifier, 93:139 (USA patent application 7-704,590)
PRESSURIZED WATER COOLED MODERATED REACTOR
See PWR TYPE REACTORS
PRESSURIZED WATER REACTORS
See PWR TYPE REACTORS
PRESSURIZERS
Automated robotic equipment for ultrasonic inspection of pressurizer heater wells, 93:48 (USA Patent 5,194,215/A/)
PRINTED CIRCUITS
Method and apparatus for continuous lamination of sheet material, 93:141 (USA patent application 7-713,208)
PROBES
Piping inspection instrument carriage, 93:49 (USA patent application 7-730,425)
PROCESSING (DATA)
See DATA PROCESSING
PRODUCTION (HYDROGEN)
See HYDROGEN PRODUCTION
PROPELLANTS
Explosive laser light initiation of propellants, 93:198 (USA Patent 5,212,339/A/)
PROPERTIES (CHEMICAL)
See CHEMICAL PROPERTIES
PROPERTIES (PHYSICAL)
See PHYSICAL PROPERTIES
PROTECTION (RADIATION)
See RADIATION PROTECTION
PROTECTIVE CLOTHING
Safety harness, 93:29 (USA patent application 7-681,291)
PROTECTIVE COATINGS
Solid-gel precursor solutions and methods for the fabrication of polymetallicsiloxane coating films, 93:286 (USA Patent 5,200,237/A/)
PULPS
See SLURRIES
PULSE COLUMNS
See EXTRACTION COLUMNS
PUMPS
See also ELECTROMAGNETIC PUMPS
Expert system for online surveillance of nuclear reactor coolant pumps, 93:53 (USA Patent 5,223,207/A/)
Fluid-driven reciprocating apparatus and valving for controlling same, 93:126 (USA Patent 5,222,873/A/)
PWR TYPE REACTORS
Automated robotic equipment for ultrasonic inspection of pressurizer heater wells, 93:48 (USA Patent 5,194,215/A/)
PYRENE
Crystalline titanate catalyst supports, 93:17 (USA Patent 5,177,045/A/)
PYROLYTIC OILS
Phenolic compounds containing/neutral fractions extract and products derived therefrom from fractionated fast-pyrolysis oils, 93:267 (USA Patent 5,223,601/A/)
Process for preparing phenolic formaldehyde resole resin products derived from fractionated fast-pyrolysis oils, 93:241 (USA Patent 5,091,499/A/)
Resole resin products derived from fractionated organic and aqueous condensates made by fast-pyrolysis of biomass materials, 93:39 (USA Patent 5,235,021/A/)

Q

QUADRUPOLE LINACS
Small system for tritium accelerator mass spectrometry, 93:169 (USA Patent 5,189,302/A/)

R

RACKS (FUEL)
See FUEL RACKS
RADIATION DETECTORS
See also NEUTRON DETECTORS
Alternating current long range alpha particle detector, 93:304 (USA Patent 5,187,370/A/)
Method and apparatus for providing pulse pile-up correction in charge quantizing radiation detection systems, 93:176 (USA Patent 5,225,682/A/)
Quantitative method for measuring heat flux emitted from a cryogenic object, 93:217 (USA Patent 5,193,909/A/)
Self-filling and self-purging apparatus for detecting spontaneous radiation from substances in fluids, 93:302 (USA Patent 5,229,604/A/)
RADIATION HYGIENE
See RADIATION PROTECTION
RADIATION MONITORS
Audible radiation monitor, 93:175 (USA Patent 5,231,288/A/)
Automatically processed alpha-track radon monitor, 93:174 (USA patent application 7-694,738)
Long range alpha particle detector, 93:177 (USA Patent 5,184,019/A/)
RADIATION PROTECTION
Determination of actinides in urine and fecal samples, 93:214 (USA Patent 5,190,881/A/)
RADIATION SAFETY
See RADIATION PROTECTION
RADIO EQUIPMENT
Fading channel simulator, 93:161 (USA Patent 5,191,594/A/)
RADIO RECEIVERS
See RADIO EQUIPMENT
RADIO TRANSMITTERS
See RADIO EQUIPMENT
RADIOACTIVE BIOLOGICAL WASTES
See RADIOACTIVE WASTES
RADIOACTIVE GASEOUS WASTES
See RADIOACTIVE WASTES
RADIOACTIVE MATERIALS
See also FISSION PRODUCTS
RADIOACTIVE WASTES
Nonhazardous solvent composition and method for cleaning metal surfaces, 93:320 (USA Patent 5,207,838/A/)
RADIOACTIVE WASTES
See also ALPHA-BEARING WASTES
LOW-LEVEL RADIOACTIVE WASTES
High-flexibility, noncollapsing lightweight hose, 93:27 (USA Patent 5,203,378/A/)
RADIOISOTOPE MIGRATION
See RADIONUCLIDE MIGRATION
RADIOISOTOPE-LABELLED DRUGS
See RADIOPHARMACEUTICALS
RADIOLOGICAL PROTECTION
See RADIATION PROTECTION
RADIONUCLIDE MIGRATION
System to control contamination during retrieval of buried TRU waste, 93:26 (USA Patent 5,203,644/A/)
RADIONUCLIDE TRANSFER (IN ENVIRONMENT)
See RADIONUCLIDE MIGRATION
RADIOPHARMACEUTICALS
Enantioselective synthesis of L-(-)-4-boronophenylalanine (L-BPA), 93:115 (USA patent application 7-710,208)
RADON
Automatically processed alpha-track radon monitor, 93:174 (USA patent application 7-694,738)
RAILGUN ACCELERATORS
Hybrid armature projectile, 93:199 (USA Patent 5,191,164/A/)

