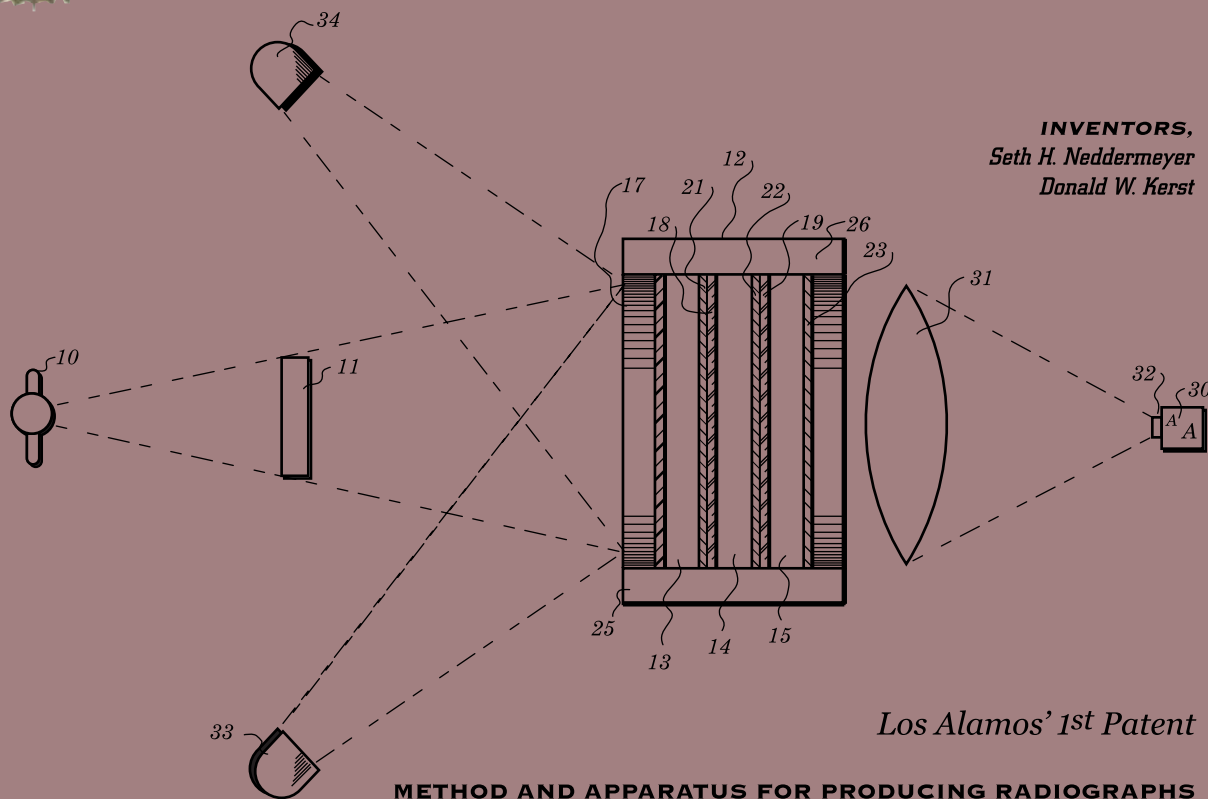




# outstanding innovation

Applauding our innovators



**INVENTORS,**  
Seth H. Neddermeyer  
Donald W. Kerst

Los Alamos' 1st Patent

**METHOD AND APPARATUS FOR PRODUCING RADIOGRAPHS**

Issued April 1947

THE **2002** PATENT & LICENSING AWARDS  
Carrying on the tradition of world-changing innovation

*outStanding  
innOvation*

*Applauding our innovators*

**THE 2002 PATENT & LICENSING AWARDS**

*Carrying on the tradition of world-changing innovation*

Thursday, February 13, 2003  
Los Alamos National Laboratory  
Los Alamos, New Mexico





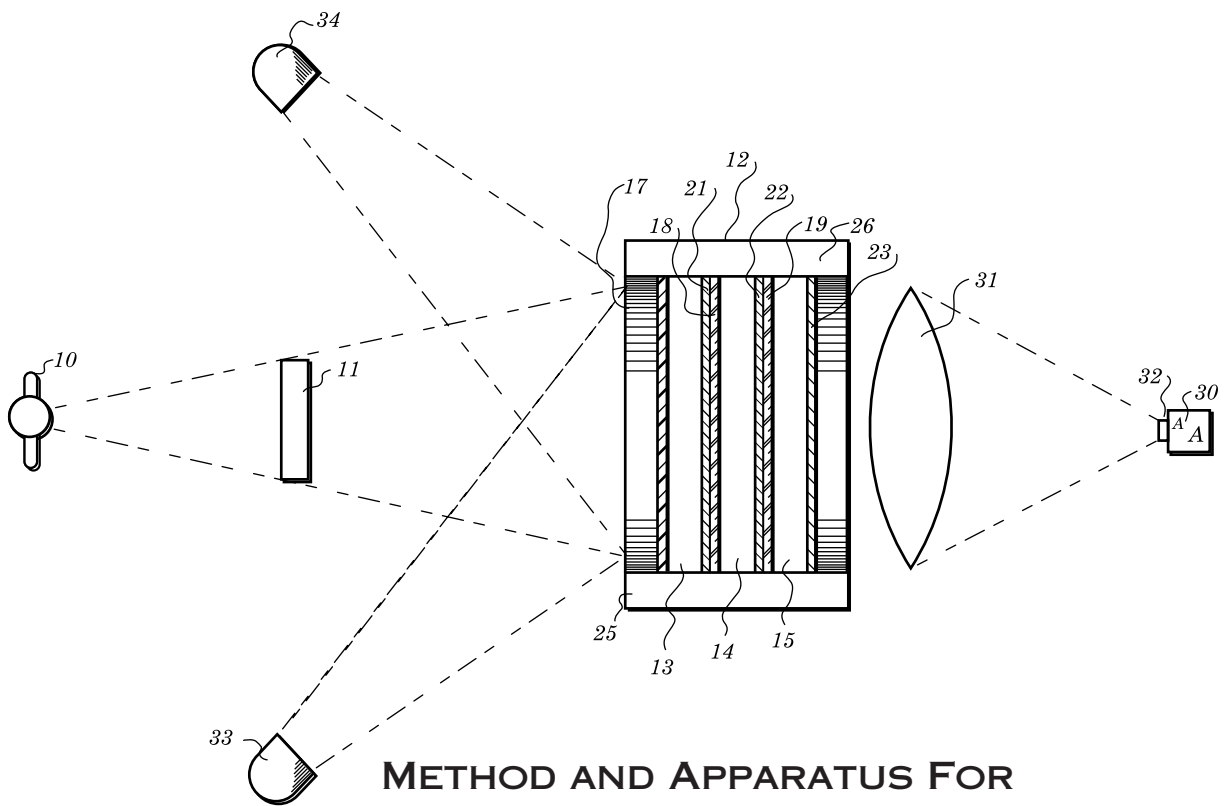
**W**elcome to the fifth Annual Patent and Licensing Awards Ceremony. This evenings' event honors the Laboratory's outstanding innovators for their contributions during the past year to the Laboratory's growing portfolio of patented, copyrighted and licensable technologies. Their efforts to patent and copyright their creative achievements help to reinforce and sustain the Laboratory's reputation for outstanding accomplishment in scientific discovery and technological innovation—a reputation that it has maintained for 60 years.

The opportunity to recognize these creative and hard-working men and women who have demonstrated their willingness to contribute to technology transfer activities at the Laboratory by protecting our intellectual property assets gives me great pleasure. It is through our researchers' efforts to file copyright assertions and patent applications that the Laboratory gains recognition and royalties for patents issued and technologies licensed. The ingenuity of our innovators and the diligence of our technology transfer professionals demonstrate that in addition to our reputation for scientific excellence, our work also has economic value for the Laboratory and for the nation. When we transfer the Laboratory's leading-edge technological advancements to our nation's private industry, we enhance U.S. economic competitiveness. When our patented, licensed, and copyrighted technologies bring royalties back to the Laboratory, we enhance the quality and quantity of our research.

On behalf of the entire Laboratory Community, I congratulate our honorees for their achievements and I encourage their own and their colleagues' continued participation in the effort to protect the Laboratory's intellectual property.

Congratulations!

G. Peter Nanos, Jr.  
Interim Director



## METHOD AND APPARATUS FOR PRODUCING RADIOGRAPHS

The first patent obtained at Los Alamos National Laboratory was filed in 1945 in the names of Seth Neddermeyer and Donald Kerst, two original Los Alamos employees who were well-known for their creative and unrestrained experimentations into the explosive compression of materials. The patent covered an apparatus for conducting high-speed x-ray radiography of explosive detonations. No mention of Los Alamos appears in the published patent, as Los Alamos was a “secret city” when the patent issued in 1947. This invention was an early accomplishment of a research program that has continued for some 60 years and for which Los Alamos is internationally renowned. Today this program has culminated in the operation of the Dual Axis Radiographic Hydrodynamic Test facility (DARHT). Phase 1 of DARHT is now fully operational with a single-pulsed, first axis, x-ray machine. Phase 2 is scheduled for completion in the fall of 2004 with the commissioning of a complex, multi-pulsed, second axis, x-ray machine.

## ABSTRACTS OF RECOGNIZED PATENTS

*Listings are in accordance with  
issue dates from beginning to end of  
fiscal year 2002.*

### ENHANCED METHANOL UTILIZATION IN DIRECT METHANOL FUEL CELL

Xiaoming Ren  
Shimshon Gottesfeld  
U.S. Patent No. 6,296,964

The fuel utilization of a direct methanol fuel cell is improved by forming a mass transport barrier to the methanol fuel that is large relative to a mass transport barrier for a gaseous hydrogen fuel cell. The mass transport barrier may be conveniently increased by increasing the thickness of an anode conductive sheet adjacent the membrane surface of the fuel cell.

