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Patents ALERT

This section contains abstracts of recently issued patents in the United States and published patent applications filed from over 100 countries under the Patent Cooperation Treaty and compiled in accordance with interest profiles developed by the Editors.

Journal of Power Sources

*LEAD ACID***6602638****SEALING STRUCTURE FOR TERMINAL POSTS OF BATTERIES**

Rhodri Wyn Evans; Paul John Rendell; Roger James Knight; Great Britain assigned to Hawker Energy Products Limited

A battery, particularly of the lead acid type, has two terminals, one connected to the positive plates and the other to the negative plates. Each terminal is located in an aperture in the battery lid and a seal located under the lid surrounds the respective terminal. A space is also defined around each terminal and contains settable material such as epoxy resin cement in a set condition.

6617071**ACTIVE MATERIAL FOR HIGH POWER AND HIGH ENERGY LEAD ACID BATTERIES AND METHOD OF MANUFACTURE**

Rongrong Chen; Y. Wellington Kwok; USA assigned to Delphi Technologies Inc.

A grid plate for high power lead acid battery having a plate covered with a conductive polymeric matrix of preferably polyaniline and its derivatives, which is then coated with nanoscale particles of active material such as lead sulfate and basic lead sulfate complexes.

*BATTERY MATERIALS***6602976****POLYCARBONATE OLIGOMERS AND POLYMERS FOR USE IN ELECTROLYTES**

W. Novis Smith; Joel McCloskey; USA assigned to Lithdyne International.

There is provided novel polycarbonate polymers and oligomers for use as electrolytes in electrochemical devices having a higher content of organic carbonates so as to enhance electrical conductivity. The polymers are prepared by a condensation reaction or by ester exchange.

6605237**POLYPHOSPHAZENES AS GEL POLYMER ELECTROLYTES**

R. Allcock Harry; E. Clay Kellam III; Robert V. Morford; USA assigned to The Penn State Research Foundation H01B 112 C08G 7902

Co-substituted linear polyphosphazene polymers that useful in gel polymer electrolytes having an ion conductivity at room temperature of at least about 10^{-5} S cm⁻¹ and comprising: (i) a polyphosphazene having controlled ratios of side chains that promote ionic conductivity and hydropho-

bic, non-conductive side chains that promote mechanical stability, (ii) a small molecule additive, such as propylene carbonate, that influences the ionic conductivity and physical properties of the gel polymer electrolytes, and (iii) a metal salt, such as lithium trifluoromethanesulfonate, that influences the ionic conductivity of the gel polymer electrolytes, and methods of preparing the polyphosphazene polymers and the gel polymer electrolytes are disclosed.

6605316**STRUCTURES AND FABRICATION TECHNIQUES FOR SOLID STATE ELECTROCHEMICAL DEVICES**

Steven J. Visco; Craig P. Jacobson; Lutgard C. DeJonghe; USA assigned to The Regents of the University of California

Provided are low-cost, mechanically strong, highly electronically conductive porous substrates and associated structures for solid-state electrochemical devices, techniques for forming these structures, and devices incorporating the structures. The invention provides solid state electrochemical device substrates of novel composition and techniques for forming thin electrode/membrane/electrolyte coatings on the novel or more conventional substrates. In particular, in one embodiment the invention provides techniques for co-firing of device substrate (often an electrode) with an electrolyte or membrane layer to form densified electrolyte/membrane films 5–20 μm thick. In another embodiment, densified electrolyte/membrane films 5–20 μm thick may be formed on a pre-sintered substrate by a constrained sintering process. In some cases, the substrate may be a porous metal, alloy, or non-nickel cermet incorporating one or more of the transition metals Cr, Fe, Cu, and Ag, or alloys thereof.

6616988**SULFUR CONTAINING ATOMIC GROUP INTRODUCED POROUS ARTICLE, PROCESS FOR INTRODUCING A SULFUR CONTAINING ATOMIC GROUP ONTO THE OUTER-INNER SURFACES OF A POROUS ARTICLE, AND A BATTERY SEPARATOR**

Yasushi Takeuchi; Masaaki Kawabe; Hiroaki Yamazaki; Masashi Kaneko; Genya Anan; Kazuya Sato; Japan assigned to Japan Vilene Company Ltd.

A porous article wherein a sulfur containing atomic group is introduced onto at least a part of outer-inner surfaces of the article, a ratio (S/C) of the number of sulfur atoms (S) to the number of carbon atoms (C) on the surface onto which the sulfur containing atomic group is introduced is 7×10^{-4} or more, a ratio (O/C) of the number of oxygen atoms (O) to the number of carbon atoms (C) on the surface onto which the sulfur containing atomic group is introduced is 0.2 or more, and the ratio (S/C) and the ratio (O/C) are determined

by means of an X-ray photoelectron spectrophotometer is disclosed.

6632557

**CATHODES FOR METAL AIR
ELECTROCHEMICAL CELLS**

Edward Curelop; Sharon Lu; Stephen McDevitt; David Pappas; Joseph Sunstrom; USA assigned to The Gillette Company

A textured dual layer metal air cathode is disclosed. The cathode includes a first layer that contains 30–70% organic polymer by weight, a second layer that contains 10–30% organic polymer by weight, and a catalyst. The first layer and the second layer contact each other at a textured interface.

6632561

**COMPOSITES BODIES USED AS SEPARATORS IN
ELECTROCHEMICAL CELLS**

Stephan Bauer; Bernd Bronstert; Helmut Mohwald; Rainer Blum; Gerhard Dotter; Germany assigned to BASF Aktiengesellschaft

A composite comprises at least one layer which includes a composite comprising (a) from 1 to 99% by weight of a solid (I) with a primary particle size of from 5 nm to 100 μm or a mixture made from at least two solids, (b) from 99 to 1% by weight of a polymeric binder (II) which includes: (IIa) from 1 to 100% by weight of a polymer or copolymer (IIa) which has, along the chain, terminally and/or laterally, reactive groups (RG) which are capable of crosslinking reactions when exposed to heat and/or UV radiation, and (IIb) from 0 to 99% by weight of at least one polymer or copolymer (IIb) which is free from reactive groups, where the at least one layer has been applied to at least 1 s layer comprising at least one conventional separator.

