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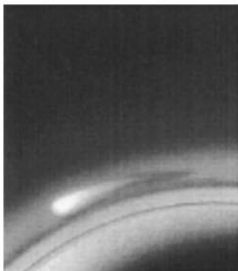
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LEAD ACID**5998062****BATTERY PASTE COMPOSITIONS AND
ELECTROCHEMICAL CELLS FOR
USE THEREWITH**

John B. Olson; Boulder, CO, UNITED STATES assigned to Optima Batteries Inc.

An improved battery paste composition and a lead-acid electrochemical cell which incorporates the composition. The cell includes a positive current collector and a negative current collector which are each coated with a paste containing one or more lead-containing compositions and a paste vehicle to form a positive plate and a negative plate. An absorbent electrolyte-containing separator member may also be positioned between the positive and negative plates. The paste on the positive current collector, the negative current collector, or both further includes a special additive consisting of polyvinylsulfonic acid or salts thereof which provides many benefits including improved battery cycle life, increased charge capacity, and enhanced overall stability. The additive also makes the pastes smoother and more adhesive, thereby improving the paste application process. The paste compositions of interest may be used in conventional flat-plate cells or in spirally wound batteries with equal effectiveness.

6001506**TERMINAL POST ASSEMBLY FOR
LEAD-ACID BATTERIES**

John B. Timmons; Edward F. Koss; Winston-Salem, Redlands, CA, UNITED STATES assigned to Concorde Battery Corporation

An improved terminal post assembly for lead-acid batteries in which the conventional cast lead connecting pad which connects the battery post with the threaded terminal has been replaced by a prefabricated connector formed of a lightweight material having high current capacity and creep resistance.

6004689**BATTERY CASE**

Thomas P. Walker; Tristan E. Juergens; Morrison, Telluride, CO, UNITED STATES assigned to Bolder Technologies Corporation

An electrochemical cell case and method of manufacturing an electrochemical battery are provided. The cell case includes a main body that encloses a plurality of individual cells in separate, contiguous compartments. After the cells have been inserted into the compartments, the compartments are hermetically sealed. The compartments may be separately filled and vented, and the cell of each compartment receives end connectors such as rivet connectors. The elements are electrically interconnected, such as in a series

configuration. A top cap attaches to the main body, and encloses the interconnected cell terminals. The top cap may also enclose other electronics, such as battery recharging circuitry or a temperature sensor. The top cap may be sized and shaped to mate with connectors on specific electrical devices, and may be removable so that another top cap may be installed for use with another device.

6008480**INDUCTION HEATING APPARATUS AND METHOD
FOR FUSING BATTERY CELL TERMINALS**

David L. Lund; Minneapolis, MN, UNITED STATES assigned to GNB Technologies Inc.

An induction heating method and apparatus for simultaneously and efficiently fusing battery cell terminal posts and bushings in a battery production line. The apparatus includes an induction heating generator having a T-shaped bus bar for symmetrically supporting a plurality of pairs of induction heating coils, with one coil of each pair being supported on the forward side of a transverse bus bar section and the other coil of each pair being supported on a rear side of the transverse bus bar section. The coils each have respective mounting structures for permitting individual vertical adjustment of the coil with respect to the bus bar to enable uniform positioning of the coils with respect to a plurality of bushings and terminal posts for effecting uniform depth fusion of the plurality of posts and bushings. The induction heating coils define a water flow path through which cooling water is circulated during the fusion operation, while efficiencies and symmetries in the bus bar design enable it to support and conduct current to the respective coils without water cooling.

FUEL CELL**5992008****DIRECT METHANOL FEED FUEL CELL WITH
REDUCED CATALYST LOADING**

Andrew Kindler; San Marino, CA, UNITED STATES assigned to California Institute of Technology

Improvements to direct feed methanol fuel cells include new protocols for component formation. Catalyst-water repellent material is applied in formation of electrodes and sintered before application of ionomer. A membrane used in formation of an electrode assembly is specially pre-treated to improve bonding between catalyst and membrane. The improved electrode and the pre-treated membrane are assembled into a membrane electrode assembly.

5993619**ELECTROCHEMICAL AUTOTHERMAL
REFORMER**

David P. Bloomfield; Arthur N. Rabe; Boston, North Quincy, MA, UNITED STATES assigned to Niagara Mohawk Power Corporation

An electrochemical autothermal reformer (EATR) provides hydrogen. The EATR includes an autothermal reformer region, a reformer anode supply region, and a composite membrane layer separating the reformer anode from the autothermal reformer region. The composite membrane layer includes a mechanically stable porous ceramic support member with a thin gas permeable ceramic substrate layer overlaying the support member. Overlaying the substrate layer is a first thin metallic catalyst layer which promotes the dissociation of H_2 to $2H^+ + 2e^-$. Overlaying the first catalyst layer is a metallic oxide layer capable of conducting $2H^+ + 2e^-$ at elevated temperatures. Overlaying the metallic oxide layer is a second thin metallic catalyst layer which promotes the recombination of $2H^+ + 2e^-$ to H_2 .

5993985

**FUEL CELL TUBES AND METHOD
OF MAKING SAME**

Brian P. Borglum; Edgewood, PA, UNITED STATES assigned to Siemens Westinghouse Power Corporation

A method of manufacturing porous ceramic tubes for fuel cells with improved properties and higher manufacturing yield is disclosed. The method involves extruding a closed end fuel cell tube, such as an air electrode of a solid oxide fuel cell, in which the closed end also functions as the sintering support. The resultant fuel cell tube has a superior porosity distribution which allows improved diffusion of oxygen at the closed end of the tube during operation of the fuel cell. Because this region has the highest current density, performance enhancement and improved reliability of the fuel cell tube result. Furthermore, the higher manufacturing yield associated with the present method decreases the overall fuel cell cost.

5993986

**SOLID OXIDE FUEL CELL STACK WITH
COMPOSITE ELECTRODES AND
METHOD FOR MAKING**

Sten A. Wallin; Sunil D. Wijeyesekera; Midland, MI, UNITED STATES assigned to The Dow Chemical Company

A planar solid oxide fuel cell stack has a number of fuel cells (anode/electrolyte/cathode) connected in series by a gas tight, electrically conductive interconnection in which at least one electrode is a porous composite of a contiguous network of an ionically conductive material or phase, a contiguous network of an electrically conductive material or phase, and a highly efficient electrocatalyst material or phase which is dispersed within the pores of the electrode so that the electrocatalyst material or phase particles are in contact with both the ionically conductive material or phase and the electrically conductive material or phase. The electrocatalyst particles are introduced into the electrode of the assembled stack by infiltrating the pores of the electrode with a precursor solution through the fuel gas

or oxidant gas manifolding connections, respectively. The stack assembly is then heat treated to form small, highly active particles of the dispersed electrocatalyst material or phase within the electrode.

5993987

**ELECTROCHEMICAL FUEL CELL STACK
WITH COMPRESSION BANDS**

Boguslaw Wozniczka; Nicholas J. Fletcher; Peter R. Gibb; Coquitlam, Vancouver, Coquitlam, CANADA assigned to Ballard Power Systems Inc.