### TRIGGERED OPTICAL BIOSENSOR

Xuedong Song  
Basil I. Swanson  
U.S. Patent No. 6,297,059

An optical biosensor is provided for the detection of a target biomolecule using a recognition element situated at the surface of the sensor. The recognition element is capable of multivalent binding with the target biomolecule. The recognition element includes a fluorescence label thereon, whereby a fluorescence change in response to binding between the recognition element and the target biomolecule is measured.

### MOLYBDENUM DISILICIDE COMPOSITES

Robert P. Rodriguez  
John J. Petrovic  
U.S. Patent No. 6,300,265

Molybdenum disilicide/  
 $B'-Si_{6-z}Al_zO_zN_{8-z}$  composites are made by use of *in situ* reactions among a silicon nitride, molybdenum disilicide, and aluminum. Molybdenum disilicide within a molybdenum disilicide/  
 $B'-Si_{6-z}Al_zO_zN_{8-z}$  eutectoid matrix is the resulting microstructure.

### CRYOGENIC DEFORMATION OF HIGH TEMPERATURE SUPERCONDUCTIVE COMPOSITE STRUCTURES

Peter R. Roberts  
William Michels  
John F. Bingert  
U.S. Patent No. 6,300,285

A new cryogenic processing of superconductive wire or tape involves rolling the wire at sub-ambient temperatures during the processing with resultant improved properties including about a 10% improvement in  $J_c$ , improvements in reduction of variations in uniformity of the superconductive material within the wire, and improvements in density of the superconductive material.

## **METHOD FOR LASER WELDING A FIN AND A TUBE**

Phillip W. Fuerschbach  
Roderick Mahoney  
John O. Milewski  
U.S. Patent No. 6,300,591

A method of laser welding includes placing a planar metal surface into approximate contact with a cylindrical metal surface to form a juncture area to be welded, forming an acute angle of contact between the surfaces. A laser beam is focused through the acute angle of contact at the juncture area, with the laser beam heating the juncture area to a welding temperature to cause welding to occur.

## **MACHINE TOOL LOCATOR**

John A. Hanlon  
Timothy J. Gill  
U.S. Patent No. 6,301,007

Machine tools can be accurately measured and positioned on manufacturing machines within very small tolerances by use of an autocollimator on a 3-axis mount on a manufacturing machine. A digital camera is connected to the viewing end of the autocollimator, and a marker and measure generator receives digital images from the camera. Distances between the projection reticle and the reference reticle on the monitoring screen are measured and the distances to the actual position of the autocollimator relative to the reference tooling ball are related. The images and measurements are used to set the

position of the machine tool and to measure the size and shape of the machine tool tip, and examine cutting edge wear.

## **LASER CONTROLLED FLAME STABILIZATION**

James W. Early  
Matthew C. Thomas  
U.S. Patent No. 6,302,682

Fuel combustion is initiated and stabilized in applications such as gas turbine electrical power generating engines and jet turbine engines where it is desired to burn lean fuel/air mixtures which produce lower amounts of NO<sub>x</sub>. A laser-induced spark is propagated at a distance from the fuel nozzle with the laser igniter being remotely located from the high temperature environment of the combustion chamber. A laser initiating spark is generated by focusing high peak power laser light to a sufficiently tight laser spot within the fuel to cause the ionization of air and fuel into a plasma and is unobtrusive to the flow dynamics of the combustion chamber of a fuel injector.

## **ROTARY POWDER FEEDTHROUGH APPARATUS**

Gary K. Lewis  
Richard M. Less  
U.S. Patent No. 6,305,884

The uniformity of solids within a solids fabrication system, such as a direct light fabrication (DLF) system, is improved. A feedthrough

interface couples gas entrained powders input from stationary input lines to a rotating head of the fabrication system. This feedthrough eliminates the need to provide additional slack in the feed lines to accommodate head rotation, and therefore reduces feed line bending movements which induce non-uniform feeding of gas-entrained powder to a rotating head.

## **HIGH THROUGHPUT ANALYSIS OF SAMPLES IN FLOWING FLUID**

William P. Ambrose VI  
W. Kevin Grace  
Peter M. Goodwin  
James H. Jett  
Alan K. Van Orden  
Richard A. Keller  
U.S. Patent No. 6,309,886

Multiple fluorescent sample particles in a single flow channel are imaged at one time. A flow channel defines a flow direction for samples in a flow stream and has a viewing plane perpendicular to the flow direction. A laser beam is formed as a ribbon having a width effective to cover the viewing plane. Imaging optics are arranged to view the viewing plane to form an image of the fluorescent sample particles in the flow stream, and a camera records the image formed by the imaging optics.

## **LOW-SMOKE PYROTECHNIC COMPOSITIONS**

Michael A. Hiskey  
David E. Chavez  
Darren Naud  
U.S. Patent No. 6,312,537

A low smoke producing pyrotechnic composition includes a high-nitrogen content, low-carbon content energetic material, an oxidant and a colorant, together with the use of selected metal salts of a high-nitrogen content, low-carbon content energetic material as the colorant.

## **ORIENTED CONDUCTIVE OXIDE ELECTRODES ON SiO<sub>2</sub>/Si AND GLASS**

Quanxi Jia  
Paul N. Arendt  
U.S. Patent No. 6,312,819

A thin film structure is provided including a silicon substrate with a layer of silicon dioxide on a surface thereof, and a layer of cubic oxide material deposited upon the layer of silicon dioxide by ion-beam-assisted-deposition, said layer of cubic-oxide material characterized as biaxially oriented. Additional thin layers of biaxially oriented ruthenium oxide or lanthanum strontium cobalt oxide are deposited upon the layer of cubic oxide material. An intermediate layer of cerium oxide is employed between the yttria-stabilized zirconia layer and the cubic oxide material.

## **CHEMICAL MICROSENSORS FOR DETECTION OF EXPLOSIVES AND CHEMICAL WARFARE AGENTS**

Xiaoguang Yang  
Basil I. Swanson  
U.S. Patent No. 6,316,268

A substrate having an oxide surface layer and a layer of a cyclodextrin derivative chemically bonded to said substrate, the layer of a cyclodextrin derivative adapted for the inclusion of selected compounds, e.g., nitro-containing organic compounds, therewith, provides a chemical microsensor capable of detecting a resultant mass change from inclusion of the nitro-containing organic compound.

## **STATISTICAL PATTERN RECOGNITION**

Liang Lu  
U.S. Patent No. 6,317,517

A method of performing statistical pattern recognition in a set of data having predetermined dimensions involving the steps of performing feature selection on the set of data to determine a selected feature; performing pattern recognition using the set of data with the selected feature to determine a recognized pattern; and outputting the recognized pattern.

## **PLASMA TREATMENT FOR PRODUCING ELECTRON EMITTERS**

Don M. Coates  
Kevin C. Walter  
U.S. Patent No. 6,319,367

A plasma treatment produces carbonaceous field emission electron emitters. A plasma of ions is generated in a closed chamber to surround the exposed surface of a carbonaceous material. A voltage is applied to an electrode that is in contact with the carbonaceous material. This voltage has a negative potential relative to a second electrode in the chamber and serves to accelerate the ions toward the carbonaceous material and provide an ion energy sufficient to etch the exposed surface of the carbonaceous material but not sufficient to result in the implantation of the ions within the carbonaceous material.

## **SINGLE CRYSTAL SCINTILLATOR**

Kenneth J. McClellan  
U.S. Patent No. 6,323,489

Single crystal scintillators include a transparent single crystal of cerium-activated lutetium yttrium oxyorthosilicate having the general formula  $\text{Lu}_{(2-x-z)}\text{Y}_x\text{Ce}_z\text{SiO}_5$ , wherein  $x$  is from 0.05 to 1.95 and  $z$  is from 0.001 to 0.02. The crystal scintillator is dense, bright, rugged, and non-hygroscopic and has a relatively short decay time for luminescence. A scintillation detector using the crystal scintillator produces an electrical signal in response to light



received from the crystal scintillator upon exposure to gamma rays, x-rays, and the like.

### **GRAVITY BRAKE**

Richard E. Lujan  
U.S. Patent No. 6,325,184

A mechanical gravity brake prevents hoisted loads within a shaft from free-falling when a loss of hoisting force occurs. Under normal hoisting conditions, the gravity brake is subject to an upward lifting force from the hoist and a downward pulling force from a suspended load. If the lifting force should suddenly cease, the loss of differential forces on the gravity brake in free-fall is translated to extend a set of brakes against the walls of the shaft to stop the free fall descent of the gravity brake and attached load.

### **RECOMBINANT FLUORESCENT PROTEIN MICROSPHERE CALIBRATION STANDARD**

John P. Nolan  
Rhiannon L. Nolan  
Teresa Ruscetti  
Bruce E. Lehnert, Jr.  
U.S. Patent No. 6,326,157

Green fluorescent protein (GFP) microsphere standards facilitate quantitative determination of GFP concentration. Green fluorescent protein has utility as both a marker for gene expression and a fluorescent fusion protein tag when visualized using fluorescence microscopy or flow cytometry (FC).

An expression vector which codes for a biotinylated enhanced GFP (BEGFP) gene is first constructed. Following expression and purification of the resulting protein, nM amounts of BEGFP are titrated onto avidin or streptavidin-coated microspheres which are then characterized using fluorimetry and FC. The binding of BEGFP to the streptavidin beads is observed to be stable and the saturation concentration of BEGFP is about  $3.0 \times 10^6$  molecules per bead with a KD of approximately 4 uM.