6632569

**CARBONACEOUS MATERIAL FOR ELECTRODE
AND NON-AQUEOUS SOLVENT SECONDARY
BATTERY USING THIS MATERIAL**

Takashi Kameda; Tadashi Ishihara; Japan assigned to Mitsubishi Chemical Corporation

A carbonaceous material has a plane space $d002$ of a (002) plane less than 0.337 nm in an X-ray wide angle diffraction method, a crystallite size (L_c) of 90 nm or higher, an R value, as a peak intensity ratio of a peak intensity of 1360 cm^{-1} to a peak intensity of 1580 cm^{-1} in a Raman spectrum in use of an argon ion laser, of 0.20 or higher, and a tap density of 0.75 g cm^{-3} or higher. Also disclosed is a multilayer structure carbonaceous material for electrode, which is manufactured by carbonizing some organic compounds where the carbonaceous material for electrode is mixed with the organic compounds. The battery using the carbonaceous ma-

terial for electrode or the multilayer structure carbonaceous material for electrode has a large capacity, a small irreversible capacity admitted in the initial cycle, excellent capacity maintaining rate of the cycle, and particularly, largely improved quick charging and discharging characteristics.

FUEL CELL

6613469

**FLUID DISTRIBUTION SURFACE FOR SOLID
OXIDE FUEL CELLS**

Kevin Richard Keegan; USA assigned to Delphi Technologies Inc.

An electrode fluid distributor includes a fluid passageway having a plurality of segment pairs each including an inlet segment in fluid communication with an inlet and an outlet segment in fluid communication with an outlet. A baffle is disposed between adjacent inlet and outlet segments. Each inlet segment is in fluid communication with adjacent inlet segments and adjacent outlet segments, and each outlet segment is in fluid communication with adjacent outlet segments.

6613470

**SOLID POLYMER ELECTROLYTE FUEL CELL
STACK**

Narutoshi Sugita; Noriaki Osao; Takeshi Ushio; Japan assigned to Honda Giken Kogyo Kabushiki Kaisha

A fuel gas inlet, a fuel gas outlet, an oxygen-containing gas inlet, an oxygen-containing gas outlet, and other components, which are disposed at upper and lower portions at both ends in the lateral direction, are provided in a first fuel cell stack. A plurality of cooling medium inlets, a plurality of cooling medium outlets, and other components are provided at lower portions on the long side and at upper portions on the long side, respectively. A cooling medium flows from the lower portions to the upper portions through cooling medium flow passages to cool the power generation surface smoothly and reliably.

6613471

**ACTIVE MATERIAL FOR FUEL CELL ANODES
INCORPORATING AN ADDITIVE FOR
PRECHARGING/ACTIVATION THEREOF**

Stanford R. Ovshinsky; Boyko Aladjov; Srinivasan Venkatesan; Thomas Hopper; Kevin Fok; Subhash Dhar; USA assigned to Energy Conversion Devices Inc.

A hydrogen storage alloy active material for the anode of Ovonic instant start-up/regenerative fuel cells. The active material includes a hydrogen storage alloy material with a water reactive chemical hydride additive, which, upon utilization of the active material in an anode of an alkaline elec-

trolyte fuel cell, gives the anode added benefits, not attainable by using hydrogen storage alloy material alone. These added benefits include (a) precharge of the hydrogen storage material with hydrogen; (b) higher porosity/increased surface area/reduced electrode polarization at high currents; (c) simplified, faster activation of the hydrogen storage alloy; (d) optionally, enhanced corrosion protection for the hydrogen storage alloy.

6615940

CONTROL SYSTEM FOR VEHICLE HAVING FUEL CELL

Kunio Morisawa; Japan assigned to Toyota Jidosha Kabushiki Kaisha

A control system of a vehicle including a fuel cell and an electric motor that drives drive wheels of the vehicle with electric energy generated by the fuel cell is provided wherein a traction controller controls the output of the drive wheels so as to secure tractive force of the vehicle when a certain traction control start condition is satisfied.

6616424

DRIVE SYSTEM AND METHOD FOR THE OPERATION OF A FUEL CELL SYSTEM

Stephen Raiser; Germany assigned to General Motors Corporation

A drive system for a compressor that delivers compressed air to a fuel cell system in a motor vehicle. The drive system includes an electric motor that drives the compressor. During normal operation of the fuel cell system, the motor is fed with electrical energy from the fuel cell system. During start-up of the fuel cell system, the electric motor receives electrical energy from a low voltage battery, where the electric motor can be operated at a voltage that is significantly higher than the output voltage of the low voltage battery. An expander can be connected to the compressor to drive the compressor with energy from cathode exhaust gases. Further, hydrogen recirculation can also be employed.

6617065

METHOD AND APPARATUS FOR MAINTAINING NEUTRAL WATER BALANCE IN A FUEL CELL SYSTEM

Bhaskar Balasubramanian; Frano Barbir; Jay K. Neutzler; USA assigned to Teledyne Energy Systems Inc.

In a fuel cell system, sufficient water to supply the consumption needs of the system, particularly by the system humidifiers and fuel processor, can be obtained from the exhaust of the fuel cell stack without the use of a condenser, by controlling the operating temperature of the fuel cell stack. The operating temperature can be controlled, for example, using a controller that monitors water level in the

process water reservoir and increases or decreases the operating temperature through control of the fuel cell cooling system to maintain the water level within a predetermined range representative of neutral water balance in the system.