An electrochemical fuel cell stack includes a plurality of fuel cell assemblies interposed between a pair of end plate assemblies. The mechanism for securing the stack in its compressed, assembled state includes at least one compression band which circumscribes the end plate assemblies and interposed fuel cell assemblies of the stack. At least one of the end plate assemblies is sufficiently thin so as to deflect under the compressive force if at least one end plate assembly is supported only at a peripheral edge portion thereof. Preferably, at least one of the end plate assemblies comprises a resilient member which cooperates with each compression band to urge the first end plate assembly toward the second end plate assembly, thereby applying compressive force to the fuel cell assemblies to promote sealing and electrical contact between the layers forming the fuel cell stack.

5993988

**COMPOSITE CERAMIC POWDER, METHOD FOR
MANUFACTURING THE POWDER, ELECTRODE
FOR SOLID ELECTROLYTIC FUEL CELL, AND
METHOD FOR MANUFACTURING THE
ELECTRODE**

Satoshi Ohara; Takehisa Fukui; Kaseki Kodera; Nagoya, Akashi, JAPAN assigned to Japan Fine Ceramics Center

An object of the present invention is to provide composite ceramic powder containing composite ceramic particulates as constituent particulates. Each of the composite ceramic particulates is constituted of a group of first particles and a group of second particles in which the first particles are localized around the second particles. A spray pyrolysis is used to localize the first particles around the second particles, thereby producing such composite ceramic particulates.

5993989

**INTERFACIAL MATERIAL FOR SOLID
OXIDE FUEL CELL**

Li Baozhen; Roswell J. Ruka; Subhash C. Singhal; Essex Junction, Pittsburgh, Murrysville, UNITED STATES assigned to Siemens Westinghouse Power Corporation

Solid oxide fuel cells having improved low-temperature operation are disclosed. In one embodiment, an interfacial layer of terbia-stabilized zirconia is located between the air

electrode and electrolyte of the solid oxide fuel cell. The interfacial layer provides a barrier which controls interaction between the air electrode and electrolyte. The interfacial layer also reduces polarization loss through the reduction of the air electrode/electrolyte interfacial electrical resistance. In another embodiment, the solid oxide fuel cell comprises a scandia-stabilized zirconia electrolyte having high electrical conductivity. The scandia-stabilized zirconia electrolyte may be provided as a very thin layer in order to reduce resistance. The scandia-stabilized electrolyte is preferably used in combination with the terbia-stabilized interfacial layer. The solid oxide fuel cells are operable over wider temperature ranges and wider temperature gradients in comparison with conventional fuel cells.

5994426

**SOLID-POLYMER-ELECTROLYTE MEMBRANE
FOR FUEL CELL AND PROCESS FOR
PRODUCING THE SAME**

Shinji Nezu; Masaki Gondo; Obu, Hashima, JAPAN assigned to Aisin Seiki Kabushiki Kaisha

A solid-polymer-electrolyte membrane for a polymer-electrolyte fuel cell is formed of a synthetic resin. The synthetic resin includes a main chain, and a hydrocarbon-based side chain. The main chain is formed as a film, and formed of a copolymer made from a fluorocarbon-based vinyl monomer and a hydrocarbon-based vinyl monomer. The hydrocarbon-based side chain involves a sulfonic group. The solid-polymer-electrolyte membrane exhibits a high strength and flexibility, but a low electric resistance, and can be produced at a reduced manufacturing cost. Thus, the solid-polymer-electrolyte membrane can be effectively applied to construct polymer-electrolyte fuel cells.

5997794

**METHOD OF MAKING MATRIX FOR
CARBONATE FUEL CELLS**

Chao M. Huang; Joel D. Doyon; Chao-Yi Yuh; Danbury, Bantam, New Milford, CT, UNITED STATES assigned to Energy Research Corporation

A method of forming an electrolyte matrix for a carbonate fuel cell. An α -LiAlO₂ ceramic is mixed in an aqueous solvent having a citric acid dispersant and deflocculated using a high energy attrition milling. The deflocculated mixture is added to an alcohol/glycerol aqueous binder system to form a slurry which is degassed and then tape cast to form the matrix.

5998054

**FUEL CELL MEMBRANE HYDRATION
AND FLUID METERING**

Daniel O. Jones; Michael M. Walsh; Glenville, Fairfield, CT, UNITED STATES assigned to Plug Power L.L.C.

A hydration system includes fuel cell fluid flow plate(s) and injection port(s). Each plate has flow channel(s) with respective inlet(s) for receiving respective portion(s) of a given stream of reactant fluid for a fuel cell. Each injection port injects a portion of liquid water directly into its respective flow channel in order to mix its respective portion of liquid water with the corresponding portion of the stream. This serves to hydrate at least corresponding part(s) of a given membrane of the corresponding fuel cell(s). The hydration system may be augmented by a metering system including flow regulator(s). Each flow regulator meters an injecting at inlet(s) of each plate of respective portions of liquid into respective portion(s) of a given stream of fluid by corresponding injection port(s).

5998055

GAS-PASSAGE PLATES OF A FUEL CELL

Kenji Kurita; Katsuhiro Kajio; Nagoya, Anjo, JAPAN assigned to Aisin Seiki Kabushiki Kaisha

Gas passages of a gas-passage plate disposed between fuel cells are improved in order to enhance gas utilization efficiency and output performance. The supply-gas passages formed on the gas-passage plate on a surface to face one gaseous diffusion electrode comprise an inlet-side channel part, an outlet-side channel part, and an intermediate channel part which connects the inlet-side channel part and the outlet-side channel part. The inlet-side channel part and the outlet-side channel part are lattice-shaped passages. The intermediate channel part has the shape of being folded plural times, and comprises groups of a plurality of straight independent passages, and lattice-shaped passages formed at portions returning from one independent-passages group to the next independent-passages group.

5998056

**ANODE SUBSTRATE FOR A HIGH
TEMPERATURE FUEL CELL**

Jiri Divisek; Lambertus G.J. de Haart; Ernst Riensche; Ulrich Stimming; Julich, Heerlen, Aachen, GERMANY assigned to Forschungszentrum Julich

In an anode structure for a high temperature fuel cell which has a non-catalytic phase and a catalytic phase with respect to methane-vapor reforming reactions, a substrate with a bipolar plate disposed thereon has areas of different catalytic activity levels, i.e. an area in which the regular catalytic metallic phase has been replaced by a catalytic metallic phase with low catalytic activity whereby the methane vapor reforming reaction is delayed in the areas of reduced catalyst activity.

6001498

**FUEL CELL ARRANGEMENT WITH
GRAVITY-DRIVEN CIRCULATION SYSTEM**

Ilona Busenbender; Hendrik Dohle; Thorsten Kels; Volker Peinecke; Aachen, Eschweiler, Juelich-Broich, Aachen, GERMANY assigned to Forschungszentrum Julich

In a fuel cell arrangement with at least one fuel cell operated by a fuel and an oxidizing agent, means are provided for effecting gravity driven circulation of the fuel and the oxidizing agent through the fuel cell so that no pumping means, which consume power and need servicing, are required.