### **RELATING TO ION DETECTION**

Christopher H. Orr  
Craig J. Luff  
Thomas Dockray  
Duncan W. MacArthur  
U.S. Patent No. 6,326,626

The detection of alpha and/or beta emitting sources on items or in locations using indirect means is improved. The emission forms generate ions in a medium surrounding the item or location and the medium is then moved to a detecting location where the ions are discharged to give a measure of the emission levels. To increase the level of ions generated and render the system particularly applicable for narrow pipes and other forms of conduits, the medium pressure is increased above atmospheric pressure.

### **METHOD FOR SCREENING INHIBITORS OF THE TOXICITY OF BACILLUS ANTHRACIS**

Nick M. Cirino  
Paul J. Jackson  
Bruce E. Lehnert, Jr.  
U.S. Patent No. 6,329,156

The protective antigen (PA) of *Bacillus anthracis* is integral to the mechanism of anthrax poisoning. The cloning, expression and purification of a 32 kDa B. anthracis PA fragment (PA32) is described. This fragment has also been expressed as a fusion construct to stabilized green fluorescent protein (EGFP-PA32). Expressed proteins were found to be highly soluble. Both proteins were capable of binding to specific cell surface receptors as determined by fluorescent microscopy and a flow cytometric assay. This assay was also employed to screen anti-PA83 antibody fragments for receptor binding inhibition. Using the flow cytometer assay, one of the four isolated scF-v showed specific inhibition (80%) of receptor binding at a 1:1 ratio to PA. This assay can be employed as a rapid screen for compounds which disrupt binding of PA to cells. Additionally, the high intracellular expression levels and ease of purification make this recombinant protein an attractive vaccine candidate or therapeutic treatment for anthrax poisoning.



## **METHOD FOR NETWORK ANALYZATION AND APPARATUS**

Roger R. Bracht  
Regina V. Pasquale  
U.S. Patent No. 6,329,805

A portable network analyzer and method has multiple channel transmit and receive capability for real-time monitoring of processes which maintains phase integrity, requires low power, is adapted to provide full vector analysis, provides output frequencies of up to 62.5 MHz and provides fine sensitivity frequency resolution. A multichannel means for transmitting and a multichannel means for receiving are provided, both in electrical communication with a software means for controlling. The means for controlling is programmed to provide a signal to a system under investigation which steps consecutively over a range of predetermined frequencies. The resulting received signal from the system provides complete time domain response information by executing a frequency transform of the magnitude and phase information acquired at each frequency step.

## **RESONANT NONLINEAR ULTRASOUND SPECTROSCOPY**

Paul A. Johnson  
James A. Tencate  
Robert A. Guyer  
Koen E. A. Van Den Abeele  
U.S. Patent No. 6,330,827

Components with defects are identified from the response to strains applied at acoustic and ultrasound frequencies. The relative resonance frequency shift is determined as a function of applied strain amplitude for an acceptable component, where  $f_0$  is the frequency of the resonance peak at the lowest amplitude of applied strain and is the frequency shift of the resonance peak of a selected mode to determine a reference relationship. Then, the relative resonance frequency shift is determined as a function of applied strain for a component under test, where  $f_0$  is the frequency of the resonance peak at the lowest amplitude of applied strain and is the frequency shift of the resonance peak to determine a quality test relationship. The reference relationship is compared with the quality test relationship to determine the presence of defects in the component under test.

## **TENSION/COMPRESSION FATIGUE CRACKING GRIPS**

David L. Sandoval  
Loren A. Jacobson  
U.S. Patent No. 6,330,830

A pair of grips holds a specimen having a pair of through openings for receiving tension pins and a pair of spaced apart, parallel edges. Each of the grips includes a pin, a Davis adjustable key, and a housing. The housing includes a bore for receiving the Davis adjustable key, a bore for receiving the pin, and a slot for receiving that portion of the specimen which includes the through opening and the edge. The Davis adjustable key bore and said pin bore are substantially parallel to each other. The slot is substantially perpendicular to and completely bisecting the pin bore. The slot also partially intersects the Davis adjustable key bore to, when the specimen is received in the slot, the pin received in the through opening and the in bore, and the Davis adjustable key is received in the Davis adjustable key bore, permit the moveable key portion to be moved into engagement with the edge.

## **COLLECTION OF IONS**

Christopher H. Orr  
Craig J. Luff  
Thomas Dockray  
Duncan W. MacArthur  
John A. Bounds  
James E. Koster  
U.S. Patent No. 6,331,706

The apparatus and method provide techniques for effectively implementing alpha and/or beta and/or gamma monitoring of items or locations as desired. Indirect alpha monitoring detects ions generated by alpha emissions, in conjunction with beta and/or gamma monitoring. Additionally screening of items prior to alpha monitoring using beta and/or gamma monitoring is provided, so as to ensure that the alpha monitoring apparatus is not contaminated by proceeding direct to alpha monitoring of a heavily contaminated item or location.

## **ELECTROSTATIC MONITOR**

Christopher H. Orr  
Craig J. Luff  
Thomas Dockray  
Duncan W. MacArthur  
U.S. Patent No. 6,331,707

Alpha and/or beta emissions arising from items or locations are more readily measured using indirect monitoring of the emissions by detecting ions generated by the emissions, the ions being attracted electrostatically to electrodes for discharge of collection. A chamber is sealed around the item or location during monitoring with no air being

drawn into or expelled from the chamber during the monitoring process. This simplified structure and operations does not impair the efficiency and accuracy of the detection technique.

## **ADVANCED ELECTRONICS FOR FASTER TIME-CORRELATION ANALYSIS OF PULSE SEQUENCES**

James E. Stewart  
Merlyn S. Krick  
Steven C. Bourret  
Martin R. Sweet  
U.S. Patent No. 6,333,958

Nondestructive analysis of material containing uranium or plutonium improves precision, with reduced counting time. The real coincidences, R, and the accidental coincidences, A, at the pulse rate are measured. At the same time, the accidental coincidences, A, are measured at a clock rate of 4 MHz, much faster than the pulse rate. These measurements significantly increase the measurement precision of accidental coincidences.

## **POLYMERIZATION CATALYSTS CONTAINING ELECTRON-WITHDRAWING AMIDE LIGANDS**

John G. Watkin  
Damon R. Click  
U.S. Patent No. 6,335,303

A totally new class of ligands, bonded to a transition metal center, acts as a catalyst for performing

polymerization reactions, most notably the polymerization of olefins, such as ethylene and propylene, but also applicable to the polymerization of cyclic carbonate monomers to form polycarbonates. A catalyst system utilizes electron-withdrawing amide ligands attached to a transition or lanthanide metal center. The invention includes (1) synthesis of electron-withdrawing amine ligands, (2) attachment of the ligand to a metal center, and (3) use of these metal-containing complexes as catalysts for polymerization reactions.

## **PREPARATION OF 3,3'-AZOBIS(6-AMINO-1,2,4,5-TETRAZINE)**

Michael A. Hiskey  
David E. Chavez  
U.S. Patent No. 6,342,589

The compound of the species 3,3'-azobis(6-amino-1,2,4,5-tetrazine) and derivatives thereof, and a process of preparing such compounds are provided.

## **PERFORATING DEVICES USED IN WELLS**

Jerome J. Jacoby  
James E. Brooks  
Clifford L. Aseltine  
U.S. Patent No. 6,349,649

The perforating device for use in completing a well includes a case, an explosive charge contained in the case, and a generally bowl-shaped liner. The liner is positioned adjacent the explosive charge and has

non-uniform thickness along its length. The liner further includes a protruding portion near its tip. In another configuration, the liner includes a hole near its tip to expose a portion of the explosive charge.

### **METHOD OF QUANTITATING DSDNA**

Peter C. Stark  
Kenneth I. Mullen  
Cheryl R. Kuske  
U.S. Patent No. 6,350,578

dsDNA in an aqueous sample solution containing an unknown amount of dsDNA is quantitated. Diluted test solutions are prepared until a sufficiently dilute test solution having a known amount of dsDNA is prepared that has a fluorescence intensity that is not attenuated upon further dilution. The value of the maximum absorbance of this solution between 200-900 nanometers (nm), referred to herein as the threshold absorbance, is measured. A sample solution having an unknown amount of dsDNA and an absorbance identical to that of the sufficiently dilute test solution at the same chosen wavelength is prepared. Dye is then added to the sample solution to form the fluorescent dye-dsDNA-complex, after which the fluorescence intensity of the sample solution is measured and the quantity of dsDNA in the sample solution is determined. Once the threshold absorbance of a sample solution obtained from a particular environment has been determined, any similarly prepared sample

solution taken from a similar environment and having the same value for the threshold absorbance can be quantified for dsDNA by adding a large excess of dye to the sample solution and measuring its fluorescence intensity.

### **OPTICAL FIBER SWITCH**

James W. Early  
U.S. Patent No. 6,351,579

Optical fiber switches operated by electrical activation of at least one laser light modulator through which laser light is directed into at least one polarizer are used for the sequential transport of laser light from a single laser into a plurality of optical fibers. Laser light from a single excitation laser can be sequentially transported to a plurality of optical fibers which in turn transport the laser light to separate individual remotely located laser fuel ignitors. The invention can be operated electro-optically without any mechanical or moving parts, or, alternatively, can be operated electro-mechanically.