6617066

FUEL CELL POWER GENERATION SYSTEM

Tatsuya Sugawara; Japan assigned to Honda Giken Kogyo Kabushiki Kaisha

A fuel cell power generation system comprising a reformer generating a hydrogen from base fuel to supply a fuel cell with the hydrogen, and a hydrogen reservoir connected to a first supply conduit between the reformer and the fuel cell through a second supply conduit, for storing hydrogen from the reformer as fuel cell assisting hydrogen. A distributing valve for distributing hydrogen from the reformer to the fuel cell side and the hydrogen reservoir side is provided at a connecting portion of the first and second supply conduits. The distributing valve is controlled to satisfy the amount of hydrogen required for the fuel cell, and thus to supply the hydrogen reservoir with remaining hydrogen. This always satisfies the amount of the hydrogen required for the fuel cell corresponding to the fuel cell operation state.

6617068

BI-ZONE WATER TRANSPORT PLATE FOR A FUEL CELL

Brian F. Dufner; Michael L. Perry; John C. Trocciola; Deliang Yang; Jung S. Yi; USA assigned to UTC Fuel Cells, LLC

The invention is a bi-zone water transport plate for a fuel cell wherein the plate includes a water permeability zone and a bubble barrier zone. The bubble barrier zone extends between all reactive perimeters of the plate, has a pore size of less than 20 μm , and has a thickness of less than 25% of a shortest distance between opposed contact surfaces of the plate. The water permeability zone has a pore size of at least 100% greater than the pore size of the bubble barrier zone, and has a thickness of greater than 75% of the shortest distance between the opposed contact surfaces of the plate. By having a separate bubble barrier zone, the plate affords enhanced water permeability while the bubble barrier maintains a gas seal.

6630259

FUEL CELL POWER SYSTEM PERFORMING AC INVERSION, METHOD OF DISTRIBUTING AC POWER, AND METHOD OF OPERATING A FUEL CELL POWER SYSTEM

William A. Fuglevand; USA assigned to Avista Laboratories Inc.

A fuel cell power system, comprising a fuel cell which generates dc voltage; a plurality of energy storage devices se-

lectively electrically coupled with the fuel cell; and circuitry for sequentially selectively electrically coupling and decoupling the respective energy storage devices to a load in a manner which approximates a voltage sine wave.

6630260

WATER VAPOR TRANSFER DEVICE FOR A FUEL CELL POWER PLANT

Jameson R. Forte; Steven Burch; Mark A. Brundage; USA assigned to General Motors Corporation

A fuel cell system that extracts water from the effluent of a fuel cell for supply to other components of the fuel cell system that require water. A preferred embodiment is a fuel cell system, for the production of electricity from hydrogen gas and an oxidant, comprising: (a) a fuel cell comprising an anode input for a hydrogen-containing anode supply stream, a cathode input for an oxidant-containing cathode supply stream, and a cathode output for cathode effluent comprising water produced by said fuel cell; and (b) a water transfer device, connected to said fuel cell, that transfers water from said cathode effluent to said anode supply stream.

6630261

APPARATUS AND METHOD FOR UTILIZING THE WASTE HEAT OF AN AIR-COOLED FUEL CELL BATTERY

Peter Buchner; RittmarVon Helmolt; Germany assigned to Siemens Aktiengesellschaft

A heat exchange cell and to a method of utilizing the waste heat of an air-cooled fuel cell battery is described. The heat exchange cell is of a configuration similar to that of the fuel cell and, in the stack, should directly adjoin the fuel cell battery, so that the spent cooling air is utilized to heat a medium without an intermediate line.

6630263

FUEL CELL SYSTEMS AND METHODS

James F. McElroy; USA assigned to Plug Power Inc.

Fuel cell systems and methods having relatively long use lifetimes are disclosed. The systems and methods can provide relatively long lifetimes when one or more reactant gas streams is unsaturated with water. The systems and methods can use proton exchange membranes having relatively long use lifetimes.

6630264

SOLID OXIDE FUEL CELL PROCESS GAS SAMPLING FOR ANALYSIS

Karl Jacob Haltiner, Jr.; Harry Richard Mieney; USA assigned to Delphi Technologies Inc.

A method for monitoring process gas of a solid oxide fuel cell (SOFCs) system is disclosed. The method comprises directing a portion of process gas from a chamber of the solid oxide fuel cell system to a main plenum chamber. A portion of process gas is cooled to a measurable temperature and directed to a sensor for analyzing. A solid oxide fuel cell system is also disclosed.

6630265

COMPOSITE ELECTROLYTE FOR FUEL CELLS

Karl Milton Taft III; Matthew Robert Kurano; USA assigned to Hoku Scientific Inc.

An inexpensive composite electrolyte for use in electrochemical fuel cells includes an inorganic cation exchange material, (i) a silica-based binder; and (ii) a polymer-based binder. The cation exchange material includes aluminosilicate clays. The composite electrolyte can be fabricated with a tape casting apparatus.

6630266

DIFFUSION FUEL AMPOULES FOR FUEL CELLS

Robert G. Hockaday; Patrick S. Turner; Marc D. DeJohn; Carlos J. Navas; Heathcliff L. Vaz; L. Luke Vazul; USA assigned to Manhattan Scientifics Inc.

A fuel ampoule for fuel cells delivers fuel by diffusion through the ampoule walls. The fuel ampoule is stored in a fuel impermeable container. These ampoules used with small low power fuel cells need a steady controlled uniform delivery of vaporous fuel such as alcohols. This fueling system avoids the leakage problems of liquid fuel, and may be easily packaged for small compact fuel cell systems.