RANDOM NUMBER GENERATORS
Random one-of-N selector, 93:155 (USA Patent 5,204,671/A/)
RANGE FINDERS
Secure distance ranging by electronic means, 93:32 (USA patent application 7-727,036)
REACTOR ACCIDENTS
Nuclear reactor flow control method and apparatus, 93:55 (USA Patent 5,198,185/A/)
REACTOR COMPONENTS
See also CONTROL ROD DRIVES
REACTOR COOLING SYSTEMS
REACTOR CORES
Integrated head package for top mounted nuclear instrumentation, 93:243 (USA Patent 5,225,150/A/)
REACTOR COOLING SYSTEMS
Expert system for online surveillance of nuclear reactor coolant pumps, 93:53 (USA Patent 5,223,207/A/)
Piping inspection instrument carriage, 93:49 (USA patent application 7-730,425)
REACTOR CORES
Spring design for use in the core of a nuclear reactor, 93:50 (USA Patent 5,226,633/A/)
REACTOR MONITORING SYSTEMS
Expert system for online surveillance of nuclear reactor coolant pumps, 93:53 (USA Patent 5,223,207/A/)
REFRACTORIES
Combustion synthesis method and products, 93:86 (USA Patent 5,198,188/A/)
REFRIGERANTS
Charged particle mobility refrigerant analyzer, 93:281 (USA Patent 5,184,015/A/)
REFRIGERATING MACHINERY
Triple-effect absorption refrigeration system with double-condenser coupling, 93:252 (USA Patent 5,205,136/A/)
REFRIGERATORS
See also HELIUM DILUTION REFRIGERATORS
Compact acoustic refrigerator, 93:178 (USA patent application 7-710,207)
REFUSE
See SOLID WASTES
REMOTE HANDLING EQUIPMENT
See also MANIPULATORS
Gripper deploying and inverting linkage, 93:123 (USA patent application 7-681,294)
Gripper deploying and inverting linkage, 93:132 (USA Patent 5,190,333/A/)
Underwater manipulator, 93:128 (USA Patent 5,203,645/A/)
RESIDUES (RADIOACTIVE)
See RADIOACTIVE WASTES
RESINS
Phenolic compounds containing/neutral fractions extract and products derived therefrom from fractionated fast-pyrolysis oils, 93:267 (USA Patent 5,223,601/A/)
Process for preparing phenolic formaldehyde resole resin products derived from fractionated fast-pyrolysis oils, 93:241 (USA Patent 5,091,499/A/)
Resole resin products derived from fractionated organic and aqueous condensates made by fast-pyrolysis of biomass materials, 93:39 (USA Patent 5,235,021/A/)
RESISTIVITY (ELECTRIC)
See ELECTRIC CONDUCTIVITY
RESONATORS
Micro-machined resonator, 93:158 (USA Patent 5,198,716/A/)
RHENIUM 188
Tungsten-188/carrier-free rhenium-188 perrhenic acid generator system, 93:288 (USA Patent 5,186,913/A/)
RHODIUM ALLOYS
Method for bonding thin film thermocouples to ceramics, 93:74 (USA Patent 5,215,597/A/)
ROADWAY-POWERED ELECTRIC VEHICLES
Propulsion and stabilization system for magnetically levitated vehicles, 93:75 (USA Patent 5,222,436/A/)
ROBOTS
Automated robotic equipment for ultrasonic inspection of pressurizer heater wells, 93:48 (USA Patent 5,194,215/A/)
Error-eliminating rapid ultrasonic firing, 93:290 (USA Patent 5,239,515/A/)
ROMBACH PROCESS
See COAL GASIFICATION
ROOTS
Root-growth-inhibiting sheet, 93:314 (USA Patent 5,181,952/A/)

S

SAFETY (NUCLEAR)
See RADIATION PROTECTION
SAMPLE HOLDERS
Apparatus for tensile testing plate-type ceramic specimens, 93:292 (USA Patent 5,237,876/A/)
SANITARY LANDFILLS
Drill string enclosure, 93:72 (USA Patent 5,191,156/A/)
SCHMALFELDT-WINTERSHALL PROCESS
See COAL GASIFICATION
SEALS
See also SECURITY SEALS
Inflatable containment diaphragm for sealing and removing stacks, 93:70 (USA Patent 5,201,345/A/)
SECONDARY BATTERIES
See ELECTRIC BATTERIES
SECURITY SEALS
Secure distance ranging by electronic means, 93:32 (USA patent application 7-727,036)
SEISMIC DETECTORS
Advanced motor driven clamped borehole seismic receiver, 93:215 (USA Patent 5,189,262/A/)
SELENIUM 72
Production of selenium-72 and arsenic-72, 93:289 (USA Patent 5,204,072/A/)
SELOX PROCESS
See COAL GASIFICATION
SEMICONDUCTOR DEVICES
See also SEMICONDUCTOR DIODES
SEMICONDUCTOR RESISTORS
SEMICONDUCTOR SWITCHES
Method of producing strained-layer semiconductor devices via subsurface-patterning, 93:149 (USA Patent 5,225,368/A/)
SEMICONDUCTOR DIODES
High voltage feed through bushing, 93:156 (USA Patent 5,200,578/A/)
SEMICONDUCTOR MATERIALS
Controlled metal-semiconductor sintering/alloying by one-directional reverse illumination, 93:91 (USA Patent 5,223,453/A/)
SEMICONDUCTOR RESISTORS
Zinc oxide varistors and/or resistors, 93:265 (USA Patent 5,231,370/A/)
SEMICONDUCTOR SWITCHES
Optically triggered high voltage switch network and method for switching a high voltage, 93:244 (USA Patent 5,180,963/A/)
SEPARATION EQUIPMENT
Oil/gas separator for installation at burning wells, 93:18 (USA Patent 5,191,940/A/)
SEPARATION PROCESSES
See also ISOTOPE SEPARATION
Means and method of detection in chemical separation procedures, 93:280 (USA Patent 5,192,407/A/)
SHIELDING
Material containment enclosure, 93:118 (USA patent application 7-678,387)
SHUTTERS
Single-bunch synchrotron shutter, 93:172 (USA Patent 5,225,788/A/)
SIALON
See ALUMINIUM OXIDES
SIGNAL CONDITIONERS
Asynchronous parallel status comparator, 93:138 (USA patent application 7-678,428)