### **METHODS OF SELECTIVELY SEPARATING CO<sub>2</sub> FROM A MULTICOMPONENT GASEOUS STREAM USING CO<sub>2</sub> HYDRATE PROMOTORS**

Dwain F. Spencer  
Robert P. Currier  
U.S. Patent No. 6,352,576

CO<sub>2</sub> is selectively removed from a multicomponent gaseous stream to provide a CO<sub>2</sub> depleted gas stream having a reduction, e.g., 30 to 90%, in the concentration of CO<sub>2</sub> relative to the untreated multicomponent gaseous stream. A multicomponent gas stream is contacted with an aqueous fluid, e.g., CO<sub>2</sub> nucleated water, under conditions of selective CO<sub>2</sub> clathrate formation to produce a CO<sub>2</sub> clathrate slurry and CO<sub>2</sub> depleted gaseous stream. A CO<sub>2</sub> hydrate promoter reduces the minimum CO<sub>2</sub> partial pressure required for hydrate formation as compared to a control.

### **MONITORING MATERIALS**

Christopher H. Orr  
Craig J. Luff  
Thomas Dockray  
Duncan W. MacArthur  
U.S. Patent No. 6,353,230

Alpha and/or beta and/or gamma monitoring of items or locations, as desired, is implemented by detecting ions generated by alpha emissions, in conjunction with beta and/or gamma monitoring. Additionally, screening of items prior to alpha

monitoring using beta and/or gamma monitoring is provided to ensure that the alpha monitoring apparatus is not contaminated by proceeding direct to alpha monitoring of a heavily contaminated item or location. A variety of emission forms can be monitored while maintaining accuracy and avoiding inadvertent contamination.

### **CONDUCTING POLYMER ULTRACAPACITOR**

Steven Z. Shi  
John R. Davey  
Shimshon Gottesfeld  
Xiaoming Ren  
U.S. Patent No. 6,356,433

A sealed ultracapacitor assembly is formed with first and second electrodes of first and second conductive polymers electrodeposited on porous carbon paper. Collector plates are bonded to exterior surfaces of the electrodes. A porous membrane separates opposing surfaces of the electrodes, with a liquid electrolyte impregnating the insulating membrane. A gasket formed of a thermoplastic material surrounds the first and second electrodes and seals between the first and second current collector plates for containing the liquid electrolyte.

### **USE OF 3,3'-DIAMINO- 4,4'-AZOXYFUZZAN AND 3,3'-DIAMINO-4,4'- AZOFUZZAN AS INSENSITIVE HIGH EXPLOSIVE MATERIALS**

Michael A. Hiskey  
David E. Chavez  
Robert L. Bishop  
John F. Kramer  
Scott A. Kinkead  
U.S. Patent No. 6,358,339

Diaminoazoxyfuran is used as an insensitive high explosive. DAAF has a reasonable median of the desirable properties, performance and insensitivity. DAAF is fairly easy to make starting from inexpensive materials in water and presses without a binder.

### **DETECTORS**

Christopher H. Orr  
Craig J. Luff  
Thomas Dockray  
Duncan W. MacArthur  
John A. Bounds  
Krag S. Allander  
U.S. Patent No. 6,359,280

Both alpha and beta emission determinations are made simultaneously using a simple detector structure. A beta detector covered in an electrically conducting material is used with the electrically conducting material-discharging ions generated by alpha emissions, and, as a consequence, provides a measure of those alpha emissions. Improved mountings for alpha detectors and other forms of detectors against vibration and the

consequential effects vibration has on measurement accuracy is also obtained.

### **RELATED TO MONITORING ION SOURCES**

Christopher H. Orr  
Craig J. Luff  
Thomas Dockray  
Duncan W. MacArthur  
John A. Bounds  
U.S. Patent No. 6,365,901

The position on alpha contamination in or on items or locations is monitored. The technique is particularly applicable to pipes, conduits and other locations to which access is difficult. Indirect monitoring of alpha emissions by detecting ions generated by the alpha emissions is used. The medium containing the ions is moved in a controlled manner from proximate the item or location to the detecting unit and the signals achieved over time are used to generate alpha source position information.

### **DOPANT PROFILE MODELING BY RARE EVENT ENHANCED DOMAIN-FOLLOWING MOLECULAR DYNAMICS**

Keith M. Beardmore  
Niels G. Jensen  
U.S. Patent No. 6,366,873

A computer-implemented molecular dynamics-based process simulates a distribution of ions implanted in a semiconductor substrate. The properties of the semiconductor

substrate and ion dose to be simulated are first initialized, including an initial set of splitting depths that contain an equal number of virtual ions implanted in each substrate volume determined by the splitting depths. A first ion with selected velocity is input onto an impact position of the substrate. A first position and velocity of the first ion is determined. The first ion is split into first and second virtual ions if the first ion has passed through a splitting interval. The process then follows each virtual ion until all of the virtual ions have come to rest. A new ion is input to the surface and the process repeats until all of the ion dose has been input. The resulting ion rest positions form the simulated implant distribution.

#### **METHOD AND APPARATUS FOR DETERMINING THE COORDINATES OF AN OBJECT**

Paul S. Pedersen  
U.S. Patent No. 6,369,879

The location of points on the surface of an object are determined by varying, in accordance with a unique sequence, the intensity of each illuminated pixel directed to the object surface, and detecting at known detector pixel locations the intensity sequence of reflected illumination from the surface of the object whereby the identity and location of the originating illuminated pixel can be determined. The coordinates of points on the surface of the object are then determined by conventional triangulation methods.

#### **SEMICONDUCTOR-BASED OPTICAL REFRIGERATOR**

Richard I. Epstein  
Bradley C. Edwards  
Mansoor Sheik-Bahae  
U.S. Patent No. 6,378,321

Optical refrigerators are formed using semiconductor material as a cooling medium, with layers of material in close proximity to the cooling medium that carries away heat from the cooling material and preventing radiation trapping. In addition to the use of semiconductor material, the invention can be used with ytterbium-doped glass optical refrigerators.

#### **METHOD FOR MEASURING CHANGES IN LIGHT ABSORPTION OF HIGHLY SCATTERING MEDIA**

Irving J. Bigio  
Tamara M. Johnson  
Judith R. Mourant  
U.S. Patent No. 6,381,018

The noninvasive measurement of variations in absorption is used to measure changes in concentrations of biochemically relevant compounds in tissue. For an appropriate separation between light-delivery and light-collection fibers, the path length of the collected photons is insensitive to scattering parameters for the range of parameters typically found in tissue, leading to the development of rapid, noninvasive, inexpensive, and accurate methods for measuring absorption changes in tissue.

#### **LASER IGNITION**

James W. Early  
Charles S. Lester  
U.S. Patent No. 6,382,957

A first excitation laser or other excitation light source is provided in tandem with an igniter laser to provide a compact, durable, engine deployable fuel ignition laser system. The beam from the excitation light source is split with a portion of it going to the igniter laser and a second portion of it being combined with either the first portion after a delay before injection into the igniter laser or combined with the output of the igniter laser. Alternatively, alternating short and long pulses of light from the excitation light source are directed into the igniter laser. The excitation light source may be a laser with more than one resonating cavity; beams from one resonating cavity are directed into an igniter laser and beams from the other resonating cavity are directed into a beam combiner where they are combined with the output of the igniter laser. An excitation light source capable of producing alternating beams of light having different wavelengths may be used to pump the igniter laser.



## **CONDUCTING POLYMER FOR HIGH POWER ULTRACAPACITOR**

Steven Z. Shi  
Shimshon Gottesfeld  
U.S. Patent No. 6,383,640

An ultracapacitor is formed having an electrode with a conducting polymer active material. The conducting polymer active material is electropolymerized solution of a monomer that is selected from the group of thiophenes derived in the 3-position, having an aryl group attached to thiophene in the 3-position, having aryl and alkyl groups independently attached to thiophene in the 3 and 4 positions.

## **ARCHITECTURE FOR HIGH CRITICAL CURRENT SUPERCONDUCTING TAPES**

Quanxi Jia  
Stephen R. Foltyn  
U.S. Patent No. 6,383,989

A composite structure achieves high critical current densities in superconductive tapes, where the composite structure is a multilayer structure or architecture including a structure of a first layer of a superconducting rare-earth-barium-copper oxide from about 0.2 microns to about 2 microns in thickness, a layer of an insulating material from the group of cerium oxide, strontium titanate, yttrium oxide, magnesium oxide, and yttria-stabilized zirconia, or of a conducting material of strontium ruthenium oxide, and a second layer of a superconducting rare-earth-barium-copper oxide from about 0.2 microns

to about 2 microns in thickness, the superconducting structure characterized as having a total combined thickness of superconducting rare-earth-barium-copper oxide layers of at least 2 microns.

## **MULTISCALE CHARACTERIZATION AND ANALYSIS OF SHAPES**

Lakshman Prasad  
Ramana L. Rao  
U.S. Patent No. 6,393,159

An adaptive computational method enables the characterization analysis and understanding of planar shapes at multiple scales. These techniques and algorithms enable the simplification, quantification, and description of complex qualitative characteristics of shapes that seem to play a vital role in human visual conception. There are applications in the areas of image understanding, computer vision pattern recognition and robotic navigation.

## **TRIBOLUMINESCENT TAMPER-INDICATING DEVICE**

Roger G. Johnston  
Anthony R. E. Garcia  
U.S. Patent No. 6,394,022

A tamper-indicating device has a transparent or translucent cylindrical body that includes triboluminescent material, and an outer opaque layer that prevents ambient light from entering. A chamber in the body holds an undeveloped piece of photographic film bearing an image. Body members are positioned on opposite sides of a

hasp, inserted through the hasp, and attached. The optical assembly is then manipulated to allow any light generated from the triboluminescent materials during a tampering activity that damages the device to reach the film and destroy the image on the film.