6630267

SOLID OXIDE FUEL CELLS WITH SYMMETRIC COMPOSITE ELECTRODES

Michael E. Badding; Jacqueline L. Brown; Thomas D. Ketcham; Dell J. St. Julien; USA assigned to Corning Incorporated

The present invention relates to electrode/electrolyte assemblies for solid oxide fuel cells comprising a thin electrolyte sheet interposed between opposite electrodes, and wherein the positive air electrode (cathode) and negative fuel electrode (anode) are composed of similar electronically conductive metal phases and stabilizing ceramic phases, and wherein the anode exhibits both good oxidation resistance and good catalytic activity toward fuel oxidation.

6630269

FUEL CELL

Thomas Barth; Klaus Kaspar; Birgit Severich; Germany assigned to Firma Carl Freudenberg

A fuel cell, comprising a housing, at least one first proton-conducting layer covered by catalyst layers on both sides, gas-permeable electrodes on the catalyst layers and second layers arranged on both sides of the first layers, whereby said second layers take the form of electro-conductive plates that are located in closely adjacent electro-conductive contact with the electrodes, define gas conducting channels in conjunction with the electrodes and one layer touches the other layer by means of a substantially planar surface. The electrodes are made of at least one layer of electro-conductive polymer fibers that is intersected by flow channels running parallel to the surface thereof in at least one direction.

6632409

REFORMER FOR FUEL CELL SYSTEM

Koichi Kuwaba; Japan assigned to Aisin Seiki Kabushiki Kaisha

A reformer includes an evaporation portion for evaporating a raw material, a reforming portion for producing a reformed gas whose principal element is hydrogen from the raw materials, a CO reduction portion for reducing CO involved in the reformed gas, a circulating conduit portion having a storage tank for storing the raw material, a feeding device for feeding the raw material under pressure, a cooling device for cooling the CO reduction portion and a supply device for supplying the raw material to the evaporation portion. The supply device includes a conduit branched from the circulating conduit portion connected to the evaporation portion and a flow control device provided in the conduit.

6632551

FUEL CELL ARRANGEMENT AND GAS SUPPLY SYSTEM AND METHOD FOR OPERATING THE SAME

Lars Kaufmann; Germany assigned to Ballard Power Systems AG

A fuel cell arrangement has at least one fuel cell with an anode and a cathode. A compressor arranged in the admission flow path of the cathode supplies air to the cathode, and a reforming unit with a reformer and a thermally coupled heating chamber is arranged in the admission flow path of the anode supplies the anode with a hydrogen-rich medium. A catalytic burner arranged in the cathode off-gas flow path between cathode and an expansion machine is coupled to drive the compressor. The heating chamber of the reforming unit or of an evaporator unit arranged in the admission flow path of the anode is arranged in the cathode off-gas flow path; and the expansion machine is arranged in the cathode off-gas flow path between catalytic burner and the heating chamber.

6632552

WATER PURGE FUEL CELL SYSTEM AND METHOD

Fuminori Yamanashi; Japan assigned to Nissan Motor Co. Ltd.

In a fuel cell system for use in a vehicle and a method controlling the system, the system includes a fuel cell, a first flow control valve controlling the flow rate of oxygen containing gas to be supplied to the fuel cell, and a second flow control valve controlling the flow rate of hydrogen containing gas to be supplied to the fuel cell. A control unit supplies purge fluid into the fuel cell to remove water in response to a load condition of the vehicle.

6632553

METHODS AND APPARATUSES FOR MANAGING EFFLUENT PRODUCTS IN A FUEL CELL SYSTEM

John A. Corey; Gerhard Beckmann; USA assigned to MTI Microfuel Cells Inc.

A water management system for a fuel cell having an anode chamber including a fuel, a cathode chamber in fluid communication with an oxidizing agent, and a proton conducting membrane electrolyte separating the chambers. The system includes a gas plenum, a first valve for controlling a first flow of a gas from the anode chamber into the gas plenum, and a second valve for controlling a second flow of the gas collected by the gas plenum into the cathode chamber. The first valve is opened allowing the first flow while the second valve is closed between the gas plenum and the cathode chamber so that effluent gas is collected in the gas plenum. When the amount of the effluent gas in the gas plenum reaches a predetermined value, the first valve is closed and the second valve is opened to allow the second flow.

6632554

HIGH PERFORMANCE CATHODES FOR SOLID OXIDE FUEL CELLS

Rajiv Doshi; Jie Guan; Nguyen Minh; Kurtis Montgomery; Estela Ong; Gregory Lear; USA assigned to Hybrid Power Generation Systems, LLC

The present invention relates to a multi-layered and multifunctional cathode in solid oxide fuel cells having high conductivity, high catalytic activity, minimized coefficient of thermal expansion (CTE) mismatch, excellent compatibility to other portions of the fuel cell, and reduced temperature operation. The cathode comprises a conductive layer, a catalyst layer, and a graded composition layer. The conductive layer has a first density, the catalyst layer has a second density that is less than the first density, and the graded composition layer is characterized by a graded electronic conductivity and a graded ionic conductivity.

6632555

PROTON ELECTROLYTE MEMBRANE FUEL CELL WITH ANTI-FREEZE COOLANT AND HUMIDIFIERS

Yi Ding; USA assigned to Ballard Power Systems Inc.

A fuel cell system comprising a closed coolant path within a fuel cell; a humidifier comprising a humidification fluid flow path and a fuel and air gas supply passage continuous in, through and out of the humidifier; the humidification fluid flow path and the fuel and air gas supply passage separated by a water permeable membrane that is impervious to organic materials allowing water from the humidification fluid flow path to enter the fuel and air gas supply passage; and the humidifier connected to the fuel cell by a humidified air and fuel passageway. The water permeable membrane can be a keggin ion pillared a-ZrP composite material. The coolant can be water and organic material mixture, such as glycol, thus allowing the coolant flow in temperatures below the freezing point.