SILICON CARBIDES
Diorganosilacetylene-alt-diorganosilvinylene polymers and a process of preparation, 93:263 (USA Patent 5,241,029/A/)
Manufacture of silicon carbide using solar energy, 93:81 (USA patent application 7-681,296)
SILOXANES
Solid-gel precursor solutions and methods for the fabrication of polymetallicsiloxane coating films, 93:286 (USA Patent 5,200,237/A/)
SIMULATORS
Simulated nuclear reactor fuel assembly, 93:51 (USA Patent 5,200,144/A/)
SLAGS
Device and method for skull-melting depth measurement, 93:261 (USA Patent 5,185,031/A/)
SLEEVES
Nuclear reactor flow control method and apparatus, 93:55 (USA Patent 5,198,185/A/)
SLUDGES
Disposable sludge dewatering container and method, 93:67 (USA Patent 5,232,599/A/)
SLURRIES
Method for enhanced atomization of liquids, 93:68 (USA Patent 5,217,362/A/)
Method for simultaneous measurement of mass loading and fluid property changes using a quartz crystal microbalance, 93:196 (USA Patent 5,201,215/A/)
SLURRY PIPELINES
Method and apparatus for transporting liquid slurries, 93:130 (USA Patent 5,193,942/A/)
SODIUM PHOSPHIDES
See PHOSPHIDES
SOFC
See SOLID ELECTROLYTE FUEL CELLS
SOFT SOLDERING
See SOLDERING
SOILS
Ice electrode electrolytic cell, 93:71 (USA Patent 5,200,054/A/)
In-situ remediation system for groundwater and soils, 93:30 (USA patent application 7-711,686)
Method and apparatus for removing ions from soil, 93:205 (USA Patent 5,190,628/A/)
Method of photon spectral analysis, 93:313 (USA Patent 5,206,174/A/)
Root-growth-inhibiting sheet, 93:314 (USA Patent 5,181,952/A/)
SOLAR CONCENTRATORS
See also SOLAR REFLECTORS
Photovoltaic solar concentrator module, 93:44 (USA patent application 7-700,813)
SOLAR FURNACES
Manufacture of silicon carbide using solar energy, 93:81 (USA patent application 7-681,296)
SOLAR REFLECTORS
Method and apparatus for uniformly concentrating solar flux for photovoltaic applications, 93:45 (USA patent application 7-712,812)
SOLDERING
Solder for oxide layer-building metals and alloys, 93:77 (USA patent application 7-681,290)
SOLID ELECTROLYTE FUEL CELLS
Ionic conductors for solid oxide fuel cells, 93:62 (USA Patent 5,232,794/A/)
Solid oxide fuel cell generator, 93:248 (USA Patent 5,200,279/A/)
Solid-oxide fuel cell electrolyte, 93:63 (USA Patent 5,213,911/A/)
SOLID ELECTROLYTES
Solid electrolytes, 93:246 (USA Patent 5,219,679/A/)
SOLID FUELS
Gas stream clean-up filter and method for forming same, 93:28 (USA Patent 5,198,002/A/)
SOLID WASTES
Method of draining water through a solid waste site without leaching, 93:253 (USA Patent 5,183,355/A/)
SOLIDS
Method and apparatus for acoustic plate mode liquid-solid phase transition detection, 93:136 (USA Patent 5,187,980/A/)
SONDES
See PROBES
SPARGERS
Shielded fluid stream injector for particle bed reactor, 93:66 (USA Patent 5,232,673/A/)
SPECIMEN HOLDERS
See SAMPLE HOLDERS
SPECTRA
Neural network system and methods for analysis of organic materials and structures using spectral data, 93:275 (USA Patent 5,218,529/A/)
SPECTROMETERS
See also MASS SPECTROMETERS
OPTICAL SPECTROMETERS
Detection device for high explosives, 93:200 (USA patent application 7-707,414)
Fiber-optic apparatus and method for measurement of luminescence and Raman scattering, 93:106 (USA Patent 5,194,913/A/)
Method of photon spectral analysis, 93:313 (USA Patent 5,206,174/A/)
Programmable spectral imaging method and apparatus, 93:98 (USA patent application 7-693,466)
SPEED INDICATORS
See VELOCIMETERS
SPENT FUEL STORAGE
Fail-safe storage rack for irradiated fuel rod assemblies, 93:23 (USA Patent 5,196,161/A/)
SPENT FUELS
Metal recovery from porous materials, 93:21 (USA patent application 7-723,122)
Plutonium recovery from spent reactor fuel by uranium displacement, 93:20 (USA patent application 7-703,641)
SPENT LIQUORS
Fluorescence analyzer for lignin, 93:239 (USA Patent 5,216,483/A/)
SPRINGS
Spring design for use in the core of a nuclear reactor, 93:50 (USA Patent 5,226,633/A/)
STACKS
Inflatable containment diaphragm for sealing and removing stacks, 93:70 (USA Patent 5,201,345/A/)
STEAM GENERATORS
A method and apparatus for tube crevice detection and measurement, 93:191 (USA patent application 7-707,538)
STORAGE (SPENT FUEL)
See SPENT FUEL STORAGE
STORAGE BATTERIES
See ELECTRIC BATTERIES
STRONTIUM
Combined transuranic-strontium extraction process, 93:25 (USA patent application 7-717,426)
STRUCTURAL MATERIALS
See BUILDING MATERIALS
STRUCTURES (MECHANICS)
See MECHANICAL STRUCTURES
SULFIDES
See also HYDROGEN SULFIDES
Synthesis of actinide nitrides, phosphides, sulfides and oxides, 93:114 (USA patent application 7-679,487)
SULFITE WASTE LIQUOR
See SPENT LIQUORS
SULFUR
Hydrogen and sulfur recovery from hydrogen sulfide wastes, 93:251 (USA Patent 5,211,923/A/)
SULFUR COMPOUNDS
See also SULFIDES
SULFUR OXIDES
Two stage sorption of sulfur compounds, 93:47 (USA patent application 7-697,041)
SULFUR HYDRIDES
See HYDROGEN SULFIDES
SULFUR OXIDES
SOx/NOx sorbent and process of use, 93:227 (USA Patent 5,180,703/A/)
SULFUR SULFIDES
See SULFUR
SUN
Apparatus for synthesis of a solar spectrum, 93:183 (USA Patent 5,217,285/A/)

SUPERCONDUCTING COILS
Method of preloading superconducting coils by using materials with different thermal expansion coefficients, 93:219 (USA Patent 5,187,859/A/)
SUPERCONDUCTING COMPOSITES
Strain tolerant microfilamentary superconducting wire, 93:274 (USA Patent 5,189,260/A/)
SUPERCONDUCTING DEVICES
Dual control active superconductive devices, 93:324 (USA Patent 5,229,655/A/)
SUPERCONDUCTING FILMS
Superconducting microcircuitry by the microlithographic patterning of superconducting compounds and related materials, 93:218 (USA Patent 5,238,913/A/)
SUPERCONDUCTING SUPER COLLIDER
Correction coil cable, 93:171 (USA patent application 7-682,833)
SUPERCONDUCTING WIRES
Niobium-titanium superconductors produced by powder metallurgy having artificial flux pinning centers, 93:259 (USA Patent 5,226,947/A/)
Strain tolerant microfilamentary superconducting wire, 93:274 (USA Patent 5,189,260/A/)
SUPPORTS (CATALYST)
See CATALYST SUPPORTS
SURFACES
Apparatus and method for measuring and imaging surface resistance, 93:194 (USA Patent 5,239,269/A/)
SWITCHES
See also SEMICONDUCTOR SWITCHES
Communication switch for serial and parallel network, 93:329 (USA patent application 7-898,081)
Double domino driver, 93:327 (USA patent application 7-997,593)
Irreversible magnetic switch, 93:140 (USA patent application 7-713,206)
SWITCHING CIRCUITS
Remote two-wire data entry method and device, 93:142 (USA patent application 7-720,128)
SYNCHROTRON RADIATION SOURCES
Single-bunch synchrotron shutter, 93:172 (USA Patent 5,225,788/A/)
Tunability enhanced electromagnetic wiggler, 93:170 (USA patent application 7-672,308)
SYNTHINE PROCESS
See FISCHER-TROPSCH SYNTHESIS