## **LASER IGNITION**

James W. Early  
Charles S. Lester  
U.S. Patent No. 6,394,788

A first excitation laser or other excitation light source used in tandem with an igniter laser provides a compact, durable, engine deployable fuel ignition laser system. A single remote excitation light source is used for one or more small lasers located proximate to one or more fuel combustion zones. The beam from the excitation light source may be split with a portion of it going to the igniter laser and a second portion of it being combined with either the first portion after a delay before injection into the igniter laser or combined with the output of the igniter laser. Alternatively, alternating short and long pulses of light from the excitation light source are directed into the igniter laser. The excitation light source may be a laser with more than one resonating cavity; beams from one resonating cavity are directed into an igniter laser and beams from the other resonating cavity are directed into a beam combiner where they are combined with the output of the igniter laser. An excitation light source capable of producing alternating beams of light having different wavelengths may be used to pump the igniter laser.

## **ULTRAFINE-GRAINED TITANIUM FOR MEDICAL IMPLANTS**

Yuntian T. Zhu  
Terry C. Lowe  
Ruslan Z. Valiev  
Vladimir V. Stolyarov  
Vladimir V. Latysh  
Georgy J. Raab  
U.S. Patent No. 6,399,215

Ultrafine-grained (UFG) titanium and titanium alloy are produced with superior mechanical properties. The grain size of titanium and titanium alloy ingots is refined significantly by "Equal Channel Angular Pressing" (ECAP) and "cold deformation". The products are used to make medical implants and other structural components requiring high strength.

## **COMPOSITION AND METHOD FOR REMOVING PHOTORESIST MATERIALS FROM ELECTRONIC COMPONENTS**

Leisa B. Davenhall  
Jim Rubin  
U.S. Patent No. 6,403,544

A composition including a dense phase fluid such as carbon dioxide together with a modifier such as propylene carbonate is used for removal of photo resist materials.

## **POLYANILINE-BASED OPTICAL AMMONIA DETECTOR**

Yixiang Duan  
Zhe Jin  
Yongxuan Su  
U.S. Patent No. 6,406,669

A conducting polymer-based optical ammonia detector includes an electronic absorption spectroscopy of a polyaniline film deposited on polyethylene surface by chemical oxidation of aniline monomer at room temperature was used to quantitatively detect ammonia gas. The optical ammonia gas detector was found to have a response time of less than 15 seconds, a regeneration time of less than two minutes at room temperature, and a detection limit of 1 ppm (v/v) for ammonia, with a linear dynamic range from 180 ppm to 18,000 ppm.

## **LASER IGNITION**

James W. Early  
Charles S. Lester  
U.S. Patent No. 6,413,077

A first excitation laser or other excitation light source capable of producing alternating beams of light having different wavelengths is used in tandem with one or more ignitor lasers to provide a compact, durable, engine deployable fuel ignition laser system. Reliable fuel ignition is provided over a wide range of fuel conditions by using the single remote excitation light source for pumping one or more small lasers located proximate to one or more fuel combustion zones with alternating wavelengths of light.

## **REMOVAL OF DISSOLVED AND COLLOIDAL SILICA**

William S. Midkiff  
U.S. Patent No. 6,416,672

Small amorphous silica particles are used to provide a relatively large surface area upon which silica will preferentially adsorb, thereby preventing or substantially reducing scaling caused by deposition of silica on evaporative cooling tower components, especially heat exchange surfaces. The silica spheres are contacted by the cooling tower water in a sidestream reactor, then separated using gravity separation, microfiltration, vacuum filtration, or other suitable separation technology.

## **MULTIPLE FEED POWDER SPLITTER**

Gary K. Lewis  
Richard M. Less  
U.S. Patent No. 6,418,955

A uniform powder flow to the nozzles when creating solid structures using a solid fabrication system such as the directed light fabrication (DLF) process is provided. A uniform flow of gas entrained powders is provided to the nozzles of the DLF system by a series of modular splitters that are slidably interconnected and contain an integral flow control mechanism. The device can take the gas entrained powder from between one to four hoppers and split the flow into eight tubular lines which feed the powder delivery nozzles of the DLF system.



## **COSMIC-RAY NEUTRON BACKGROUND REDUCTION USING LOCALIZED COINCIDENCE VETO NEUTRON COUNTING**

Howard O. Menlove  
Steven G. Bourret  
Merlyn S. Krick  
U.S. Patent No. 6,420,712

The sensitivity of measuring the amount of radioactive material in waste is increased by reducing the interference caused by cosmic ray generated neutrons. The apparatus includes: (a) a plurality of neutron detectors, each of the detectors including means for generating a pulse in response to the detection of a neutron; and (b) means, coupled to each of the neutron's detectors, for counting only some of the pulses from each of the detectors, whether cosmic ray or fission generated. The means for counting includes a means that, after counting one of the pulses, vetos the counting of additional pulses for a prescribed period of time. The apparatus also includes means for vetoing the counting of coincidence pulses from all of the detectors included in each of the pods which are adjacent to the pod which includes the detector which produced the pulse which was counted.

## **ULTRA-BRIGHT SOURCE OF POLARIZATION- ENTANGLED PHOTONS**

Paul G. Kwiat  
Philippe Eberhard  
Andrew G. White  
U.S. Patent No. 6,424,665

Utilizing the process of spontaneous parametric down-conversion in a novel crystal geometry, a source of polarization-entangled photon pairs has been provided that is more than ten times brighter, per unit of pump power, than previous sources, with another factor of 30 to 75 expected to be readily achievable. A high level of entanglement between photons emitted over a relatively large collection angle, and over a 10-nm bandwidth, is a characteristic of the invention. In addition, both the degree of entanglement, and the purity of the state are readily tunable. The polarization entangled photon source can be utilized as a light source for the practice of quantum cryptography.

## **HYDROGEN SCAVENGERS**

David W. Carroll  
Kenneth V. Salazar  
Mitchell Trkula  
Cynthia W. Sandoval  
U.S. Patent No. 6,426,314

A codeposition process for fabricating hydrogen scavengers is practiced by, first, preparing a bonded allylic organometallic complex by reacting an allylic transition metal halide with an organic ligand complexed with an alkali metal; and, then, in a second step, a vapor

of the bonded allylic organometallic complex is combined with the vapor of an acetylenic compound, irradiated with UV light, and codeposited on a substrate.

## **LASER IGNITION**

James W. Early  
Charles S. Lester  
U.S. Patent No. 6,428,307

A first excitation laser or other excitation light source is used in tandem with an igniter laser to provide a compact, durable, engine deployable fuel ignition laser system. Reliable fuel ignition is provided over a wide range of fuel conditions by using a single remote excitation light source for one or more small lasers located proximate to one or more fuel combustion zones. The beam from the excitation light source may be split with a portion of it going to the igniter laser and a second portion of it being combined with either the first portion after a delay before injection into the igniter laser or combined with the output of the igniter laser. Alternating short and long pulses of light from the excitation light source may be directed into the igniter laser. The excitation light source may be a laser with more than one resonating cavity; beams from one resonating cavity are directed into an igniter laser and beams from the other resonating cavity are directed into a beam combiner where they are combined with the output of the igniter laser. An excitation light source capable of producing alternating beams of light having different wavelengths may be used to pump the igniter laser.

## **SUBSTRATES FOR SUPERCONDUCTORS**

Leslie G. Fritzemeier  
Elliott D. Thompson  
Edward J. Siegal  
Cornelius L. Hans Thieme  
Robert D. Cameron  
James L. Smith  
William L. Hults  
U.S. Patent No. 6,428,635

An alloy capable of forming a (100)[001] cube-texture by thermomechanical techniques has 5 to 45 atomic percent nickel with the balance being copper. The alloy is useful as a conductive substrate for superconducting composites where the substrate is coated with a superconducting oxide. A buffer layer can optionally be coated in the substrate to enhance deposition of the superconducting oxide. Methods for producing the alloys, substrates, and superconductors are included.

## **STABLE, CONCENTRATED SOLUTIONS OF POLYANILINE USING AMINES AS GEL INHIBITORS**

Hsing-Lin Wang  
Benjamin R. Mattes  
U.S. Patent No. 6,429,282

Stable, concentrated solutions of high-molecular weight polyaniline using amines as gel inhibitors are formed. Certain amine compounds (gel inhibitors) are used to form highly concentrated, stable solutions of the emeraldine base form of polyaniline in numerous organic

solvents from which coatings, films and fibers are readily prepared without problems associated with rapid gelation which occurs when concentrated solutions are attempted without the use of the gel inhibitors. Concentrated solutions of polyaniline copolymers or ring and/or nitrogen-substituted polyanilines may also be prepared.

## **CONTROLLED LASER PRODUCTION OF ELONGATED ARTICLES FROM PARTICULATES**

Raymond D. Dixon  
Gary K. Lewis  
John O. Milewski  
U.S. Patent No. 6,429,402

Wires and small diameter rods can be produced using laser deposition technology. An elongated article such as a wire or rod is constructed by melting and depositing particulate material into a deposition zone which has been designed to yield the desired article shape and dimensions. The article is withdrawn from the deposition zone as it is formed, thus enabling formation of the article in a continuous process. Alternatively, the deposition zone is moved along any of numerous deposition paths away from the article being formed.