6001500
CYLINDRICAL PROTON EXCHANGE
MEMBRANE FUEL CELLS AND METHODS
OF MAKING SAME

Edward Albert Bass; Patrick Martin Merritt; Christopher Alan Sharp; Craig Marshall Wall; John Campbell; San Antonio, TX, UNITED STATES

The present invention provides a method of manufacturing a cylindrical fuel cell comprising: providing an anode comprising a substantially solid cylindrical porous conductive matrix, said anode having an anode outer surface; intimately contacting a first proton exchange catalyst with said anode; conforming around and in intimate contact with said anode outer surface an inner polymer electrolyte membrane comprising a membrane outer surface and a membrane inner surface, wherein said membrane inner surface defines a tubular compartment and ionically communicates with said first proton exchange catalyst; providing a source of hydrogen gas in fluid communication with said first proton exchange catalyst; and, disposing around and in ionic communication with said membrane outer surface a cathode comprising a catalytically effective amount of a second proton exchange catalyst.

6001501
CONNECTIONS FOR SOLID OXIDE FUEL CELLS
 Jeffrey C. Collie; Pittsburgh, PA, UNITED STATES
 assigned to Siemens Westinghouse Power Corporation

A connection for fuel cell assemblies is disclosed. The connection includes compliant members connected to individual fuel cells and a rigid member connected to the compliant members. Adjacent bundles or modules of fuel cells are connected together by mechanically joining their rigid members. The compliant/rigid connection permits construction of generator fuel cell stacks from basic modular groups of cells of any desired size. The connections can be made prior to installation of the fuel cells in a generator, thereby eliminating the need for in situ completion of the connections. In addition to allowing pre-fabrication, the compliant/rigid connections also simplify removal and replacement of sections of a generator fuel cell stack.

6001502
CURRENT CONDUCTING END PLATE
OF FUEL CELL ASSEMBLY
 Michael M. Walsh; Fairfield, CT, UNITED STATES
 assigned to Plug Power L.L.C.

A fuel cell assembly has a current conducting end plate with a conductive body formed integrally with isolating material. The conductive body has a first surface, a second surface opposite the first surface, and an electrical connector. The first surface has an exposed portion for conducting current between a working section of the fuel cell assembly and the electrical connector. The isolating material is positioned on at least a portion of the second surface. The conductive body can have support passage(s) extending throughout for receiving structural member(s) of the fuel cell assembly. Isolating material can electrically isolate the conductive body from the structural member(s). The conductive body can have service passage(s) extending throughout for servicing one or more fluids for the fuel cell assembly. Isolating material can chemically isolate the one or more fluids from the conductive body. The isolating material can also electrically isolate the conductive body from the one or more fluids.

6004688
SOLID OXIDE FUEL CELL AND DOPED
PEROVSKITE LANTHANUM GALLATE
ELECTROLYTE THEREOF

John Bannister Goodenough; Keqin Huang; Austin, TX, UNITED STATES assigned to The Board of Regents of the University of Texas System

A perovskite lanthanum gallate electrolyte doped with strontium and magnesium and a solid oxide fuel cell incorporating a doped lanthanum gallate electrolyte with a cathode on one side, an anode on the other side and a buffer layer comprising a mixed electronic and oxide-ion conductor between the anodes and/or the cathode and the electrolyte to block unwanted chemical reactions while permitting electronic and oxide-ion transport.

6007930
METHOD FOR INITIATING A
FUEL CELL

James A Adams; Mark S. Sulek; George Steve Saloka; Ann Arbor, Warren, Dearborn, MI, UNITED STATES assigned to Ford Global Technologies Inc.

The present invention provides a method for initiating a fuel cell power system by directly introducing a gas containing oxygen into the fuel cell stack 10. A gas storage source 28 provides oxidizer to the fuel cell 10 such that there is enough initial power to generate a load. The air compressor 24 is started electrically by a portion of the load, and begins to supply compressed air to the cathode 14. The fuel cell stack 10 thereby obtains a further quantity of oxidizer from the compressed air. The air system valve 32 then operates to transfer the fuel cell stack 10 from the gas storage source 28 to the air compressor 24.

6007931**MASS AND HEAT RECOVERY SYSTEM FOR A FUEL CELL POWER PLANT**

Thomas F. Fuller; Paul R. Margiott; Leslie L. Van Dine; Glastonbury, South Windsor, Manchester, CT, UNITED STATES assigned to International Fuel Cells Corporation

A mass and heat recovery system for a fuel cell power plant includes at least one fuel cell for producing electrical energy, hydrocarbon fuel processing components for producing a hydrogen rich reducing fluid for the fuel cell, and a direct mass and heat transfer device for recovering mass and heat such as water vapor leaving the plant. The fuel processing components include an auxiliary burner that provides heat to generate steam and a reformer that receives the steam mixed with a hydrocarbon fuel along with a small amount of air and converts the mixture to a hydrogen rich stream appropriate for supplying hydrogen to the anode electrode. The direct mass and heat transfer device passes a process oxidant stream upstream of the plant in mass transfer relationship with a plant exhaust stream that includes both the cathode exhaust stream and the anode exhaust stream wherein the anode exhaust stream has first been burned in the auxiliary burner so that mass and heat such as water vapor in the plant exhaust stream transfer directly through a mass transfer medium of the device to the process oxidant stream entering the plant. The device includes a separator housing for supporting the transfer medium and for preventing bulk mixing of the streams. An exemplary transfer medium such as a liquid water portion of a water saturated polyfluoro-sulfonic ionomer selectively sorbs a fluid substance consisting of polar molecules such as water molecules from a fluid stream containing polar and non-polar molecules.

6007932**TUBULAR FUEL CELL ASSEMBLY AND METHOD OF MANUFACTURE**

Willem J. Steyn; Jackson, NJ, UNITED STATES assigned to Gore Enterprise Holdings Inc.

A fuel cell assembly including a porous tubular substrate made from a fluid-permeable material, and a plurality of elongated flexible polymer electrolyte fuel cells wound in side by side relation onto the substrate. Each elongated cell includes a central proton exchange membrane, a cathode element mounted on one side of said membrane and an anode element mounted on the other side of said membrane. In a preferred arrangement, the anode element of the first elongated wound fuel cell is in electrical contact with the cathode element of an adjacently wound fuel cell.

6007933**FUEL CELL ASSEMBLY UNIT FOR PROMOTING FLUID SERVICE AND ELECTRICAL CONDUCTIVITY**

Daniel O. Jones; Glenville, NY, UNITED STATES assigned to Plug Power L.L.C.

Fluid service and/or electrical conductivity for a fuel cell assembly is promoted. Open-faced flow channel(s) are formed in a flow field plate face, and extend in the flow field plate face between entry and exit fluid manifolds. A resilient gas diffusion layer is located between the flow field plate face and a membrane electrode assembly, fluidly serviced with the open-faced flow channel(s). The resilient gas diffusion layer is restrained against entering the open-faced flow channel(s) under a compressive force applied to the fuel cell assembly. In particular, a first side of a support member abuts the flow field plate face, and a second side of the support member abuts the resilient gas diffusion layer. The support member is formed with a plurality of openings extending between the first and second sides of the support member. In addition, a clamping pressure is maintained for an interface between the resilient gas diffusion layer and a portion of the membrane electrode assembly. Preferably, the support member is spikeless and/or substantially flat. Further, the support member is formed with an electrical path for conducting current between the resilient gas diffusion layer and position(s) on the flow field plate face.