6632556

MANIFOLD ASSEMBLY FOR A FUEL CELL POWER PLANT

Robin J. Guthrie; Tomas J. Corrigan; USA assigned to UTC Fuel Cells, LLC

A fuel cell power plant includes a first cell stack assembly having a plurality of planar fuel cells in electrical communication with one another and a second cell stack assembly having a plurality of planar fuel cells in electrical communication with one another. An inter-stack manifold assembly is disposed between the first and second cell stack assemblies and provides an electrical pathway between the first and second cell stack assemblies. A baffle is formed internally to the manifold assembly for feeding a substantially uniform proportion of a reactant stream to the first and second cell stack assemblies while collecting an exhausted reactant stream from the first and second cell stack assemblies.

LITHIUM BATTERIES

6605382

LITHIUM ION BATTERY SUITABLE FOR HYBRID ELECTRIC VEHICLES

Alan Ruth; Andy Szyszkowski; Clay Kishiyama; Hiroyuki Yumoto; Hisashi Tsukamoto; USA assigned to Quallion LLC

A lithium ion battery configured to yield a high energy density output by minimizing head space, i.e., wasted interior volume, within the battery case and/or by reducing electrical energy losses internal to the battery.

6605385

ELECTROCHEMICAL CELL HAVING AN ELECTRODE WITH A CARBONATE ADDITIVE IN THE ELECTRODE ACTIVE MIXTURE

Hong Gan; Esther S. Takeuchi; USA assigned to Wilson Greatbatch Ltd.

An electrochemical cell of either a primary or a secondary chemistry, is described. In either case, the cell has a negative electrode of lithium or of an anode material which is capable of intercalating and de-intercalating lithium coupled with a positive electrode of a cathode active material. A carbonate compound is mixed with either the anode material or the cathode active material prior to contact with its current collector. The resulting electrode couple is activated by a non-aqueous electrolyte. The electrolyte flows into and throughout the electrodes causing the carbonate additive to dissolve in the electrolyte. The carbonate solute is then able to contact the lithium to provide an electrically insulating and ionically conducting passivation layer thereon.

6605390

LITHIUM ION BATTERY UTILIZING CARBON FOAM ELECTRODES

Thomas S. Moore; Subimal Dinda; USA assigned to Daimler Chrysler Corporation

A lithium ion battery has at least two carbon foam electrodes. Each of the electrodes is fitted with a plate formed from an electrically conductive material. The plate has an underside which is formed so as to be attached to one end of the carbon foam electrode. The plate may be fixed to the electrode by crimping or a similar deforming process or may be fitted thereto by an electrically conductive adhesive.

6613479

POSITIVE ELECTRODE MATERIAL AND BATTERY FOR NON-AQUEOUS ELECTROLYTE SECONDARY BATTERY

Tatsuhiko Fukuzawa; Fumio Munakata; Yasuhiko Ohsawa; Yuuji Tanjo; Takuya Mihara; Takashi Kimura; Kazuo Sunahara; Manabu Suhara; Japan assigned to Nissan Motor Company Ltd.; Seimi Chemical Company Ltd.

A positive electrode active material for a non-aqueous electrolyte secondary battery includes at least a lithium-containing manganese layered composite oxide represented by the general formula $\text{Li}_{1-x}\text{MO}_{2-y-d}\text{F}_y$. The second metallic element or constituent M may be Mn or a combination of Mn and substitute metal such as Co, Ni, Cr, Fe, Al, Ga, or In. A lithium deficiency quantity x is in the range of $0 < x < 1$. An oxygen defect quantity d may be equal to or smaller than

0.2. A quantity y of fluorine substituting for part of oxygen is greater than zero.

6616715

BATTERIES HAVING DESIRED WORKING VOLUME RATIOS OF POSITIVE AND NEGATIVE MATERIALS

Kenshin Kitoh; Hiroshi Nemoto; Japan assigned to NGK Insulators Ltd.

A lithium secondary battery includes a battery case, an internal electrode body contained in the battery case and including a positive electrode, a negative electrode and a separator made of porous polymer, the positive electrode and the negative electrode are wound or laminated. A working volume ratio of the positive active material and the negative active material obtained by the positive active material weight being divided by the negative active material weight is within the range from 40 to 90% of the theoretical working volume ratio. The lithium secondary battery has high safety as well as high energy density by controlling the working volume of an electrode active material and the dispersion of the distribution of the working volume and in particular is preferably used for a drive motor of an electric vehicle.

6617074

LITHIUM ION POLYMER SECONDARY BATTERY AND GELATINOUS POLYMER ELECTROLYTE FOR SHEET BATTERY

Yusuke Watarai; Akio Minakuchi; Tadashi Kobayashi; Akihiro Higami; Sawako Takeuchi; Japan assigned to Mitsubishi Materials Corporation

A lithium ion polymer secondary battery is a laminate of a positive-electrode sheet of a positive-electrode collector foil provided with an active material thereon, a negative-electrode sheet of a negative-electrode collector foil provided with another active material thereon, and a polymer electrolyte layer interposed between the positive-electrode sheet and the negative-electrode sheet. One of the positive-electrode sheet and the negative-electrode sheet is a strip and is fan-folded at least one time so that the positive-electrode sheet is provided on the surface of the active material on the sheet. The other one of the positive-electrode sheet and the negative-electrode sheet consists of a plurality of sheet segments having an area which is the same as the area of each flat portion of the fan-folded sheet. The sheet segments are interposed between the flat portions of the fan-folded sheet so that the polymer electrolyte layer is in contact with the surfaces of the active materials. The battery exhibits a large discharge capacity and improved discharge capacity characteristics after a number of discharge-charge cycles and does not cause internal short-circuiting.