## **MICROWAVE PLASMA MONITORING SYSTEM FOR REAL-TIME ELEMENTAL ANALYSIS**

Yixiang Duan  
U.S. Patent No. 6,429,935

Air to be monitored is contacted with a high sensitivity microwave-activated plasma. The microwave plasma torch serves as the excitation source for atomic emission spectrometry using a portable PC card detector. A novel feature of the microwave plasma torch is arrangement of tubes for introduction of plasma gas and air to be sampled. Three coaxially positioned tubes for transport of gas and air are positioned within a fourth tube or other enclosure for housing. The innermost tube is for transport of plasma gas; the annulus between the outside of the innermost tube and the inside diameter of the centermost of the three transport tubes is for transport of air to be sampled; and the annulus between the outside of the centermost transport tube and the inside diameter of the outermost (third) transport tube is for transport of a second portion of plasma gas. Thus, the air to be sampled is sheathed on both sides by portions of the plasma gas. Surrounding the outermost transport tube is the housing for the apparatus.

## **SINGLE ROTOR TURBINE ENGINE**

David A. Platts  
U.S. Patent No. 6,430,917

A turbine engine is provided with a single rotor that cools the engine, functions as a radial compressor, pushes air through the engine to the ignition point, and acts as an axial turbine for powering the compressor. The engine is designed to use a simple scheme of conventional passage shapes to provide both a radial and axial flow pattern through the single rotor, thereby allowing the radial intake air flow to cool the turbine blades and turbine exhaust gases in an axial flow to be used for energy transfer. In an alternative embodiment, an electric generator is incorporated in the engine to specifically adapt the invention for power generation. Magnets are embedded in the exhaust face of the single rotor proximate to a ring of stationary magnetic cores with windings to provide for the generation of electricity. In this alternative embodiment, the turbine is a radial inflow turbine rather than an axial turbine as used in the first embodiment. Radial inflow passages of conventional design are interleaved with radial compressor passages to allow the intake air to cool the turbine blades.

## **DIAMOND-LIKE-CARBON-COATED ARAMID FIBERS HAVING IMPROVED MECHANICAL PROPERTIES**

David J. Devlin  
Don M. Coates  
Thomas A. Archuleta  
U.S. Patent No. 6,432,537

The mechanical properties of aramid fibers, particularly the flexural rigidity, are improved by directly depositing a diamond-like-carbon coating onto the surface of the fibers is disclosed. Diamond-like-carbon (DLC) coated aramid fibers having increased flexural rigidity are also formed. DLC coated aramid fibers show an increase in flexural rigidity and suppression of low yielding behavior when compared to uncoated aramid fibers.

## **LONG-RANGE, FULL DUPLEX, MODULATED-REFLECTOR CELL PHONE FOR VOICE/DATA TRANSMISSION**

Daniel L. Neagley  
Scott D. Briles  
Don M. Coates  
Samuel M. Freund  
U.S. Patent No. 6,434,372

A long-range communications apparatus utilizing modulated-reflector technology includes an energy-transmitting base station and remote units that do not emit radiation in order to communicate with the base station, whereby information is attached to an RF

carrier wave originating from the base station that is reflected by the remote unit back to the base station. Since the remote unit does not emit radiation, only a low-power power source is required for its operation. Information from the base station is transmitted to the remote unit using a transmitter and receiver, respectively. The range of such a communications system is determined by the properties of a modulated-reflector half-duplex link.

## **ELECTROCHEMICAL REDUCTION OF NITRATE IN THE PRESENCE OF AN AMIDE**

Jacek J. Dziejewski  
Stanislaw Marczak  
U.S. Patent No. 6,436,275

The electrochemical reduction of nitrates in aqueous solutions thereof, in the presence of amides, to gaseous nitrogen ( $N_2$ ) is provided. Generally, electrochemical reduction of  $NO_3^-$  proceeds stepwise, from  $NO_3^-$  to  $NO_2^-$ , and subsequently in several consecutive steps to ammonia ( $NH_3$ ) as a final product. Addition of at least one amide to the solution being electrolyzed suppresses ammonia generation, since suitable amides react with  $NO_2^-$  to generate  $N_2$ . This permits nitrate reduction to gaseous nitrogen to proceed by electrolysis.

## WATER-SOLUBLE POLYMERS AND COMPOSITION THEREOF

Barbara F. Smith  
Thomas W. Robison  
Joel W. Gohdes  
U.S. Patent No. 6,441,089

Water-soluble polymers including functionalization from the group of amino groups, carboxylic acid groups, phosphonic acid groups, phosphonic ester groups, acylpyrazolone groups, hydroxamic acid groups, aza crown ether groups, oxy crown ethers groups, guanidinium groups, amide groups, ester groups, aminodicarboxylic groups, permethylated polvinylpyridine groups, permethylated amine groups, mercaptosuccinic acid groups, alkyl thiol groups, and N-alkylthiourea groups are formed.

## ACCELERATOR-DRIVEN TRANSMUTATION OF SPENT FUEL ELEMENTS

Francesco Venneri  
Mark A. Williamson  
Ning Li  
U.S. Patent No. 6,442,226

Higher actinides, plutonium and selected fission products in a liquid-fuel subcritical assembly are transmuted. Uranium may also be enriched, thereby providing new fuel for use in conventional nuclear power plants. An accelerator provides the additional neutrons required to perform the processes. Fast spectrum actinide transmutation apparatus (based on liquid-metal fuel) will take full advantage

of the accelerator-produced source neutrons and provide maximum utilization of the actinide-generated fission neutrons. However, near-thermal transmutation apparatus will require lower standing inventories of plutonium and higher actinides. Uranium, presently the largest volume constituent in nuclear waste is fully utilized and not discharged as waste. Since no plutonium, higher actinides or fission products are present in the reconstituted fuel elements, the present processes can be used repeatedly. Since the performance of the existing reactors is not changed, full utilization of both thorium and uranium resources is achieved.

## THIN FILM DIELECTRIC COMPOSITE MATERIALS

Quanxi Jia  
Brady J. Gibbons  
Alp T. Findikoglu  
Bae Ho Park  
U.S. Patent No. 6,444,336

A dielectric composite material comprising at least two crystal phases of different components with TiO<sub>2</sub> as a first component and a material selected from the group consisting of Ba<sub>1-x</sub>Sr<sub>x</sub>TiO<sub>3</sub> where x is from 0.3 to 0.7, Pb<sub>1-x</sub>Ca<sub>x</sub>TiO<sub>3</sub> where x is from 0.4 to 0.7, Sr<sub>1-x</sub>Pb<sub>x</sub>TiO<sub>3</sub> where x is from 0.2 to 0.4, Ba<sub>1-x</sub>Cd<sub>x</sub>TiO<sub>3</sub> where x is from 0.02 to 0.1, BaTi<sub>1-x</sub>Zr<sub>x</sub>O<sub>3</sub> where x is from 0.2 to 0.3, BaTi<sub>1-x</sub>Sn<sub>x</sub>O<sub>3</sub> where x is from 0.15 to 0.3, BaTi<sub>1-x</sub>Hf<sub>x</sub>O<sub>3</sub> where x is from 0.24 to 0.3, Pb<sub>1-1.3x</sub>La<sub>x</sub>TiO<sub>3+0.2x</sub> where x is from 0.23 to 0.3, (BaTiO<sub>3</sub>)<sub>x</sub>(PbFe<sub>0.5</sub>Nb<sub>0.5</sub>O<sub>3</sub>)<sub>1-x</sub> where x is from 0.75 to 0.9,

(PbTiO<sub>3</sub>)<sub>x</sub>(PbCo<sub>0.5</sub>W<sub>0.5</sub>O<sub>3</sub>)<sub>1-x</sub> where x is from 0.1 to 0.45, (PbTiO<sub>3</sub>)<sub>x</sub>(PbMg<sub>0.5</sub>W<sub>0.5</sub>O<sub>3</sub>)<sub>1-x</sub> where x is from 0.2 to 0.4, and (PbTiO<sub>3</sub>)<sub>x</sub>(PbFe<sub>0.5</sub>Ta<sub>0.5</sub>O<sub>3</sub>)<sub>1-x</sub> where x is from 0 to 0.2, as the second component is formed. The dielectric composite material can be formed as a thin film upon suitable substrates.

## RAMP-EDGE STRUCTURED TUNNELING DEVICES USING FERROMAGNET ELECTRODES

Chuhhee Kwon  
Quanxi Jia  
U.S. Patent No. 6,445,024

Ferromagnet-insulator-ferromagnet magnetic tunneling junction devices using a ramp-edge geometry based on, e.g., (La<sub>0.7</sub>Sr<sub>0.3</sub>)MnO<sub>3</sub>, ferromagnetic electrodes and a SrTiO<sub>3</sub> insulator are fabricated. The maximum junction magnetoresistance (JMR) as large as 23% was observed below 300 Oe at low temperatures (T < 100K). These ramp-edge junctions exhibited JMR of 6% at 200K with a field less than 100 Oe.

## LASER DETECTION OF MATERIAL THICKNESS

James W. Early  
U.S. Patent No. 6,445,457

Material thickness is measured by: (a) contacting a surface of a material to be measured with a high intensity short duration laser pulse at a light wavelength that heats the area of contact with the material, thereby



creating an acoustical pulse within the material; (b) timing the intervals between deflections in the contacted surface caused by the reverberation of acoustical pulses between the contacted surface and the opposite surface of the material; and (c) determining the thickness of the material by calculating the proportion of the thickness of the material to the measured time intervals between deflections of the contacted surface.

### **METHOD FOR DETERMINING AND MODIFYING PROTEIN/ PEPTIDE SOLUBILITY**

Geoffrey S. Waldo  
U.S. Patent No. 6,448,087

A solubility reporter for measuring a protein's solubility *in vivo* or *in vitro* is formed. The reporter, which can be used in a single living cell, gives a specific signal suitable for determining whether the cell bears a soluble version of the protein of interest. The method of the present invention includes "irrational" (random mutagenesis) methods, which do not require *a priori* knowledge of the three-dimensional structure of the protein of interest. Multiple sequences of mutation/genetic recombination and selection for improved solubility are demonstrated to yield versions of the protein that display enhanced solubility.