6007934**CO-TOLERANT ANODE CATALYST FOR PEM FUEL CELLS AND A PROCESS FOR ITS PREPARATION**

Emmanuel Auer; Andreas Freund; Thomas Lehmann; Karl-Anton Starz; Robert Schwarz; Udo Stenke; Frankfurt, Kleinostheim, Langenselbold, Rodenbach, Rodenbach, Mainaschaff, GERMANY assigned to Degussa Aktiengesellschaft

A platinum supported catalyst is disclosed for the anode in a PEM fuel cell with high resistance to poisoning by carbon monoxide. The catalyst contains the noble metals platinum and ruthenium on a finely divided, conductive support material. The two noble metals are not alloyed with each other and are present in highly dispersed form on the support material, wherein the crystallite size of the platinum is <2 nm and that of the ruthenium is <1 nm.

BATTERY MATERIALS**5993991****BATTERY VENT PLUG IMPROVEMENT**

William E.M. Jones; Horsham, PA, UNITED STATES

A vent plug for insertion into a battery vent well that retains the original large diameter of the well. The vent plug has a body having a top and bottom and an opening extending from top to the bottom. A neck extends from the body for insertion into the well. The neck has an opening therein and an arm positioned to engage the underside of a projection in the well without substantially intruding into the well diameter.

5998559**SINGLE-ION CONDUCTING SOLID POLYMER ELECTROLYTES, AND CONDUCTIVE COMPOSITIONS AND BATTERIES MADE THEREFROM**

Subhash C. Narang; Susanna C. Ventura; Redwood City, Los Alto, CA, UNITED STATES assigned to SRI International

A single-ion electrolyte achieves conductivity greater than $10^{-3} \text{ S cm}^{-1}$ at 20°C by employing repeating mer units which are functionalized by fluoroalkylsulfonate groups. Preferred backbones for the electrolyte include polysiloxanes, polymethacrylates and poly(alkylene oxides). More preferred backbones have the structure (figure) wherein A is selected from the group consisting of C and Si such that when A is C then R^4 is $(\text{CH}_2)_{1-100}$ and when A is Si then R^4 is O; R^1 and R^2 are independently selected from the group consisting of hydrogen, lower alkyl, lower alkoxy, fluorinated lower alkyl, fluorinated lower alkoxy, and fluoroalkylsulfonate; and R^3 is null or selected from the group consisting of O, $(\text{O})_{1-100}$, $\text{O}-\text{CH}_2$, $(\text{O})_{1-100}-\text{(CH}_2)_{1-100}$.

6001509**SOLID POLYMER ELECTROLYTES**

Dong-Won Kim; Young-Roak Kim; Boo-Keun Oh; Chang-Woo Baek; Daejeon, Taeku, SOUTH KOREA assigned to Samsung Display Devices Company Ltd.

A solid polymer electrolyte according to the present invention comprises a polymer (A), and a liquid electrolyte (B) composed of a lithium salt and an aprotic solvent, optionally and a ceramic filler (C). The polymer (A) is poly(acrylonitrile-methyl methacrylate), poly(acrylonitrile-methyl methacrylate-oligooxyethylene ethylether methacrylate) or poly(acrylonitrile-methyl methacrylate-styrene). The polymer (A) is poly(acrylonitrile-methyl methacrylate) containing acrylonitrile about 10–90 mol%, preferably 26–46 mol%, poly(acrylonitrile-methyl methacrylate-oligooxyethylene ethylether methacrylate) containing acrylonitrile about 20–80 mol%, methyl methacrylate 20–80 mol% and oligooxyethylene ethylether methacrylate 5–20 mol%, and poly(acrylonitrile-methyl methacrylate-styrene) containing acrylonitrile 10–80 mol%, methyl methacrylate 10–60 mol% and styrene 5–50 mol%.

6004696**AG-PEROVSKITE CERMETS FOR THIN FILM SOLID OXIDE FUEL CELL AIR-ELECTRODE APPLICATIONS**

Scott Alexander Barnett; Li-Shun Wang; Evanston, Santa Rosa, CA, UNITED STATES assigned to Northwestern University

An air-electrode for a solid oxide fuel cell having high conductivity and low interfacial resistance is disclosed. The said air electrode is composed of an Ag-perovskite cermet.

6004698**SOLID POLYMER ELECTROLYTE ELECTROCHEMICAL STORAGE CELL CONTAINING A REDOX SHUTTLE ADDITIVE FOR OVERCHARGE PROTECTION**

Thomas J. Richardson; Philip N. Ross; Oakland, Moraga, CA, UNITED STATES assigned to USA as represented by the US Department of Energy

A class of organic redox shuttle additives is described, preferably comprising nitrogen-containing aromatics compounds, which can be used in a high temperature (85°C or higher) electrochemical storage cell comprising a positive electrode, a negative electrode, and a solid polymer electrolyte to provide overcharge protection to the cell. The organic redox additives or shuttles are characterized by a high diffusion coefficient of at least $2.1 \times 10^{-8} \text{ cm}^2 \text{ s}^{-1}$ and a high onset potential of 2.5 V or higher. Examples of such organic redox shuttle additives include an alkali metal salt of 1,2,4-triazole, an alkali metal salt of imidazole, 2,3,5,6-tetramethylpyrazine, 1,3,5-tricyanobenzene, and a dialkali metal salt of 3-4-dihydroxy-3-cyclobutene-1,2-dione.

6007683**HYBRID DEPOSITION OF THIN FILM SOLID OXIDE FUEL CELLS AND ELECTROLYZERS**

Alan F. Jankowski; Daniel M. Makowiecki; Glenn D. Rambach; Erik Randich; Livermore, Endinboro, UNITED STATES assigned to The Regents of the University of California

The use of vapor deposition techniques enables synthesis of the basic components of a solid oxide fuel cell (SOFC); namely, the electrolyte layer, the two electrodes, and the electrolyte-electrode interfaces. Such vapor deposition techniques provide solutions to each of the three critical steps of material synthesis to produce a thin film solid oxide fuel cell (TF-SOFC). The electrolyte is formed by reactive deposition of essentially any ion conducting oxide, such as defect free, yttria stabilized zirconia (YSZ) by planar magnetron sputtering. The electrodes are formed from ceramic powders sputter coated with an appropriate metal and sintered to a porous compact. The electrolyte-electrode interface is formed by chemical vapor deposition of zirconia compounds onto the porous electrodes to provide a dense, smooth surface on which to continue the growth of the defect-free electrolyte, whereby a single fuel cell or multiple cells may be fabricated.