6617075

LITHIUM-ION BATTERY

Zhenhua Mao; Anaba Anani; USA assigned to Motorola Inc.

An improved lithium-ion or lithium-polymer battery that is capacity-fade resistant. The battery includes an anode comprised of graphite where density of the graphite is in a range from 1.2 to 1.5 g cm⁻³; and the battery further has a cathode that is comprised of LiNiO₂ present at a density in a range from 3.0 to 3.3 g cm⁻³. The battery also includes an electrolyte and a separator between the anode and cathode, and the separator is coated with PVDF such that the anode, cathode, and separator are held together to form the electricity-producing battery. The ratio by weight of LiNiO₂ to graphite present in the battery is preferably no greater than 2.0-1.

6617078

LITHIUM ION RECHARGEABLE BATTERIES UTILIZING CHLORINATED POLYMER BLENDS

Yee-Ho Chia; Janice Jones-Coleman; Mohammad Parsian; Kent A. Snyder; USA assigned to Delphi Technologies Inc.

Described is a rechargeable lithium ion battery comprised of (a) a negative electrode and (b) a positive electrode both comprised of a current collector and applied to each a mixture of chlorinated polymer blend and lithium intercalation materials, and (c) a separator/polymer electrolyte comprised of chlorinated polymer blend and filler.

6630270

LITHIUM ION BATTERY USING PRISMATIC CAN WITH RECESSED SURFACES

Soo-Ryoung Kim; Jee-Ho Kim; South Korea assigned to LG Chemical Ltd.

The present invention relates to a prismatic lithium ion battery, more particularly to a prismatic lithium ion battery, wherein jelly roll of a lithium ion battery is mounted and electrolyte is infused in a prismatic can. The present invention provides a prismatic lithium ion battery in which improved safety is provided to a battery itself as well as its battery pack by mounting a jelly roll into a prismatic can with surfaces with recessed portions so that battery volume change due to the electrode expansion and pressure rise inside the battery is restrained. Furthermore, a prismatic lithium ion battery of the present invention improves the cycle life characteristics of a battery by alleviating the jelly roll deformation caused by the expansion and contraction of a jelly roll of a lithium ion battery due to continuous charging and discharging. Accordingly, lithium metal can be uniformly and stably adsorbed in and detached from a jelly roll.

6632564**NON-AQUEOUS ELECTROLYTE AND
NON-AQUEOUS ELECTROLYTE CELL**

Tadayoshi Takahashi; Shinichi Kawaguchi; Nobuharu Koshiba; Japan assigned to Matsushita Electric Industrial Co. Ltd.

In a non-aqueous electrolyte comprising an organic solvent and a solute dissolved in the organic solvent, a lithium salt containing at least one organic anion selected from phthalimide, a derivative of phthalimide, phthalimidine and a derivative of phthalimidine is used as the solute. Such non-aqueous electrolyte is not liable to react with the negative electrode in a primary battery and a secondary battery during a long-term storage at high temperatures. As a consequence, by using this non-aqueous electrolyte, a non-aqueous electrolyte battery having an excellent storage property can be obtained; and the charge/discharge cycle characteristics are improved in a secondary battery.

6632565**LITHIUM SECONDARY BATTERY**

Hiroshi Nemoto; Japan assigned to NGK Insulators Ltd.

A lithium secondary battery uses an organic electrolyte solution and includes a battery case, an internal electrode body contained in a battery case and including a positive electrode, a negative electrode and a separator made of porous polymer. The positive electrode and the negative electrode are wound or laminated so that the positive electrode and negative electrode are not brought into direct contact with each other via the separator. A zeolite having a moisture absorption characteristic, has been incorporated in the battery case so that the zeolite is brought into contact with the organic electrolyte solution within the battery case. The lithium secondary battery achieves suppression of deterioration of a charge-discharge cycle characteristic of a battery caused by decomposition of an electrolyte by limiting moisture mixed into an organic electrolyte solution to a considerably lower level as well as improvement of its self-discharge characteristic.

6632571**POLYMERIC GEL ELECTROLYTE AND LITHIUM
BATTERY EMPLOYING THE SAME**

Hyung-gon Noh; South Korea assigned to Samsung SDI Company Ltd.

Provided are a polymeric gel electrolyte comprising a lithium salt, an organic solvent and a thermal curing product of a composition having a terpolymer having a repeating unit represented by formula (1), a repeating unit represented by formula (2), and a repeating unit represented by formula (3); wherein n is an integer from 1 to 12, and R is a C1 to C12 alkyl group, and a lithium battery employing the polymeric electrolyte. Use of a polymeric gel electrolyte

according to the present invention can effectively suppress swelling due to an electrolytic solution, and a lithium battery which can prevent reliability and safety from being lowered due to the swelling, can be attained.

6632572**LITHIUM SECONDARY BATTERY**

Masatoshi Takahashi; Zensaku Yasutake; Koji Abe; Akira Ueki; Toshikazu Hamamoto; Japan assigned to Sanyo Electric Company Ltd.; Ube Industries Ltd.

A lithium secondary battery including an electrode assembly composed of positive and negative electrode plates wound up spirally with a separator and disposed in a cell casing filled with electrolyte containing lithium salt dissolved in organic solvent wherein the cell casing is provided with a current interrupt device for cutting off a charge current of the battery when an internal gas pressure of the battery exceeds a predetermined value, and wherein the organic solvent contains alkylbenzene derivative or cycloalkylbenzene derivative having tertiary carbon adjacent a phenyl group.