T

TANKS
Magnetic gripper device, 93:131 (USA Patent 5,192,155/A/)
TELESCOPES
Laser metrology for coherent multi-telescope arrays, 93:186 (USA Patent 5,208,654/A/)
THERAPEUTIC AGENTS
See DRUGS
THERMAL ENERGY STORAGE EQUIPMENT
Microwave impregnation of porous materials with thermal energy storage materials, 93:46 (USA Patent 5,202,150/A/)
THERMAL INSULATION
Compact vacuum insulation, 93:249 (USA Patent 5,175,975/A/)
Method of fabricating a multilayer insulation blanket, 93:266 (USA Patent 5,224,832/A/)
THERMOCOUPLES
Method for bonding thin film thermocouples to ceramics, 93:74 (USA Patent 5,215,597/A/)
THERMOLUMINESCENT DOSEMETERS
Environmental radiation detection via thermoluminescence, 93:303 (USA Patent 5,196,704/A/)
THERMOMETERS
Dual-mode self-validating resistance/Johnson noise thermometer system, 93:307 (USA Patent 5,228,780/A/)
Internal temperature monitor for work pieces, 93:308 (USA Patent 5,226,730/A/)
THERMOPILES
See THERMOCOUPLES
THERMOPLASTICS
Polyamide thermosets, 93:111 (USA Patent 5,198,551/A/)
THIN FILMS
Method and apparatus for atomic imaging, 93:278 (USA Patent 5,200,618/A/)
THIO COMPOUNDS
See ORGANIC SULFUR COMPOUNDS
THIOETHERS
See SULFIDES
TITANATES
Crystalline titanate catalyst supports, 93:17 (USA Patent 5,177,045/A/)
TITANIUM
Magnetron sputtered boron films and Ti/B multilayer structures, 93:273 (USA Patent 5,203,977/A/)
TITANIUM ALLOYS
High strength, light weight Ti-Y composites and method of making same, 93:260 (USA Patent 5,200,004/A/)
Niobium-titanium superconductors produced by powder metallurgy having artificial flux pinning centers, 93:259 (USA Patent 5,226,947/A/)
TLD (DOSEMETERS)
See THERMOLUMINESCENT DOSEMETERS
TLD SYSTEMS
See THERMOLUMINESCENT DOSEMETERS
TOKAMAK DEVICES
Injection of electrons with predominantly perpendicular energy into an area of toroidal field ripple in a tokamak plasma to improve plasma confinement, 93:220 (USA Patent 5,225,146/A/)
TOOLS (EDUCATIONAL)
See EDUCATIONAL TOOLS
TOWERS (EXTRACTION)
See EXTRACTION COLUMNS
TOXIC MATERIALS
Material containment enclosure, 93:118 (USA patent application 7-678,387)
TRACER TECHNIQUES
Method of measurement in biological systems, 93:321 (USA Patent 5,209,919/A/)
TRANSDUCERS
Electromechanical transducer for acoustic telemetry system, 93:306 (USA Patent 5,222,049/A/)
Ultrasonic transducer for extreme temperature environments, 93:296 (USA Patent 5,195,373/A/)
TRANSFER (IN ENVIRONMENT)
See RADIONUCLIDE MIGRATION
TRANSMISSION (DATA)
See DATA TRANSMISSION
TRANSURANIUM ELEMENTS
See also PLUTONIUM
Combined transuranic-strontium extraction process, 93:25 (USA patent application 7-717,426)
TRANSURANIUM WASTES
See ALPHA-BEARING WASTES
TRAPS
Universal collisional activation ion trap mass spectrometry, 93:277 (USA Patent 5,206,509/A/)
TRITIUM
Process for making solid-state radiation-emitting composition, 93:116 (USA Patent 5,240,647/A/)
Tritium monitor and collection system, 93:202 (USA patent application 7-674,981)
TRU WASTES
See ALPHA-BEARING WASTES
TUBES (CONDUITS)
See PIPES
TUNGSTEN ALLOYS
High strength and density tungsten-uranium alloys, 93:78 (USA patent application 7-681,295)

U

UNDULATORS
See WIGGLER MAGNETS

URANIUM
Ball feeder for replenishing evaporator feed, 93:129 (USA Patent 5,195,651/A/)
Determination of actinides in urine and fecal samples, 93:214 (USA Patent 5,190,881/A/)
Method and device for frictional welding, 93:22 (USA patent application 7-724,660)
URANIUM ALLOYS
High strength and density tungsten-uranium alloys, 93:78 (USA patent application 7-681,295)
URINALYSIS
See URINE
URINE
Determination of actinides in urine and fecal samples, 93:214 (USA Patent 5,190,881/A/)

V

VA CHARACTERISTIC
See ELECTRIC CONDUCTIVITY
VALVES
Fluid-driven reciprocating apparatus and valving for controlling same, 93:126 (USA Patent 5,222,873/A/)
Noninvasive valve monitor using constant magnetic and/or DC electromagnetic field, 93:293 (USA Patent 5,236,011/A/)
VARISTORS
See SEMICONDUCTOR RESISTORS
VEHICLES
Shock destruction armor system, 93:197 (USA Patent 5,214,235/A/)
VELOCIMETERS
Three axis velocity probe system, 93:189 (USA patent application 7-683,014)
VESSELS
See CONTAINERS
VESSELS (CHEMICAL REACTIONS)
See CHEMICAL REACTORS
VIDICONS
Circular zig-zag scan video format, 93:181 (USA patent application 7-672,983)
VOC
See ORGANIC COMPOUNDS
VOLT-AMPERE CHARACTERISTIC
See ELECTRIC CONDUCTIVITY
VOLTAIC CELLS
See ELECTRIC BATTERIES