LITHIUM BATTERIES**5993767****SOLVATE OF LITHIUM
HEXAFLUOROPHOSPHATE AND PYRIDINE,
ITS PREPARATION AND PREPARATION
PROCESS FOR LITHIUM
HEXAFLUOROPHOSPHATE USING
SAID SOLVATE**

Patrick Willmann; Regine Naejus; Robert Coudert; Daniel Lemordant; Montgiscard, Tours, Notre Dame D'Oe, Orsay, FRANCE assigned to Centre National D'Etudes Spatiales

The invention relates to a lithium hexafluorophosphate solvate usable for the preparation of high purity lithium hexafluorophosphate. This solvate of lithium hexafluorophosphate and pyridine complies with the formula and is prepared by a process comprising the following stages: (a) preparation of pyridinium hexafluorophosphate of formula $C_5H_5NHPF_6$ by the neutralization of hexafluorophosphoric acid HPF_6 with pyridine and (b) conversion of the pyridinium hexafluorophosphate into solvate $LiPF_6 \cdot C_5H_5N$ by exchange with a lithium compound chosen from among lithium hydroxide, lithium alkoxides and alkyl-lithiums. The $LiPF_6$ can be regenerated from the solvate by vacuum decomposition.

5993997**LITHIUM SECONDARY BATTERY**

Masahisa Fujimoto; Noriyuki Yoshinaga; Koji Ueno; Nobuhiro Furukawa; Toshiyuki Nohma; Masatoshi Takahashi; Osaka, Sumoto, Hirakata, Itano-gun, Kadoma, Souraku-gun, JAPAN assigned to Sanyo Electric Company Ltd.

Provided is a novel lithium secondary battery comprising a positive electrode comprising a compound capable of occluding and discharging lithium, a negative electrode composed mainly of a carbon material which comprises a graphite as an only or as a principal component, a separator between said positive electrode and said negative electrode; and an electrolyte solution of an electrolyte solute dissolved in a solvent comprising at least one specific cyclic compound. The lithium secondary battery has a large capacity, small self-discharge rate and excellent cycle characteristics and high charge-discharge efficiency.

5993998**POSITIVE ACTIVE MATERIAL FOR LITHIUM
BATTERY, LITHIUM BATTERY HAVING
THE SAME AND METHOD FOR PRODUCING
THE SAME**

Hideo Yasuda; Kyoto, JAPAN assigned to Japan Storage Battery Company Ltd.

A positive active material for lithium battery, includes a lithium-containing amorphous nickel oxide represented by a chemical composition formula of Li_xNiO_2 ; where x varies

from 0.25 to 2. Preferably x is between 1 and 2. More preferably x varies from 1.4 to 2. The positive active material may contains cobalt from 2 to 60 mol% (Co/(Ni+Co)).

5997839**LITHIATED MANGANESE OXIDE**

G. Chithambarathanu Pillai; Peru, IL, UNITED STATES assigned to Carus Chemical Company

The invention is directed to making a lithiated manganese dioxide using low and high temperature calcination steps.

5998063**LITHIUM SECONDARY CELL**

Naoya Kobayashi; Soichiro Kawakami; Shinya Mishina; Masaya, Nara Asao, Kawasaki, Tsuzuki-gun, JAPAN assigned to Canon Kabushiki Kaisha

Provided is a lithium secondary cell having a positive pole and a negative pole separated by a separator in an electrolyte in a cell case, which has the negative pole comprising a substance which can contain lithium and/or the positive pole comprising a substance to which lithium can be inserted, thus being excellent in excessive discharge characteristics, high in energy density, and long in cycle life even in applications where a plurality of cells are connected in series or in parallel.

5998064**NEGATIVE ACTIVE MATERIAL FOR LITHIUM
SECONDARY BATTERY AND PRODUCING
METHOD THEREOF**

Khalil Amine; Yuko Fujita; Kyoto, JAPAN assigned to Japan Storage Battery Company Ltd.

A negative active material for lithium secondary battery contains a tin oxyhydroxide or a complex oxyhydroxide of tin and other elements such as Mg, Ca, Ni, Mn, V, Ti, Pb, Al, Ge, As, Si and/or Sb.

5998065**ION-CONDUCTOR FOR LITHIUM SECONDARY
BATTERY AND LITHIUM SECONDARY
BATTERY USING THE SAME**

Masami Tsutsumi; Hiroshi Horiuchi; Tsutomu Miyashita; Masaki Yoshio; Hideya Yoshitake; Kawasaki, Saga, Tokyo, JAPAN assigned to Fujitsu Limited, Ube Industries Ltd.

An ion-conductor for a lithium secondary battery comprising at least an electrolyte and an additive; wherein the additive contains at least one kind of imido compound selected from the group consisting of compounds of the general formula (I), where Z is an optionally substituted alkylene group having two to seven carbon atoms represented by the formula $-(CH_2)_n-$ (n is an integer from 2 to 7), an optionally substituted 1,2-cyclohexylene group or an

optionally substituted 1,2-phenylene group; and X is a hydrogen atom, an optionally substituted alkyl group, or an optionally substituted aralkylcarbonyl group.

5998967

LITHIUM-ION BATTERY PACK

Nobuaki Umeki; Kouichi Inoue; Kyoto, JAPAN assigned to Rohm Company Ltd.

A lithium-ion battery pack, despite having a simple circuit configuration, allows the charge amount of the individual battery cells provided therein to be made uniform quickly. For each battery cell, a cell balance circuit is provided that includes a resistor, a transistor, and a control circuit. The resistor and the transistor are connected in series, with their end terminals connected to the two terminals of the battery cell. The control circuit controls the state of the transistor so that the two terminals of the battery cell are short-circuited through the resistor when necessary. The control circuit includes an oscillation circuit for producing a sawtooth wave voltage that oscillates within a predetermined voltage range and outputting it after adding it to the voltage at the negative terminal of the battery cell, and a comparator for comparing the voltage at the positive terminal of the battery cell with the voltage output from the oscillation circuit and outputting, when the former exceeds the latter, a control voltage that makes the transistor conduct. When the cell voltage is within the range of the voltage produced by the oscillation circuit, the transistor is driven with a pulse-width-modulated driving voltage.

6004526

PROCESS FOR PREPARING CATHODE ACTIVE MATERIAL FOR LITHIUM SECONDARY BATTERY

Akiko Sugimoto; Shintaro Ishida; Kenzo Hanawa; Saitama, Saitama, Saitama, JAPAN assigned to Mitsui & Mining Company Ltd.

A process for producing lithium manganate as a cathode active material for lithium secondary batteries comprising firing raw materials at a rate of temperature rise and/or temperature drop of 150°C/min or more.

6004692

INSULATING ENCLOSURE FOR LITHIUM BATTERIES

Barry C. Muffoletto; Raymond J. Kuwik; Alden, Lancaster, NY, UNITED STATES assigned to Wilson Greatbatch Ltd.