### **METHOD FOR THE SYNTHESIS OF CHIRAL ALLYLIC ALCOHOLS UTILIZING SELONE BASED CHIRAL DERIVATIZING AGENTS**

Louis A. Silks III  
U.S. Patent No. 6,448,409

Molecules containing a chiral 1,2-diol unit are synthesized from reactions between aldehydes and N-acyl selones. A chilled N-acyl selone is reacted with a Lewis acid such as  $\text{TiCl}_4$  and mixed with a tertiary amine such as diisopropylethylamine to generate an enolate solution. Upon further chilling of the enolate solution a desired aldehyde is added and after an acceptable reaction period a quencher is introduced and the product isolated.

### **HIGH TEMPERATURE SUPERCONDUCTING COMPOSITE CONDUCTOR AND METHOD FOR MANUFACTURING THE SAME**

Terry G. Holesinger  
John F. Bingert  
U.S. Patent No. 6,451,742

A high temperature superconducting composite conductor is provided including a high temperature superconducting material surrounded by a noble metal layer, the high temperature superconducting composite conductor characterized as having a fill factor of greater than about 40. Additionally, the conductor can be further characterized as containing multiple cores of high

temperature superconducting material surrounded by a noble metal layer, said multiple cores characterized as having substantially uniform geometry in the cross-sectional dimensions.

### **APPARATUS FOR MEASUREMENT OF CRITICAL CURRENT IN SUPERCONDUCTING TAPES**

James Y. Coulter  
Raymond F. Depaula  
U.S. Patent No. 6,452,375

A cryogenic linear positioner is primarily used for characterizing coated conductor critical current homogeneity at 75 K. Additionally, this tool can be used to measure the positional dependence of the coated conductor resistance at room temperature, and the room temperature resistance of the underlying YBCO coating without the overlaying protective cover of silver.

### **CORROSION TEST CELL FOR BIPOLAR PLATES**

Kirk R. Weisbrod  
U.S. Patent No. 6,454,922

A corrosion test cell is provided for evaluating corrosion resistance in fuel cell bipolar plates. The cell has a transparent or translucent cell body having a pair of identical cell body members that seal against opposite sides of a bipolar plate. The cell includes an anode chamber and a cathode chamber, where each chamber contains a pair of mesh

platinum current collectors and a catalyst layer pressed between current collectors and the plate. Each chamber is filled with an electrolyte solution that is replenished. The cell includes gas inlets to each chamber for hydrogen gas and air. As the gases flow into a chamber, they pass along the platinum mesh, through the catalyst layer, and to the bipolar plate. The flow of gas into the cell produces a constant flow of fresh electrolyte into each chamber. Openings in each cell body member allow electrodes to enter the cell body and contact the electrolyte in the reservoir therein. During operation, while hydrogen gas is passed into one chamber and air into the other chamber, the cell resistance is measured, which is used to evaluate the corrosion properties of the bipolar plate.

## **SELECTIVE FLOW PATH ALPHA PARTICLE DETECTOR AND METHOD OF USE**

Christopher H. Orr  
Craig J. Luff  
Thomas Dockray  
Duncan W. MacArthur  
U.S. Patent No. 6,455,859

Alpha contamination of an item is measured where ions generated in the air surrounding the item by the passage of alpha particles are moved to a distant detector location. The parts of the item from which ions are withdrawn can be controlled by restricting the air flow over different portions of the apparatus. In this way, detection of internal and external surfaces separately, for instance, can be provided. The apparatus and method are particularly suited for use in undertaking alpha contamination measurements during decommissioning operations.

## DISTINGUISHED AWARDS

### DISTINGUISHED PATENT AWARD

The Distinguished Patent Award honors inventors whose patented invention exhibits outstanding innovation. The award is selected by the Laboratory Fellows and recognizes a premier patent exemplifying significant technical advance, adaptability to public use, and noteworthy value to the mission of Los Alamos National Laboratory.

The patent and the inventors recognized for this award reflect the Laboratory's stalwart tradition of superior technical innovation and creativity.

#### *2002 Award Winners*

Xuedong Song and Basil Swanson of the Bioscience Division are co-recipients of the Distinguished Patent Award for their patent on the "Triggered Optical Biosensor." Their invention includes a fluid membrane upon a substrate such as a transducer surface. Recognition molecules within the fluid membrane are linked to fluorescence molecules. The recognition molecules are capable of binding with multivalent target biomolecules. The recognition molecules together with the linked fluorescence molecules can move about the surface of the fluid membrane. As binding occurs between recognition molecules and multivalent target biomolecules, multiple fluorescence

molecules will be brought together in close proximity. In a preferred system, some recognition molecules are linked to fluorescence donor molecules and some recognition molecules are linked to fluorescence acceptor molecules. Energy transfer between the donor and acceptor molecules can occur as they are brought into close proximity by the binding event. This can result in the decrease in fluorescence of one fluorescence species and an increase in fluorescence of the other fluorescence species.

Song and Swanson's invention involves a transduction approach that amplifies specific binding events such that both sensitivity and specificity are amplified. Non-specific interactions can be minimized. Their invention may be used in detection of protein toxins, viruses, antibodies, and other biomolecules. Such sensor technology remains essential in defending against terrorist attacks. Additionally, such sensor technology offers significant opportunities in medical diagnostics, for example, in the diagnosis of respiratory diseases. This award winning technology is a critical step in the final development— together with other technological developments—of a generic sensor system.



## DISTINGUISHED LICENSING AWARD

The Distinguished Licensing Award recognizes an innovator who proactively engages in commercialization activities at Los Alamos National Laboratory and has had a positive impact on the Laboratory's Licensing Program. This individual, by example, demonstrates outstanding success in transferring Laboratory-developed technologies to the public and private sectors. In addition, the recipient's commercialization track record has served to enhance the reputations of both the University of California and the Laboratory.

Nominees for this award are evaluated based on ongoing active engagement in the licensing process; active participation in the promotion of their technologies; number of technologies licensed; number of licenses per technology; and support for multiple uses of the licensed technologies (private and public).

The recipient of this distinguished award is a champion for the Laboratory's licensing program and is recognized for his or her role in confirming the benefits of proactive technology commercialization activities.

### *2002 Award Winner*

Benjamin Warner of Chemistry Division's Actinide, Catalysis, and Separation Chemistry Group is the recipient of this year's Licensing Award. His chemistry work in a diverse array of fields including radiation dosimeter and timing technology, electrochromic window technology, and micro x-ray fluorescence for drug discovery has led to numerous commercialization opportunities for the Laboratory.

Ben has eleven patent disclosures and five pending patent applications, the majority of which have been submitted in the past two years. His dedication to commercializing his inventions is a model to all technical staff members. Ben has gone to great lengths to understand the diverse markets for his technologies and has demonstrated great flexibility in pursuing the different commercialization strategies for the various technologies represented by his work. He has also spent a significant amount of his personal time educating himself on technology transfer policies, market considerations, financing, and management team issues.

Ben is a very active participant in the licensing process and plays a crucial role in the efforts to find licensees for his technologies. His ability to develop relationships with potential licensees has been instrumental in moving his technologies down the commercialization path. His exemplary efforts set a standard of excellence in support of the Laboratory's technology transfer mission.

## LICENSING GROWTH

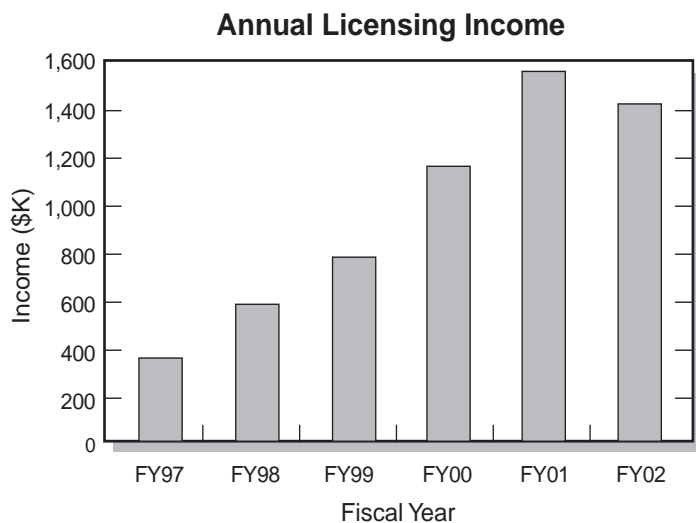
The intellectual property generated by Los Alamos National Laboratory researchers in the form of patents and copyrights is vital to the performance of our stockpile stewardship mission. In addition, the Laboratory has successfully leveraged these intellectual assets to attract funding from federal and private sponsors, form strategic alliances with private industry, and foster lucrative technology transfer activities.

In recent years, federally funded research has become an increasingly important source of innovation needed by U.S. industry to stay competitive. Private industry recognizes that Los Alamos National Laboratory is a reservoir of extraordinary scientific talent and cutting-edge technology. For the past seven years, the Laboratory's Licensing Program has facilitated the transfer of Laboratory-developed technologies to the private

sector through proactive commercialization of our intellectual property portfolio. The new products and services being created by our licensees capitalize on the key technical advances developed by our world-class researchers. In addition to the benefit to U.S. economic competitiveness, these product and service offerings enhance the reputation of the Laboratory as a premier provider of outstanding technology innovations.