W

WASTE WATER
Ice electrode electrolytic cell, 93:71 (USA Patent 5,200,054/A/)
Wastewater heat recovery method and apparatus, 93:65 (USA patent application 7-718,518)
WATER
See also GROUND WATER
WASTE WATER
Molecular water oxidation catalyst, 93:108 (USA Patent 5,223,634/A/)
WATER COOLANT
See WATER
WATER MODERATOR
See WATER
WATER SOLUTIONS
See AQUEOUS SOLUTIONS
WATERBORNE PARTICLES
See PARTICULATES
WATERFLOODING
Measuring resistivity changes from within a first cased well to monitor fluids injected into oil bearing geological formations from a second cased well while passing electrical current between the two cased wells, 93:228 (USA Patent 5,187,440/A/)
WAVEGUIDES
Digitally controlled distributed phase shifter, 93:145 (USA Patent 5,237,629/A/)
High power, high frequency, vacuum flange, 93:159 (USA Patent 5,196,814/A/)
Simplified flangeless unisex waveguide coupler assembly, 93:154 (USA Patent 5,208,569/A/)
WAVELENGTHS
Wavelength meter having single mode fiber optics multiplexed inputs, 93:163 (USA Patent 5,189,485/A/)
WEAPONS
Explosive laser light initiation of propellants, 93:198 (USA Patent 5,212,339/A/)
Selectable fragmentation warhead, 93:201 (USA Patent 5,229,542/A/)
WEEDS
Root-growth-inhibiting sheet, 93:314 (USA Patent 5,181,952/A/)
WELL INJECTION EQUIPMENT
Downhole material injector for lost circulation control, 93:137 (USA patent application 7-686,442)
WELL LOGGING EQUIPMENT
Electromechanical transducer for acoustic telemetry system, 93:306 (USA Patent 5,222,049/A/)
WELLS
See also INJECTION WELLS
OIL WELLS
Electromechanical transducer for acoustic telemetry system, 93:306 (USA Patent 5,222,049/A/)
Methods of operation of apparatus measuring formation resistivity from within a cased well having one measurement and two compensation steps, 93:305 (USA Patent 5,223,794/A/)
WIGGLER MAGNETS
Tunability enhanced electromagnetic wiggler, 93:170 (USA patent application 7-672,308)
WINDOWS
Apparatus for preventing particle deposition from process streams on optical access windows, 93:184 (USA Patent 5,217,510/A/)
WOOD ALCOHOL
See METHANOL

X

XENOBIOTICS
Method of measurement in biological systems, 93:321 (USA Patent 5,209,919/A/)
XYLANS
Two-stage dilute acid prehydrolysis of biomass, 93:37 (USA patent application 7-681,299)
XYLOSE
Combined enzyme mediated fermentation of cellulose and xylose to ethanol, 93:36 (USA patent application 7-672,984)

Y

YTTRIUM ALLOYS
High strength, light weight Ti-Y composites and method of making same, 93:260 (USA Patent 5,200,004/A/)
YTTRIUM ALUMINIUM GARNETS
See ALUMINIUM OXIDES
YTTRIUM OXIDES
Fracture toughness for copper oxide superconductors, 93:85 (USA Patent 5,202,306/A/)

Z

ZHURAVLEV PROCESS
See COAL GASIFICATION
ZIRCONIUM OXIDES
Fracture toughness for copper oxide superconductors, 93:85 (USA Patent 5,202,306/A/)
Method for bonding thin film thermocouples to ceramics, 93:74 (USA Patent 5,215,597/A/)

Contract Number Index

Numbers assigned to DOE contracts announced in documents in this publication are listed. Contract numbers are sorted alphanumerically and list the primary corporate author of the document cited, the citation number, and the report number or other document identification.

Contract No.	Abstract No.	Report No.
AC01-89ER80813		
	93:246	USA Patent 5,219,679/A/
AC02-76CH00016		
	93:286	USA Patent 5,200,237/A/
	93:323	USA Patent 5,200,619/A/
AC02-76CH03000		
	93:266	USA Patent 5,224,832/A/
	93:333	USA Patent 5,182,686/A/
AC02-76CH03073	**Princeton Univ., NJ (United States)**	
	93:190	PATENTS-US–A7694176
	93:195	USA Patent 5,239,563/A/
	93:220	USA Patent 5,225,146/A/
	93:311	USA Patent 5,177,774/A/
AC02-76ER01338		
	93:236	USA Patent 5,187,262/A/
AC02-82ER40077		
	93:259	USA Patent 5,226,947/A/
AC02-83CH10093	**Solar Energy Research Inst., Golden, CO (United States)**	
	93:36	PATENTS-US–A7672984
	93:37	PATENTS-US–A7681299
	93:42	PATENTS-US–A7689566
	93:45	PATENTS-US–A7712812
	93:81	PATENTS-US–A7681296
	National Renewable Energy Lab., Golden, CO (United States)	
	93:40	PATENTS-US–A7672286
	93:39	USA Patent 5,235,021/A/
	93:43	USA Patent 5,223,043/A/
	93:46	USA Patent 5,202,150/A/
	93:91	USA Patent 5,223,453/A/
	93:183	USA Patent 5,217,285/A/
	93:210	USA Patent 5,208,154/A/
	93:249	USA Patent 5,175,975/A/
	93:250	USA Patent 5,216,149/A/
	93:267	USA Patent 5,223,601/A/
AC02-85ER40236		
	93:148	USA Patent 5,227,701/A/
AC02-85ER80291		
	93:310	USA Patent 5,209,126/A/
AC03-76SF00098		
	93:212	USA Patent 5,190,761/A/
	93:283	USA Patent 5,215,723/A/
	93:285	USA Patent 5,205,913/A/
	93:287	USA Patent 5,187,804/A/
	93:297	USA Patent 5,182,524/A/
AC03-88ER80682	**Wang NMR, Inc., Pleasanton, CA (United States)**	
	93:171	PATENTS-US–A7682833
AC03-89ER51114		
	93:154	USA Patent 5,208,569/A/
AC03-90SF18495		
	93:243	USA Patent 5,225,150/A/
AC04-76DP00789	**Sandia National Labs., Albuquerque, NM (United States)**	
	93:44	PATENTS-US–A7700813
	93:137	PATENTS-US–A7686442
	93:140	PATENTS-US–A7713206
	93:15	USA Patent 5,180,565/A/
	93:17	USA Patent 5,177,045/A/
	93:34	USA Patent 5,177,352/A/
	93:57	USA Patent 5,202,203/A/
	93:92	USA Patent 5,204,381/A/
	93:107	USA Patent 5,224,972/A/
	93:116	USA Patent 5,240,647/A/
	93:135	USA Patent 5,235,235/A/
	93:145	USA Patent 5,237,629/A/
	93:146	USA Patent 5,235,248/A/
	93:149	USA Patent 5,225,368/A/
	93:158	USA Patent 5,198,716/A/
	93:196	USA Patent 5,201,215/A/
	93:199	USA Patent 5,191,164/A/
	93:215	USA Patent 5,189,262/A/
	93:217	USA Patent 5,193,909/A/
	93:222	USA Patent 5,226,131/A/
	93:306	USA Patent 5,222,049/A/
AC04-76DP03533	**EG and G Rocky Flats, Inc., Golden, CO (United States)**	
	93:192	PATENTS-US–A7714805
	93:80	USA Patent 5,178,498/A/
AC04-86ID12584	**Chem-Nuclear Geotech, Inc., Grand Junction, CO (United States)**	
	93:174	PATENTS-US–A7694738
AC04-88DP43495	**EG and G Mound Applied Technologies, Miamisburg, OH (United States)**	
	93:141	PATENTS-US–A7713208
AC04-88ID12692		
	93:270	USA Patent 5,212,210/A/
AC05-84OR21400	**Oak Ridge National Lab., TN (United States)**	
	93:82	PATENTS-US–A7696881
	93:110	USA Patent 5,204,003/A/
	93:129	USA Patent 5,195,651/A/
	93:176	USA Patent 5,225,682/A/
	93:252	USA Patent 5,205,136/A/
	93:257	USA Patent 5,238,645/A/
	93:261	USA Patent 5,185,031/A/
	93:265	USA Patent 5,231,370/A/
	93:272	USA Patent 5,208,003/A/
	93:277	USA Patent 5,206,509/A/
	93:279	USA Patent 5,200,626/A/
	93:281	USA Patent 5,184,015/A/
	93:288	USA Patent 5,186,913/A/
	93:292	USA Patent 5,237,876/A/
	93:293	USA Patent 5,236,011/A/
	93:302	USA Patent 5,229,604/A/
	93:307	USA Patent 5,228,780/A/
	93:320	USA Patent 5,207,838/A/
AC06-76RL01830		
	93:223	USA Patent 5,180,868/A/
	93:233	USA Patent 5,198,183/A/
	93:253	USA Patent 5,183,355/A/
	93:303	USA Patent 5,196,704/A/
	93:314	USA Patent 5,181,952/A/
AC07-76ID01570	**EG and G Idaho, Inc., Idaho Falls, ID (United States)**	
	93:38	PATENTS-US–A7738001
	93:115	PATENTS-US–A7710208