A lithium electrochemical cell including an anode and cathode assembly with the anode connected electrically to a conductive cell casing and an insulated cathode conductor extending through a lid at an end of the casing and connected to a cathode lead near the lid and with a first insulating component for insulating the casing from cell components therein and extending along and within the casing from a

closed end thereof toward the lid, and which is characterized by a second insulating component for insulating the lid from components in the casing and extending along within the lid and toward the first insulating bag so as to prevent a short circuit between the lid or casing and the cathode assembly caused by formation of lithium clusters in the region between the lid or casing and the cathode connector. Preferably the second insulating component is in the form of a cup having a relatively thin base portion extending along the lid and a relatively thin wall portion extending from the base along within the casing and toward the first insulating component which also is in the form of a thin-walled cup. The walls of the first and second insulating components preferably meet in overlapping relation. The insulating arrangement is particularly adapted for use in a cell wherein the anode and cathode assembly comprises a plurality of cathode plates with anode sections interposed in between.

6004697

MODIFIED LITHIUM VANADIUM OXIDE ELECTRODE MATERIALS PRODUCTS AND METHODS

Michael M. Thackeray; Arthur J. Kahaian; Donald R. Visser; Dennis W. Dees; Roy Benedek; Naperville, Chicago, Downers Grove, Western Springs, IL, UNITED STATES assigned to Minnesota Mining & Manufacturing Company, Hydro-Quebec Corporation

A method of improving certain vanadium oxide formulations is presented. The method concerns fluorine doping formulations having a nominal formula of LiV_3O_8 . Preferred average formulations are provided wherein the average oxidation state of the vanadium is at least 4.6. Herein preferred fluorine doped vanadium oxide materials, electrodes using such materials, and batteries including at least one electrode therein comprising such materials are provided.

6007935

RECHARGEABLE LITHIUM ANODE FOR POLYMER ELECTROLYTE BATTERY

Michel Gauthier; Andre Belanger; Alain Vallee; La Prairie; Ste-Julie; Varennes, CANADA assigned to Hydro-Quebec

Rechargeable generator consisting an anode of an alkali metal or a malleable alkali alloy, at least one polymer electrolyte which is conductive with respect to alkali cations and acts as separator, as well as at least one cathode which is reversible to cations of alkali metal and its current collector. The anode comprises a thin metallic sheet, which includes at the surface thereof a passivation film SEI capable of limiting reaction between the metal and the polymer electrolyte and to exchange lithium ions. The polymer electrolyte comprises a homogeneous separator which is capable of transmitting a pressure on the anode to resist against the dendritic strain of the metal of the anode by undergoing a rate of deformation lower than 35% of its thickness. The polymer electrolyte of

the separator, contains the maximum amount of species which are reactive towards lithium and which can accumulate at the surface of the anode to permit a preservation of the quality of the ionic exchanges at the interface of the anode and electrolyte and finally, the combination of anode, electrolyte, cathode and collector is maintained under a mechanical strain which is sufficient to ensure that the separator confines the anode sheet in place to preserve the integrity of the lithium–electrolyte interface during consecutive cycles of dissolution/plating.

6007944

RECHARGEABLE LITHIUM-ION CELL

Bechtold Dieter; Dietrich Bartke; Peter Kramer; Reiner Kretzschmar; Jurgen Vollbert; Bad Vilbel; Kelkheim, Konigstein, Hattersheim, GERMANY assigned to Varta Batterie Aktiengesellschaft

The invention relates to a rechargeable lithium-ion cell, a method for its manufacture, and its application. The cell is distinguished by the fact that it has a metallic housing which is electrically insulated internally by two half shells, which cover electrode plates and main output tabs and are composed of a non-conductive material, where the metallic housing is electrically insulated externally by means of an insulation coating. The cell also has a bursting membrane which, in its normal position, is located above the electrolyte level of the cell. In addition, the cell has a twisting protection which extends over the entire surface of the cover and provides centering and assembly functions for the electrode package, which comprises the electrode plates.

6007945

NEGATIVE ELECTRODE FOR A RECHARGEABLE LITHIUM BATTERY COMPRISING A SOLID SOLUTION OF TITANIUM DIOXIDE AND TIN DIOXIDE

James K. Jacobs; Sankar Dasgupta; Toronto, CANADA assigned to Electrofuel Inc.

Solid solution of titanium dioxide and tin dioxide is utilized as the anode active substance in the negative electrode of a rechargeable lithium battery. The lithium battery comprised of a negative electrode containing particles of titanium dioxide–tin dioxide solid solution, a non-aqueous lithium ion bearing electrolyte and a positive electrode, usually made of a lithium containing chalcogenide compound provides stable voltage, has high reversible anode capacity and high energy density.

6007947

MIXED LITHIUM MANGANESE OXIDE AND LITHIUM NICKEL COBALT OXIDE POSITIVE ELECTRODES

Steven T. Mayer; San Leandro, CA, UNITED STATES assigned to Poly Stor Corporation

Positive electrodes including lithium nickel cobalt metal oxide are disclosed. The lithium nickel cobalt metal oxides have the general formula $\text{Li}_x\text{Ni}_y\text{Company}_z\text{M}_n\text{O}_2$, where M is selected from the group consisting of aluminum, titanium, tungsten, chromium, molybdenum, magnesium, tantalum, silicon, and combinations thereof, x is between 0 and 1 and can be varied within this range by electrochemical insertion and extraction, the sum of $y+z+n$ is about 1, n ranges from 0 to 0.25, y and z are both >0 , and the ratio z/y ranges from 0 to 1/3. Also disclosed are composite positive electrodes including the above-described lithium nickel cobalt metal oxides together with a lithium manganese metal oxide of the formula $\text{Li}_x\text{Mn}_{2-r}\text{M1}_r\text{O}_4$, where r is a value between 0 and 1 and M1 is chromium, titanium, tungsten, nickel, cobalt, iron, tin, zinc, zirconium, silicon, or a combination thereof.

6008626

APPARATUS FOR PREVENTING DETERIORATION OF LITHIUM SECONDARY BATTERY

Noboru Sato; Kazuhiro Sato; Naoki Maruno; Toyko, Utsunomiya, JAPAN assigned to Honda Giken Kogyo Kabushiki Kaisha

When a battery with series-connected lithium secondary cells is charged to a high voltage, the capacity of the battery is prevented from being irreversibly deteriorated. If a battery current detected by a current sensor is small and a battery voltage detected by a voltage sensor is of a level (4.0 V) higher than a rated voltage (3.6 V) of each of the lithium secondary cells, then a switch is closed to connect a resistor to the battery thereby to forcibly discharge the battery. The voltage across the battery is now lowered to prevent the battery from being left to stand at a high voltage, and hence the capacity of the battery is prevented from being irreversibly deteriorated.

NICKEL METAL HYDRIDE BATTERIES

6007946

NON-SINTERED NICKEL ELECTRODE FOR ALKALINE STORAGE BATTERY, ALKALINE STORAGE BATTERY INCLUDING THE SAME, AND METHOD FOR PRODUCTION OF NON-SINTERED NICKEL ELECTRODE FOR ALKALINE STORAGE BATTERY

Mutsumi Yano; Mitsuzo Nogami; Katsuhiko Shinyama; Kousuke Satoguchi; Mitsunori Tokuda; Ikuo Yonezu; Koji Nishio; Masao Inoue; Shin Fujitani; Osaka, Tokushima, Tokushima, JAPAN assigned to Sanyo Electric Company Ltd.