6632573**ELECTROLYTES WITH STRONG OXIDIZING
ADDITIVES FOR LITHIUM/SULFUR BATTERIES**

Yevgeniy S. Nimon; May-Ying Chu; Steven J. Visco; USA assigned to PolyPlus Battery Company

Disclosed are oxidizer-treated lithium electrodes, battery cells containing such oxidizer-treated lithium electrodes, battery cell electrolytes containing oxidizing additives, and methods of treating lithium electrodes with oxidizing agents and battery cells containing such oxidizer-treated lithium electrodes. Battery cells containing SO₂ as an electrolyte additive in accordance with the present invention exhibit higher discharge capacities after cell storage over cells not containing SO₂. Pre-treating the lithium electrode with SO₂ gas prior to battery assembly prevented cell polarization. Moreover, the SO₂ treatment does not negatively impact sulfur utilization and improves the lithium's electrochemical function as the negative electrode in the battery cell.

*NICKEL METAL HYDRIDE BATTERIES***6602640****ALKALINE STORAGE BATTERY AND PROCESS
FOR THE PRODUCTION THEREOF**

Masaru Kihara; Motoo Tadokoro; Yoshitaka Baba; Japan assigned to Sanyo Electric Company Ltd.

An alkaline storage battery comprising a positive electrode active material mainly composed of nickel hydroxide, characterized in that the nickel hydroxide is a higher order nickel hydroxide covered with a cobalt compound on the surface thereof or in the vicinity thereof and the higher order nickel hydroxide is provided with at least one compound

selected from the group consisting of yttrium compound, erbium compound, and ytterbium compound on the surface thereof or in the vicinity

6605384

ALKALINE STORAGE BATTERY THAT CAN BE USED WITH STABILITY IN A WIDE TEMPERATURE RANGE

Kenji Arisawa; Takuya Tamagawa; Japan assigned to Sanyo Electric Company Ltd.

An alkaline storage battery having stable charging/discharging characteristics over a wide temperature range is provided. A nickel sintered base member is filled with a predetermined amount of nickel hydroxide according to a chemical impregnating method to produce a nickel positive electrode 1. At least one compound selected from a Ca compound, an Sr compound, an Sc compound, a Y compound, and a lanthanide compound is added to the nickel positive electrode 1. An alkaline electrolytic solution for this storage battery contains at least one of KOH, NaOH, RbOH, and CsOH as an electrolyte, and has an alkaline concentration of 10 mol l^{-1} or higher.

6605387

ALKALINE STORAGE BATTERY

Toshifumi Ueda; Nobuyasu Morishita; Noriyuki Fujioka; Munehisa Ikoma; Japan assigned to Matsushita Electric Industrial Company Ltd.; Toyota Jidosha Kabushiki Kaisha

An alkaline storage battery of the present invention has a negative electrode comprising an AB5 type hydrogen storage alloy containing at least nickel as B element. The hydrogen storage alloy contains 1.5–5.0% by weight of a magnetic substance comprising metallic nickel. The above-mentioned alkaline storage battery can effect high output from the initial stage of charging and discharging cycles.

6605389

ALKALINE STORAGE BATTERY AND METHOD OF MANUFACTURING THE SAME

Yoshitaka Baba; Motoo Tadokoro; Japan assigned to Sanyo Electric Company Ltd.

An alkaline storage battery includes a positive electrode active material containing nickel hydroxide as a main component. A part of the surface of the nickel hydroxide is unevenly covered with a cobalt compound having an average oxidation number of larger than +2 and containing alkaline cations. Since only a part of the surface of the nickel hydroxide is covered with the cobalt compound, the nickel hydroxide not covered with the cobalt compound is brought into direct contact with the electrolyte, thus improving the high rate discharging characteristic. Since a part of the surface of the nickel hydroxide is covered with the high-order

cobalt compound containing alkaline cations, the high-order cobalt compound with high conductivity produces a highly conductive network within the positive electrode so that the rate of using the active material is improved. In this configuration, the alkaline storage battery with high capacity and excellent high rate discharging characteristic can be provided by using a nickel hydroxide active material which permits nickel hydroxide to be brought into direct contact with an electrolyte regardless with high order cobalt oxide on the surface of nickel hydroxide.

6613107

METHOD OF PRODUCING NICKEL ELECTRODE FOR ALKALINE STORAGE BATTERIES

Takuya Tamagawa; Yoichiro Shibata; Chihiro Fujisawa; Katsuya Ito; Japan assigned to Sanyo Electric Company Ltd.

A method of producing a nickel electrode for an alkaline storage battery, comprising: an active-material loading step comprising preparing an active-material loaded plate electrode by loading an active-material containing nickel hydroxide as its principal component into the pores of said porous electrically conductive substrate; an immersion step comprising immersing said active-material loaded plate electrode into an impregnation solution comprising an acid salt solution containing at least one element selected from the group consisting of Ca, Sr, Sc, Y, Al, Mn, and lanthanides; and an alkali treatment step comprising forming a hydroxide layer on the surface of the electrode plate by converting the acid salt into a hydroxide by immersing said plate electrode into an alkaline solution; provided that the temperature of the impregnation solution is controlled in a range of from 40 to 90 °C., and that the pH value of impregnating solution is controlled to a range of from 4 to 6. Thus, it is provided a nickel electrode free from a drop in battery capacity and yet having excellent high temperature characteristics by controlling the amount of elution of the loaded active material even when immersed in an acid salt solution.

COMPONENTS AND/OR CHARGERS

6630813

METHOD AND APPARATUS FOR MONITORING THE STATE OF THE BATTERY OF A HYBRID ELECTRIC VEHICLE

David Jefferey Berels; Theodore James Miller; USA assigned to Ford Global Technologies, LLC

A system for an automotive vehicle has a temperature sensor generating a temperature signal indicative of the temperature outside the vehicle and a battery. A battery controller is coupled to the temperature sensor and the battery. The controller monitors a state of charge of the battery, monitors a temperature outside of the vehicle and compares the state of charge to a predetermined state of charge. The predetermined state of charge is a function of the temperature. The

controller generates an indicator when the state of charge reaches the predetermined state of charge.