Contract No.	Abstract No.	Report No.
	93:200	PATENTS-US--A7707414
	93:202	PATENTS-US--A7674981
	93:26	USA Patent 5,203,644/A/
	93:51	USA Patent 5,200,144/A/
	93:52	USA Patent 5,232,656/A/
	93:71	USA Patent 5,200,054/A/
	93:72	USA Patent 5,191,156/A/
	93:151	USA Patent 5,217,304/A/
	93:204	USA Patent 5,205,069/A/
	93:294	USA Patent 5,181,778/A/
	93:309	USA Patent 5,231,468/A/
	93:313	USA Patent 5,206,174/A/
AC07-84ID12435		
	93:214	USA Patent 5,190,881/A/
AC08-88NV10617	**EG and G Idaho, Inc., Idaho Falls, ID (United States)**	
	93:179	PATENTS-US--A7717580
	93:153	USA Patent 5,210,464/A/
AC09-89SR18035	**Westinghouse Savannah River Co., Aiken, SC (United States)**	
	93:21	PATENTS-US--A7723122
	93:22	PATENTS-US--A7724660
	93:29	PATENTS-US--A7681291
	93:30	PATENTS-US--A7711686
	93:31	PATENTS-US--A7730424
	93:49	PATENTS-US--A7730425
	93:54	PATENTS-US--A7689425
	93:65	PATENTS-US--A7718518
	93:77	PATENTS-US--A7681290
	93:87	PATENTS-US--A7690046
	93:88	PATENTS-US--A7730423
	93:96	PATENTS-US--A7678520
	93:97	PATENTS-US--A7681297
	93:99	PATENTS-US--A7697032
	93:100	PATENTS-US--A7697042
	93:120	PATENTS-US--A7679497
	93:123	PATENTS-US--A7681294
	93:124	PATENTS-US--A7682788
	93:125	PATENTS-US--A7724662
	93:138	PATENTS-US--A7678428
	93:142	PATENTS-US--A7720128
	93:182	PATENTS-US--A7697158
	93:203	PATENTS-US--A7681292
	93:55	USA Patent 5,198,185/A/
	93:59	USA Patent 5,189,359/A/
	93:67	USA Patent 5,232,599/A/
	93:103	USA Patent 5,217,112/A/
	93:104	USA Patent 5,204,530/A/
	93:105	USA Patent 5,198,870/A/
	93:132	USA Patent 5,190,333/A/
	93:133	USA Patent 5,228,624/A/
	93:155	USA Patent 5,204,671/A/
	93:175	USA Patent 5,231,288/A/
	93:205	USA Patent 5,190,628/A/
	93:206	USA Patent 5,186,255/A/
	93:213	USA Patent 5,217,009/A/
AC11-76PN00014	**Westinghouse Electric Corp., Pittsburgh, PA (United States). Bettis Atomic Power Div.**	
	93:191	PATENTS-US--A7707538
	93:23	USA Patent 5,196,161/A/
	93:27	USA Patent 5,203,378/A/
	93:128	USA Patent 5,203,645/A/
AC11-89PN38014		
	93:70	USA Patent 5,201,345/A/
AC12-76SN00052	**Knolls Atomic Power Lab., Schenectady, NY (United States)**	
	93:193	PATENTS-US--A7723120
AC21-80ET17089		
	93:248	USA Patent 5,200,279/A/
AC21-87MC24268		
	93:235	USA Patent 5,198,084/A/
AC21-88MC23174		
	93:226	USA Patent 5,202,101/A/
AC21-88MC25026		
	93:247	USA Patent 5,206,095/A/
AC22-85PC81201		
	93:319	USA Patent 5,198,341/A/
AC22-87PC79852		
	93:225	USA Patent 5,240,575/A/
AC22-89PC88889		
	93:227	USA Patent 5,180,703/A/
AC22-90PC90167		
	93:11	USA Patent 5,231,797/A/
AC34-90DP62349		
	93:69	USA Patent 5,203,509/A/
AC35-89ER40486		
	93:299	SSCL-ORTA--18
	93:300	SSCL-ORTA--4
	93:325	SSCL-ORTA--19
	93:326	SSCL-ORTA--60
	93:327	SSCL-ORTA--21
	93:328	SSCL-ORTA--7
	93:329	SSCL-ORTA--16
	93:330	SSCL-ORTA--32
	93:331	SSCL-ORTA--24
	93:332	SSCL-ORTA--1
	93:334	SSCL-ORTA--28
AI05-83OR21375		
	93:74	USA Patent 5,215,597/A/
AS07-86ID12626		
	93:262	USA Patent 5,208,190/A/
BI79-87BP65584		
	93:244	USA Patent 5,180,963/A/
FC05-90CE40905		
	93:239	USA Patent 5,216,483/A/
FC07-80CS40454		
	93:229	USA Patent 5,190,730/A/
	93:230	USA Patent 5,177,289/A/
	93:231	USA Patent 5,176,883/A/
FC07-89ID12875		
	93:308	USA Patent 5,226,730/A/
FC21-90MC26029		
	93:282	USA Patent 5,241,062/A/
	93:284	USA Patent 5,212,300/A/
FG01-90CE15471		
	93:180	USA Patent 5,197,040/A/
FG02-86NE37969		
	93:290	USA Patent 5,239,515/A/
FG02-87ER13787		
	93:301	USA Patent 5,231,290/A/
FG02-89ER60869		
	93:317	USA Patent 5,208,008/A/
FG02-90ER12105		
	93:301	USA Patent 5,231,290/A/
FG03-86SF16308		
	93:271	USA Patent 5,211,949/A/
FG03-88ER60694		
	93:318	USA Patent 5,219,726/A/
FG03-90ER80892		
	93:232	USA Patent 5,225,174/A/
FG03-91ER81228		
	93:234	USA Patent 5,217,506/A/
FG03-91ER81229		
	93:234	USA Patent 5,217,506/A/
FG06-84ER13294		
	93:228	USA Patent 5,187,440/A/
FG07-86ER13586		
	93:237	USA Patent 5,232,845/A/
FG09-85ER13426		
	93:275	USA Patent 5,218,529/A/
FG09-87ER13810		
	93:275	USA Patent 5,218,529/A/