In the non-sintered nickel electrode for an alkaline storage battery according to the invention, a yttrium metal powder and/or a yttrium compound powder has been added to a particulate active material comprising composite particles each consisting of a nickel hydroxide core and a sodium-doped cobalt compound shell. Because the yttrium metal

powder and/or yttrium compound powder inhibits the diffusion of cobalt into the nickel hydroxide core, the non-sintered nickel electrode of the invention exhibits a high utilization efficiency not only in an initial phase of charge-discharge cycling but over a long time of use. Moreover, because the yttrium metal powder and/or yttrium compound powder enhances the oxygen overpotential, the non-sintered nickel electrode for an alkaline storage battery according to the invention shows very satisfactory charge characteristics, particularly at high temperatures.

COMPONENTS AND/OR CHARGERS

5998969

APPARATUS FOR REGULATING STATE OF CHARGE OF CELLS OF BATTERY SET

Tadashi Tsuji; Masato Origuchi; Kanagawa-ken, JAPAN assigned to Nissan Motor Company Ltd.

There is disclosed an apparatus for precisely regulating, with a simple structure, a state of charge of each of cells constituting a battery set. In the apparatus, a detection circuit, a plurality of discharge circuit connected to corresponding one of the cells, respectively, and a control circuit are provided. The detection circuit detects open-circuit voltage of each of the plurality of cells, the plurality of discharge circuit discharges a charging electricity charged in the cells, and the control circuit controls to uniform the state of charge of each of the cells, utilizing the discharge circuit, respectively, corresponding to each of the cells, based on the open-circuit voltage of each of the cells detected by the detection circuit.

OTHER BATTERIES

6001139

NON-AQUEOUS SECONDARY BATTERY HAVING MULTIPLE-LAYERED NEGATIVE ELECTRODE

Hiroyuki Asanuma; Hiroshi Inoue; Yukio Maekawa; Mitsutoshi Tanaka; Yukio Miyaki; Hiroshi Ishizuka; Shoichiro Yasunami; Kazuo Sugiyama; Kanagawa, JAPAN assigned to Fuji Photo Film Company Ltd.

This invention provides a cylinder type non-aqueous secondary battery which comprises a positive electrode active material comprising a lithium-containing transition metal oxide, a composite oxide or composite chalcogen negative electrode material capable of intercalating and deintercalating lithium and a non-aqueous electrolyte containing a lithium metal salt, wherein high discharging capacity and excellent charge and discharge cycle characteristics are obtained by mounting a metal foil mainly comprising lithium in advance in a coiled group in which a current collector sheet coated with the positive electrode active material (positive electrode sheet), another current collector sheet coated with the negative electrode material (negative electrode sheet) and a separator are coiled in a spiral form.

6001503

BATTERY SEPARATOR HAVING A PUNCTURE-PROOF BORDER

Dennis Wayne Hercamp; Tony Edward Key; Pendleton, Yorktown, IN, UNITED STATES assigned to General Motors Corporation

A microporous polymer battery separator having a puncture-proof corrugated border along the lateral edges thereof.

6001505

NON-AQUEOUS ELECTROLYTE BATTERY

Yutaka Fukuda; Koji Hanafusa; Keiichi Tanaka; Kanuma, JAPAN assigned to Sumitomo Electric Industries Ltd.

The present invention provides a non-aqueous electrolyte battery 10 comprising a non-aqueous electrolytic solution 20 which is a non-aqueous electrolytic medium; positive and negative plates 30 and 32 in contact with the non-aqueous electrolytic medium; a first lead 18a having one end connected to the positive plate 30 and the other end extending to the outside; a second lead 18b having one end connected to the negative plate and the other end extending to the outside; and a sealing bag 14 for sealing the positive and negative plates 30 and 32, the non-aqueous electrolytic medium 20, and parts of the first and second leads 18a and 18b therein, the bag 14 being heat-sealed; wherein at least a heat-sealing portion 12 of the sealing bag 14 has a layer comprising a maleic acid modified polyolefin. The maleic acid modified polyolefin has a low hygroscopicity and a low compatibility with the non-aqueous electrolytic solution. Accordingly, high blocking properties against the non-aqueous electrolytic solution and steam are obtained, whereby the sealing bag 14 attains a high hermetic property.

6001507

NON-AQUEOUS ELECTROLYTE SECONDARY BATTERY

Takashi Ono; Hisayuki Kato; Yoshikatsu Yamamoto; Takai Mori; Fukushima, Tochigi, JAPAN assigned to Sony Corporation

A non-aqueous electrolyte battery which exhibits satisfactory reliability because reduction in the discharge capacity can be significantly prevented even after use with rapid temperature change and which enables excellent productivity to be realized. The non-aqueous electrolyte battery includes a cathode and an anode in which an active material for the cathode and/or an active material for the anode is integrated by a binder, wherein the binder for the cathode and/or the binder for the anode is a mixture of polyimide, which is soluble in an organic solvent, and a fluorine polymer. The polyimide is expressed by the following formula (figure).

6001508**AgO CATHODE BATTERY**

Joseph Lynn Passaniti; El-Sayed A. Megahed; Nuri A. Zreiba; Fitchburg, Madison, Tripoli, UNITED STATES/LIBYA assigned to Rayovac Corporation

Solid divalent silver oxide is reacted in hot aqueous alkaline reaction medium with a solid bismuth component and a reducing agent. The reaction product comprises a novel compound containing silver, bismuth, and oxygen, which is used in making cathode pellets for use in alkaline electrochemical cells. The cells exhibit low internal impedance and substantially single voltage discharge characteristic of monovalent silver oxide while retaining a significant portion of the coulombic capacity of a divalent silver cathode, without toxicity problems attendant cathodes containing lead and/or cadmium. Particulate cathode materials are disclosed comprising an intermediate layer of AgO_2 disposed between a core of AgO and an outer layer comprising silver and bismuth moieties.

6002238**METHOD AND APPARATUS FOR MEASURING COMPLEX IMPEDANCE OF CELLS AND BATTERIES**

Keith S. Champlin; Minneapolis, MN, UNITED STATES

A periodic time-varying current with smallest period $1/f_1$ excites a cell/battery and provides a timing reference. Linear circuitry produces two signals, one proportional to the excitation current, the other proportional to the responding time-varying voltage. These signals are processed with identical frequency-limiting filters to attenuate higher-order harmonics and noise. Using the timing reference for synchronization, a microprocessor/microcontroller commands analog to digital converters to sample the frequency-limited current and voltage signals at equally-spaced times over a period and accepts the digitized samples as inputs. The digital samples are averaged over multiple periods and employed to calculate averaged Fourier coefficients of in-phase and quadrature components of frequency-limited current and voltage at frequency f_1 . By numerically combining these Fourier coefficients, the microprocessor/microcontroller determines real and imaginary parts of the cell/battery's complex impedance at frequency f_1 .

6004687**CYLINDRICAL ALKALINE BATTERY**

Hirofumi Iwaki; Takeshi Okubo; Yoko Noda; Masanobu Abe; Katano, Hirakata, JAPAN assigned to Matsushita Electric Industrial Company Ltd.