The Licensing Program currently manages over 170 active commercial licenses. In addition, the Laboratory's active license portfolio contains over 650 noncommercial licenses with academia, government entities, and other nonprofit organizations. In the last few years, the program has witnessed accelerated growth, due in large part to the heightened awareness and active participation of the Laboratory's technical staff in commercialization activities.

Overall, the Licensing Program has generated over \$7.5 million in licensing income. Eighty-five percent of this income is redistributed to the inventors and to the technical divisions for scientific research and development, technology transfer activities, and education programs at the Laboratory.



## ROYALTY RECIPIENTS

### **Allander, Krag**

*Patent:*

Background Canceling Surface  
Alpha Detection

### **Backhaus, Scott**

*Patent:*

Traveling-Wave Device with  
Mass Flux Suppression

### **Baggerly, Keith**

*Copyright:*

Transportation ANalysis and  
SIMulation System (TRANSIMS)

### **Bai, Ying**

*Copyright:*

MiniGrand Family

### **Barbe, Michael**

*Patent:*

Laser Production of Articles  
from Powders

### **Barrett, Christopher**

*Copyright:*

Transportation ANalysis and  
SIMulation System (TRANSIMS)

### **Barton, Jerome**

*Patent:*

Apparatus and Method for  
Providing Pulsed Fluids

### **Beckman, Richard**

*Copyright:*

Transportation ANalysis and  
SIMulation System  
(TRANSIMS)

### **Berkbigler, Kathryn**

*Copyright:*

Transportation ANalysis and  
SIMulation System (TRANSIMS)

### **Bigio, Irving**

*Patent:*

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Alpha Detection

*Patent:*

High Flow Alpha Detector

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by Staining

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Method for the Detection of  
Specific Nucleic Acid Sequences  
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Incorporation

**Chavez, David***Patent:*

Low-Smoke Pyrotechnic  
Compositions

*Patent:*

High Nitrogen Energetic  
Material Based Pyrotechnic  
Compositions

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Fluid Density and Concentra-  
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Noninvasive *in Situ* Ultrasonic  
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Pulse Tube Refrigerator with  
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Water-Soluble Polymers and  
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**Gottesfeld, Shimson***Patent:*

Air Breathing Direct Methanol  
Fuel Cell

*Patent:*

Catalyst Inks and Method of  
Application for Direct Methanol  
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*Patent:*

Preventing CO Poisoning in  
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*Patent:*

Methanol Sensor Operated in  
Passive Mode

*Patent:*

Methanol Sensor Operated in  
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*Patent:*

Flow Channel Device for  
Electrochemical Cells

**Guthrie, George***Patent:*

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*Patent:*

Superconducting Composite  
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Buffered Industrial Process

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Genetic Algorithms for Finding  
Optimal Bayesian Experimental  
Designs Subject to Time and  
Cost Constraints

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DNA Fragment Sizing and  
Sorting by Laser-Induced  
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Processing Materials Inside an  
Atmospheric-Pressure  
Radiofrequency Nonthermal  
Plasma Discharge

*Patent:*

Atmospheric Pressure Plasma  
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*Patent:*

Large Area Atmospheric-  
Pressure Plasma Jet

*Patent:*

Combined Plasma/Liquid  
Cleaning of Substrates

**Herrmann, Hans***Patent:*

Atmospheric-Pressure Plasma  
Decontamination/Sterilization  
Chamber

*Patent:*

Processing Materials Inside an  
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Radiofrequency Nonthermal  
Plasma Discharge

**Hicks, Robert***Patent:*

Deposition of Coatings Using an  
Atmospheric Pressure Plasma  
Jet

*Patent:*

Large Area Atmospheric-  
Pressure Plasma Jet

**Hiskey, Michael***Patent:*

Low-Smoke Pyrotechnic  
Compositions

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Method for Preparing BIS-  
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Monohydrate

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Cylindrical Acoustic Levitator/ Concentrator

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Apparatus and Method for Remote, Noninvasive Characterization of Structures and Fluids Inside Containers

*Patent:*

Cylindrical Acoustic Levitator/ Concentrator

**Kane, Daniel***Patent:*

Method and Apparatus for Measuring the Intensity and Phase of an Ultrashort Light Pulse

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DNA Fragment Sizing and Sorting by Laser-Induced Fluorescence

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Multiple Feed Powder Splitter

*Patent:*

Rotary Powder Feedthrough Apparatus

*Patent:*

Deposition Head for Laser

**Lewis, Gary***Patent:*

Multiple Feed Powder Splitter

*Patent:*

Rotary Powder Feedthrough Apparatus

*Patent:*

Deposition Head for Laser

*Patent:*

Laser Production of Articles from Powder

*Patent:*

Production of Elongated Articles from Particulates

**Loree, Thomas***Patent:*

Apparatus and Method for Spectroscopic Analysis of Scattering Media

**Lowe, Terry***Patent:*

Method for Producing Ultrafine-Grained Materials Using Repetitive Corrugation and Straightening

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DNA Fragment Sizing and Sorting by Laser-Induced Fluorescence

**Martin, John***Patent:*

DNA Fragment Sizing and Sorting by Laser-Induced Fluorescence

*Patent:*

Method for Rapid Base Sequencing in DNA and RNA

**Martz Jr., Harry***Patent:*

Genetic Algorithms for Finding Optimal Bayesian Experimental Designs Subject to Time and Cost Constraints

*Patent:*

Optimizing the Availability of a Buffered Industrial Process

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High Efficiency Neutron  
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Production of Elongated  
Articles from Particulates

*Patent:*

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Method for Rapid Base  
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Method for Preparing BIS-  
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Amine Monohydrate

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**Neutzler, Jay***Patent:*

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Fluid Density and Concentra-  
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Method for Rapid Base  
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Methanol Sensor Operated in  
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*Patent:*

Methanol Sensor Operated in  
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Flow Channel Device for  
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Fuel Cell

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Catalyst Inks and Method of  
Application for Direct Methanol  
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Water-Soluble Polymers for  
Recovery of Metals from Solids

*Patent:*

Water-Soluble Polymers and  
Compositions Thereof

*Patent:*

Water-Soluble Polymers for  
Recovery of Metal Ions from  
Aqueous Streams



**Rodgers, John***Patent:*

Apparatus Having Reduced Background for Measuring Radiation Activity in Aerosol Particles

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Quick-Change Filter Cartridge

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Deposition of Coatings Using an Atmospheric Pressure Plasma Jet

*Patent:*

Atmospheric-Pressure Plasma Decontamination/Sterilization Chamber

*Patent:*

Processing Materials Inside and Atmospheric-Pressure

Radiofrequency Nonthermal Plasma Discharge

*Patent:*

Atmospheric-Pressure Plasma Jet

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Atmospheric Pressure Plasma Processing Reactor

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Recombinant Fluorescent Protein Microsphere Calibration Standard

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Combined Plasma/Liquid Cleaning of Substrates

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Flat-Panel Amorphous Silicon High-Resolution Computed Tomography-Data Processing Software

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Method for Rapid Base Sequencing in DNA and RNA

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Ordered Transport and Identification of Particles

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Noninvasive Characterization of Multiphase Flow

*Patent:*

Cylindrical Acoustic Levitator/Concentrator

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Apparatus and Method for Remote, Noninvasive Characterization of Structures and Fluids Inside Containers

*Patent:*

Noninvasive Identification of Fluids by Swept-Frequency Acoustic Interferometry

*Patent:*

Noninvasive Method for Determining the Liquid Level and Density Inside of a Container

*Patent:*

Method for Establishing the Presence of Salmonella Bacteria in Eggs

*Patent:*

Method for Noninvasive Intracranial Pressure Measurement

*Patent:*

Ultrasonic Characterization of Single Drops of Liquids

*Patent:*

Apparatus and Method for Comparing Corresponding Acoustic Resonances in Liquids

*Patent:*

Apparatus and Method for Non-Contact, Acoustic Resonance Determination of Intraocular Pressure

*Patent:*

Noninvasive Method for Determining the Liquid Level and Density Inside of a Container

**Smith, Barbara***Patent:*

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*Patent:*

Water-Soluble Polymers and Compositions Thereof

*Patent:*

Water-Soluble Polymers for Recovery of Metal Ions from Aqueous Streams

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Atmospheric Pressure Plasma Processing Reactor

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Apparatus and Method for Spectroscopic Analysis of Scattering Media

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Pulse Tube Refrigerator with Variable Phase Shift

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Catalyst Inks and Method of Application for Direct Methanol Fuel Cells

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Laboratory High Resolution X-Ray Diffractometer for Protein Powders

*Patent:*

High Throughput Screening of Ligand Binding to Macromolecules Using High Resolution Powder Diffraction

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Use of High Resolution X-Ray Diffraction to Determine Ligand to Target Biomolecule Binding Modes

**Waldo, Geoffrey***Patent:*

Method for Determining and Modifying Protein/Peptide Solubility

*Patent:*

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Fuel Cell Membrane Humidification

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*Patent:*

Fuel Cell with Metal Screen Flow-Field

*Patent:*

Fuel Cell with Interdigitated Porous Flow-Fields

*Patent:*

Composite Biopolar Plate for Electromechanical Cells

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Apparatus and Method for  
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Resonance Determination of  
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**Yamada, Tesuji***Copyright:*

Higher Order Turbulence  
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**Young, Lloyd***Copyright:*

Phase and Radial Motion in  
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**Zawodzinski, Christine***Patent:*

Fuel Cell with Metal Screen  
Flow-Field

**Zelenay, Piotr***Patent:*

Catalyst Inks and Method of  
Application for Direct Methanol  
Fuel Cells

**Zhu, Yutian***Patent:*

Method for Producing  
Ultrafine-Grained Materials  
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## CONTACT LIST

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