Contract No.	Abstract No.	Report No.
FG22-88BC14243		
	93:305	USA Patent 5,223,794/A/
FG22-89PC89786		
	93:240	USA Patent 5,221,652/A/
W-31-109-ENG-38		
	93:62	USA Patent 5,232,794/A/
W-31109-ENG-38	**Argonne National Lab., IL (United States)**	
	93:20	PATENTS-US--A7703641
	93:25	PATENTS-US--A7717426
	93:61	PATENTS-US--A7685759
	93:112	PATENTS-US--A7689426
	93:16	USA Patent 5,198,589/A/
	93:35	USA Patent 5,198,674/A/
	93:53	USA Patent 5,223,207/A/
	93:58	USA Patent 5,194,343/A/
	93:63	USA Patent 5,213,911/A/
	93:75	USA Patent 5,222,436/A/
	93:76	USA Patent 5,184,557/A/
	93:84	USA Patent 5,223,186/A/
	93:85	USA Patent 5,202,306/A/
	93:94	USA Patent 5,176,950/A/
	93:102	USA Patent 5,225,051/A/
	93:130	USA Patent 5,193,942/A/
	93:172	USA Patent 5,225,788/A/
	93:245	USA Patent 5,214,981/A/
	93:251	USA Patent 5,211,923/A/
	93:291	USA Patent 5,209,646/A/
W-7405-ENG-36	**Los Alamos National Lab., NM (United States)**	
	93:24	PATENTS-US--A7680972
	93:64	PATENTS-US--A7677738
	93:78	PATENTS-US--A7681295
	93:95	PATENTS-US--A7678081
	93:98	PATENTS-US--A7693466
	93:114	PATENTS-US--A7679487
	93:118	PATENTS-US--A7678387
	93:119	PATENTS-US--A7678488
	93:121	PATENTS-US--A7680975
	93:122	PATENTS-US--A7681293
	93:178	PATENTS-US--A7710207
	93:181	PATENTS-US--A7672983
	93:216	PATENTS-US--A7679498
	93:83	USA Patent 5,227,600/A/
	93:111	USA Patent 5,198,551/A/
	93:127	USA Patent 5,205,624/A/
	93:131	USA Patent 5,192,155/A/
	93:156	USA Patent 5,200,578/A/
	93:165	USA Patent 5,181,016/A/
	93:173	USA Patent 5,200,933/A/
	93:177	USA Patent 5,184,019/A/
	93:185	USA Patent 5,212,588/A/
	93:198	USA Patent 5,212,339/A/
	93:208	USA Patent 5,209,834/A/
	93:211	USA Patent 5,185,260/A/
	93:218	USA Patent 5,238,913/A/
	93:276	USA Patent 5,208,651/A/
	93:289	USA Patent 5,204,072/A/
	93:304	USA Patent 5,187,370/A/
	93:312	USA Patent 5,222,388/A/
W-7405-ENG-48	**Lawrence Livermore National Lab., CA (United States)**	
	93:32	PATENTS-US--A7727036
	93:79	PATENTS-US--A7689423
	93:101	PATENTS-US--A7702527
	93:139	PATENTS-US--A7704590
	93:170	PATENTS-US--A7672308
	93:221	PATENTS-US--A7711693
	93:18	USA Patent 5,191,940/A/
	93:19	USA Patent 5,213,444/A/
	93:33	USA Patent 5,237,307/A/
	93:56	USA Patent 5,221,211/A/
	93:60	USA Patent 5,234,183/A/
	93:86	USA Patent 5,198,188/A/
	93:89	USA Patent 5,232,772/A/
	93:90	USA Patent 5,227,239/A/
	93:106	USA Patent 5,194,913/A/
	93:113	USA Patent 5,202,005/A/
	93:126	USA Patent 5,222,873/A/
	93:129	USA Patent 5,195,651/A/
	93:143	USA Patent 5,241,557/A/
	93:144	USA Patent 5,241,450/A/
	93:150	USA Patent 5,224,200/A/
	93:152	USA Patent 5,218,515/A/
	93:157	USA Patent 5,199,040/A/
	93:159	USA Patent 5,196,814/A/
	93:162	USA Patent 5,189,678/A/
	93:163	USA Patent 5,189,485/A/
	93:166	USA Patent 5,178,974/A/
	93:167	USA Patent 5,177,754/A/
	93:168	USA Patent 5,176,970/A/
	93:169	USA Patent 5,189,302/A/
	93:186	USA Patent 5,208,654/A/
	93:187	USA Patent 5,202,741/A/
	93:197	USA Patent 5,214,235/A/
	93:199	USA Patent 5,191,164/A/
	93:219	USA Patent 5,187,859/A/
	93:264	USA Patent 5,240,691/A/
	93:273	USA Patent 5,203,977/A/
	93:295	USA Patent 5,239,408/A/
	93:298	USA Patent 5,181,224/A/
	93:321	USA Patent 5,209,919/A/
W-7405-ENG-82		
	93:256	USA Patent 5,240,513/A/
	93:258	USA Patent 5,228,620/A/
	93:260	USA Patent 5,200,004/A/
	93:263	USA Patent 5,241,029/A/
	93:274	USA Patent 5,189,260/A/
	93:280	USA Patent 5,192,407/A/