A cylindrical cell is disclosed which is so constructed that an insulating ring is seated on the outside of the sealed part of the opening part of a cell case, the terminal face of a negative electrode plate is depressed below the outer face of a facing

label covering the insulating ring, and a gas discharge hole formed in the negative electrode plate is concealed with the insulating ring. This construction prevents the cell from allowing flow of a current to an adjacent cell and consequently from being charged by the adjacent cell. Since the cell uses a thermally shrinkable insulating facing member, it enjoys improved reliability of the outer covering. Even if a plurality of such cells of the construction described above are used as arranged in series and part of the cells are erroneously connected with the direction of polarity thereof reversed to the remaining cells, the possibility of the reversely connected cells allowing flow of current to the remaining cells and consequently being charged by the remaining cells will be precluded and the possibility of the device in use being smeared or harmed by the electrolyte otherwise suffered to leak when the reversely connected cells are charged by the remaining cells will be eliminated.

6004691**FIBROUS BATTERY CELLS**

Ray R. Eshraghi; Hudson, OH, UNITED STATES

The subject invention relates to a battery cell structure fabricated from a single fiber containing an electrode or active material of an electrode, a membrane separator, the electrolyte, the active material of a second electrode or a second electrode. Further, the subject invention relates to a cell design fabricated from two single fibers in contact with each other, one containing an electrode, a membrane separator, electrolyte, and the other, a second electrode. The two electrodes here, represent the positive and negative electrodes of a cell. The invention further relates to the process of inserting one fibrous electrode inside a fibrous membrane separator or insulator and to the process of forming one fibrous cell which contains an electrode, porous insulator, the electrolyte, the active material of a second electrode or a second electrode.

6004693**NON-AQUEOUS ELECTROLYTE CELL**

Yutaka Fukuda; Koji Hanafusa; Keiichi Tanaka; Kanuma, JAPAN assigned to Sumitomo Electric Industries Ltd.

The present invention provides a non-aqueous electrolyte battery comprising a non-aqueous electrolytic solution; positive and negative plates in contact with the non-aqueous electrolytic solution; a separator disposed between the positive and negative plates; a first lead having one end connected to the positive plate and the other end extending to the outside; a second lead having one end connected to the negative plate and the other end extending to the outside; and a sealed bag for sealing therein the positive and negative plates, the non-aqueous electrolytic solution, the separator and parts of the first and second leads; wherein the sealing bag has a hot-melt resin layer, a metal layer disposed outside the hot-melt resin layer, and an electrolytic-solution-barrier insulating layer disposed between the hot-melt resin layer and metal layer.

The electrolytic-solution-barrier insulating layer comprises nylon or ethylene/vinyl alcohol copolymer and exhibits a very low compatibility with non-aqueous electrolytic solution. Consequently, the heat-sealing portion has an enhanced blocking property against the non-aqueous electrolytic solution, thus improving the hermetic property of the sealed bag.

6004695

NON-AQUEOUS SECONDARY BATTERY

Kensuke Goda; Yukio Miyaki; Yukio Maekawa; Masayuki Mishima; Kanagawa, JAPAN assigned to Fuji Photo Film Company Ltd.

A non-aqueous secondary battery having a high discharge voltage, a high discharge capacity, satisfactory charge and discharge cycle characteristics, and assured safety is disclosed, comprising a positive electrode material, a negative electrode material, a non-aqueous electrolyte containing a lithium salt, and a separator, wherein the negative electrode material mainly comprises an amorphous oxide containing at least one functional element selected from the group consisting of Sn, Mn, Fe, Pb, and Ge.

6007943

HIGH TEMPERATURE ELECTROCHEMICAL CELL WITH MOLTEN ALKALI METAL ANODE

Johan Coetzer; Pretoria, SOUTH AFRICA assigned to Electro Chemical Holdings Societe Anonyme

An electrochemical cell comprises a housing defining an interior space, and a separator in the housing dividing said space into an anode compartment and a cathode compartment. A sodium anode is in the anode compartment, a cathode being in the cathode compartment, electrochemically coupled by the separator to the anode. The anode is molten, the separator being a conductor of sodium cations and comprising at least five tubes having open and closed ends, the cathode being in the tubes and each tube communicating with a header space in an electronically insulating header. The relationship of the combined area of the tubes available for sodium conduction, and the volume of the interior space, as defined by the quotient (in which l is a unit length), has a value of at least $1.0 l^{-1}$.

LEAD ACID

6014798

METHOD AND DEVICE FOR MANUFACTURING LEAD PLATES FOR LEAD/ACID BATTERIES

Werner Nitsche; Norbert Lahme; Lippstadt, Brilon, GERMANY assigned to Accumulatorenwerke Hoppecke Carol Zoellner, Sohn GmbH & Company KG

A method for manufacturing lead plates for a lead/acid battery includes the step of providing lead electrode grates and filling an active paste into the lead electrode grates to

form filled lead plates. Subsequently, the lateral surfaces of the filled lead plates are subjected to a continuous processing sequence of less than 6 h under preselected processing parameters for time, temperature, humidity, and air movement. The processing sequence includes a curing step in which moisture is added to reach a first humidity value, a predrying step for reducing the amount of free lead in the active paste at a second humidity value that is lower than the first humidity value, and a final drying step.

6017653

METHOD OF MANUFACTURING MODULAR MOLDED COMPONENTS FOR A BIPOLAR BATTERY AND THE RESULTING BIPOLAR BATTERY

Stephen G. Petrakovich; William H. Kump; Columbus, St. Paul, USA assigned to GNB Technologies Inc.

A method of providing a molded plastic component for a bipolar battery comprising a metal substrate subject to warpage upon molding to form a plastic frame about the periphery of the metal substrate, and the molded plastic component itself, comprises preheating the metal substrate and then injecting a plastic having shrinkage characteristics which match those of the heated metal substrate so as to provide a plastic frame wherein the plastic-metal interface has a reliable seal and is free from residual stresses.

FUEL CELL

6010798

PEM FUEL CELL

Albert Hammerschmidt; Wolf-Dieter Domke; Christoph Nolscher; Peter Suchy; Erlangen, Rottenbach, Nurnberg, GERMANY assigned to Siemens Aktiengesellschaft

A fuel cell with a proton-conducting membrane, on which catalyst material and a collector are arranged on both sides, is characterized by the following features: on the side facing the membrane, the collectors are provided with an electrically conductive gas-permeable carbon aerogel with a surface roughness of $<2 \mu\text{m}$; a catalyst layer of platinum or a platinum alloy is in each case applied to the carbon aerogel by material bonding; and a membrane, deposited by plasma-chemical means, with a layer thickness of between 3 and 50 μm , is located between the catalyst layers.

6013385

FUEL CELL GAS MANAGEMENT SYSTEM

Ronald Arthur DuBose; Marietta, USA assigned to Emprise Corporation

Herein is disclosed a fuel cell gas management system including a cathode humidification system for transferring latent and sensible heat from an exhaust stream to the cathode inlet stream of the fuel cell; an anode humidity