OTHER BATTERIES

6602629

ZERO MERCURY AIR CELL

Jingdong Guo; Thomas J. O'Hara III; USA assigned to Eveready Battery Company Inc.

An improved button air cell is provided that contains zero mercury, is free of indium on the sealing surface of the anode cup and has an active material comprising zinc alloyed with lead. Also provided is a method of forming a button electrochemical cell free of mercury and having no indium on the inner surface of the anode cup.

6605386

NON-AQUEOUS ELECTROLYTE SECONDARY BATTERY COMPRISING COMPOSITE PARTICLES

Shinji Kasamatsu; Hiroshi Yoshizawa; Kazuhiro Okamura; Hizuru Koshina; Harunari Shimamura; Yoshiaki Nitta; Japan assigned to Matsushita Electric Industrial Company Ltd.

A non-aqueous electrolyte secondary battery comprises a positive electrode and a negative electrode capable of intercalating and de-intercalating lithium, a non-aqueous electrolyte and separators or solid electrolytes. The negative electrode contains, as a main component, composite particles constructed in such a manner that at least part of the surface of nuclear particles comprising at least one of tin, silicon, and zinc as a constituent element, is coated with a solid solution or an inter-metallic compound composed of the element included in the nuclear particles and another predetermined element which is not an element included in the nuclear particles. To improve the ability of the battery, the composite particles mentioned above can include at least one trace element selected from iron, lead, and bismuth. The porosity of a mixture layer at the negative electrode is 10% or more and 50% or less. The amount of the non-aqueous electrolyte, the thickness of the separators or the like is restricted in a specific value. The foregoing construction suppresses occurrence of an internal short circuit between the positive electrode and the negative electrode caused by expansion of the negative electrode materials, thereby achieving a high capacity battery with a superior charge/discharge cycle properties, which is suitable for a high-speed charging.

6617076

SEPARATOR FOR NON-AQUEOUS SECONDARY BATTERY AND NON-AQUEOUS SECONDARY BATTERY USING THE SAME

Yukihiro Wataru; Takashi Aoki; Japan assigned to Japan Storage Battery Company Ltd.; GS-Melcotec Company Ltd.

The present invention provides a non-aqueous secondary battery and a separator to be used therein. The separator comprises a polyolefin membrane containing one or more conjugated polyene compounds provided on the surface thereof. The non-aqueous secondary battery having this arrangement performs improved cycle life characteristics and shelf characteristics at high temperatures.

6617077

POLYMER ELECTROLYTE BATTERY AND METHOD OF FABRICATING THE SAME

Akira Ichihashi; Yoshinori Kida; Ryuji Ohshita; Hiroshi Kurokawa; Maruo Kamino; Shin Fujitani; Koji Nishio; Japan assigned to Sanyo Electric Co. Ltd.

In a polymer electrolyte battery provided with a positive electrode, a negative electrode, and a polymer electrolyte, a polymer-based material containing a copolymer of ethylene glycol (meth)acrylate compound represented by the following general formula (1) and alkyl (meth)acrylate represented by the following general formula (2) is used as said polymer electrolyte.

6632256

METHOD FOR MANUFACTURING A NON-AQUEOUS-GEL-ELECTROLYTE BATTERY

Haruo Ishizaki; Naoki Matsuo; Takeharu Kikuchi; Tuyoshi Sugiyama; Kazuhiro Imaizumi; Masayuki Shida; Japan assigned to Sony Corporation

The surface of a positive-electrode active material layer or a negative-electrode active material layer is coated with a gel electrolyte composition to form a gel electrolyte layer. The positive and negative electrodes are laminated such that the gel electrolyte layer is sandwiched. At this time, the gel electrolyte composition is formed into a sol form so as to be applied to the surface of the positive-electrode active material layer or the negative-electrode active material layer. The viscosity of the gel electrolyte composition formed into the sol form is 1–50 cp. The gel electrolyte composition is formed into the sol form by heating the gel electrolyte composition or diluting the gel electrolyte composition with non-aqueous solvent. When dilution with the non-aqueous solvent is performed, solvent having a high boiling point and solvent having a low boiling point are mixed with each other. After a coating operation has been completed, the solvent having the low boiling point is removed by vaporization. It is effective to heat the positive electrode or the negative electrode when the gel electrolyte composition formed into the sol is applied. Since the gel electrolyte composition formed into the sol form is applied, the electrolytic solution is able to quickly penetrate the active material layer.

6613298**TRIVALENT AND TETRAVALENT MIXED
VANADIUM COMPOUND PRODUCING METHOD
AND VANADIUM ELECTROLYTE PRODUCING
METHOD**

Yasuyuki Tanaka; Ken Horikawa; Muneo Mita; Nobuyuki Tokuda; Michiru Kubata; Japan assigned to Kansai Electric Power Company, Inc.; Sumitomo Electric Industries Ltd.; Nippon Chemical Industrial Company Ltd.

The present invention provides method of producing a trivalent and tetravalent mixed vanadium compound having excellent solubility with sulfuric acid directly from a

tetravalent or pentavalent vanadium compound by using a reducing agent, and a method of producing a vanadium electrolyte. For example, a vanadium compound mainly containing a pentavalent vanadium compound; sulfur and concentrated sulfuric acid in molar ratios with respect to (1 mol of vanadium atom in the pentavalent vanadium compound) 0.35 to 0.4:1.2 to 1.9 are kneaded into paste form, and the paste-form mixture is calcined at a temperature of not less than 150 °C to less than 440 °C, so that a trivalent and tetravalent mixed vanadium compound is obtained, and a redox flow battery-use vanadium electrolyte is obtained by dissolving the trivalent and tetravalent mixed vanadium compound in a sulfuric acid solution.