Patent Number Index

The numbers assigned to all patents and patent applications cited in Sections II and III of this publication appear in the first column and the abstract numbers appear in the second column.

Patent No.	*Abstract No.*
USA Patent	
4,652,538/A/	93:00000224
5,091,499/A/	93:00000241
5,162,516/A/	93:00000238
5,175,975/A/	93:00000249
5,176,883/A/	93:00000231
5,176,950/A/	93:00000094
5,176,970/A/	93:00000168
5,177,045/A/	93:00000017
5,177,289/A/	93:00000230
5,177,294/A/	93:00000041
5,177,352/A/	93:00000034
5,177,754/A/	93:00000167
5,177,774/A/	93:00000311
5,178,498/A/	93:00000080
5,178,543/A/	93:00000134
5,178,974/A/	93:00000166
5,180,565/A/	93:00000015
5,180,703/A/	93:00000227
5,180,868/A/	93:00000223
5,180,963/A/	93:00000244
5,181,016/A/	93:00000165
5,181,224/A/	93:00000298
5,181,778/A/	93:00000294
5,181,952/A/	93:00000314
5,182,524/A/	93:00000297
5,182,686/A/	93:00000333
5,183,355/A/	93:00000253
5,184,015/A/	93:00000281
5,184,019/A/	93:00000177
5,184,189/A/	93:00000164
5,184,557/A/	93:00000076
5,185,031/A/	93:00000261
5,185,260/A/	93:00000211
5,186,006/A/	93:00000255
5,186,255/A/	93:00000206
5,186,913/A/	93:00000288
5,187,262/A/	93:00000236
5,187,370/A/	93:00000304
5,187,440/A/	93:00000228
5,187,804/A/	93:00000287
5,187,859/A/	93:00000219
5,187,980/A/	93:00000136
5,189,260/A/	93:00000274
5,189,262/A/	93:00000215
5,189,302/A/	93:00000169
5,189,359/A/	93:00000059
5,189,485/A/	93:00000163
5,189,678/A/	93:00000162
5,190,333/A/	93:00000132
5,190,628/A/	93:00000205
5,190,730/A/	93:00000229
5,190,735/A/	93:00000117
5,190,761/A/	93:00000212
5,190,881/A/	93:00000214
5,191,156/A/	93:00000072
5,191,164/A/	93:00000199
5,191,594/A/	93:00000161
5,191,940/A/	93:00000018
5,192,155/A/	93:00000131
5,192,407/A/	93:00000280
5,193,349/A/	93:00000322
5,193,909/A/	93:00000217
5,193,942/A/	93:00000130
5,194,215/A/	93:00000048
5,194,218/A/	93:00000160
5,194,343/A/	93:00000058
5,194,913/A/	93:00000106
5,195,373/A/	93:00000296
5,195,651/A/	93:00000129
5,196,161/A/	93:00000023
5,196,704/A/	93:00000303
5,196,814/A/	93:00000159
5,197,040/A/	93:00000180
5,198,002/A/	93:00000028
5,198,084/A/	93:00000235
5,198,183/A/	93:00000233
5,198,185/A/	93:00000055
5,198,188/A/	93:00000086
5,198,263/A/	93:00000093
5,198,341/A/	93:00000319
5,198,551/A/	93:00000111
5,198,589/A/	93:00000016
5,198,674/A/	93:00000035
5,198,716/A/	93:00000158
5,198,870/A/	93:00000105
5,199,040/A/	93:00000157
5,200,004/A/	93:00000260
5,200,054/A/	93:00000071
5,200,144/A/	93:00000051
5,200,237/A/	93:00000286
5,200,279/A/	93:00000248
5,200,578/A/	93:00000156
5,200,618/A/	93:00000278
5,200,619/A/	93:00000323
5,200,626/A/	93:00000279
5,200,933/A/	93:00000173
5,201,215/A/	93:00000196
5,201,345/A/	93:00000070
5,202,005/A/	93:00000113
5,202,101/A/	93:00000226
5,202,150/A/	93:00000046
5,202,203/A/	93:00000057
5,202,306/A/	93:00000085
5,202,741/A/	93:00000187
5,203,378/A/	93:00000027
5,203,509/A/	93:00000069
5,203,644/A/	93:00000026
5,203,645/A/	93:00000128
5,203,977/A/	93:00000273
5,204,003/A/	93:00000110
5,204,072/A/	93:00000289
5,204,381/A/	93:00000092
5,204,530/A/	93:00000104
5,204,671/A/	93:00000155
5,205,069/A/	93:00000204
5,205,136/A/	93:00000252
5,205,624/A/	93:00000127
5,205,913/A/	93:00000285
5,206,095/A/	93:00000247
5,206,174/A/	93:00000313
5,206,509/A/	93:00000277
5,207,838/A/	93:00000320
5,208,003/A/	93:00000272
5,208,008/A/	93:00000317
5,208,154/A/	93:00000210
5,208,190/A/	93:00000262
5,208,332/A/	93:00000209
5,208,569/A/	93:00000154
5,208,651/A/	93:00000276
5,208,654/A/	93:00000186
5,209,126/A/	93:00000310
5,209,646/A/	93:00000291
5,209,834/A/	93:00000208
5,209,919/A/	93:00000321
5,210,464/A/	93:00000153
5,211,923/A/	93:00000251
5,211,949/A/	93:00000271
5,212,210/A/	93:00000270
5,212,300/A/	93:00000284
5,212,339/A/	93:00000198
5,212,588/A/	93:00000185
5,213,444/A/	93:00000019
5,213,911/A/	93:00000063
5,214,015/A/	93:00000109
5,214,235/A/	93:00000197
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USA Patent

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