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Journal of Power Sources

LEAD-ACID**6180286****LEAD-ACID CELLS AND BATTERIES**

Purushothama Rao; Thomas F. Uhlemann; UNITED STATES assigned to GNB Technologies Inc.

A lead-acid cell or battery includes positive plates made from a lead-based alloy containing calcium, tin, and silver in amounts selected based upon the type of application and the plate fabrication method utilized, starting, lighting and ignition battery grids being directly cast and having calcium present in an amount of 0.03–0.050%, tin in an amount of 0.65–1.25%, and silver in an amount of from 0.018 to 0.030%, and the grids used in sealed, lead-acid cells comprising, when made by gravity casting, from about 0.035–0.055% calcium, 0.95–1.45% tin, and 0.018–0.030% silver, and when made by continuous strip casting, calcium in the range of from 0.030 to 0.050%, tin in the range of from 0.95 to 1.25%, and silver in the range of from 0.017 to 0.030%, all of the alloy percentages being based upon the total weight of the grid.

6183903**PLASTIC BATTERY CONTAINER HAVING REDUCED END WALL DEFLECTION**

Kris Campbell; John E. Kopala; UNITED STATES assigned to GNB Technologies Inc.

A plastic battery container for a recombinant sealed lead-acid battery having reduced end wall deflection, the end wall comprising a base portion from which extends a series of integrally molded ribs disposed at approximately $\pm 45^\circ$ to the horizontal, substantially all intersection points of the ribs with the base portion having a rounded character to enhance processing characteristics.

6184650**APPARATUS FOR CHARGING AND DESULFATING LEAD-ACID BATTERIES**

Robert A. Gelbman; UNITED STATES assigned to Synergistic Technologies Inc.

Apparatus for charging and desulfating lead-acid batteries provides a dc electrical charging current to the battery terminals to charge the battery to a fully charged voltage during a bulk charge mode. When the battery reaches a fully charged voltage, the apparatus switches to a float charge mode where the battery voltage decreases to a float voltage less than the fully charged voltage and is maintained at this level. When the apparatus is in the float charge mode, the battery charging current is turned rapidly on and off to maintain the battery at the float voltage and to desulfate the battery. When the battery voltage drops to a predetermined value below the float voltage, the bulk charge mode is reentered.

6187478**BATTERY ELEMENT CONTAINING EFFICIENCY IMPROVING ADDITIVES**

Thomas J. Clough; Frank X. McGarvey; UNITED STATES assigned to Ensci Inc.

A battery element of a lead-acid battery including a negative plate, a positive plate and a separator having a metal inhibiting additive that reduces the detrimental effects of at least one impurity on the negative plate.

6190799**BATTERY ELEMENT CONTAINING METAL INHIBITING ADDITIVES**

Thomas J. Clough; UNITED STATES assigned to Ensci Inc.

A battery element of a lead-acid battery including a negative plate, a positive and a separator having a metal inhibiting additive that reduces the detrimental effects of at least one impurity on the negative plate.

6194100**METHOD FOR MAKING VALVE-REGULATED LEAD-ACID BATTERY WITH VACUUM DRAW DOWN**

David G. Vutetakis; Christopher R. Cestone; Stanley K. Wilkie; UNITED STATES assigned to Douglas Battery Manufacturing Company

The present invention relates to a method for making a valve-regulated lead-acid battery cell including forming a flooded electrolyte lead-acid cell having an interior head space, positive and negative plates and fibrous plate separators positioned between the plates. The plates and the separators are housed in a container having flexible side walls. A vacuum is then drawn in the cell interior sufficient to create a flexure force on the cell side walls sufficient to push excess electrolyte from the fibrous mat separators leaving an amount of residual and absorbed electrolyte in the cell corresponding to proper saturation of the fibrous plate separators. The vacuum is then released thereby permitting any residual electrolyte to be absorbed into the fibrous separator material. Desirably the vacuum drawn in the cell interior is up to about 28 in. of mercury.

FUEL CELL**6180271****METHOD FOR OPERATING A PEM FUEL CELL PLANT AND PEM FUEL CELL PLANT**

Walter Stuhler; Herbert Stenger; Martin Keim; GERMANY assigned to Siemens Aktiengesellschaft

A method is provided for operating a PEM fuel cell plant containing at least one PEM fuel cell block and a speed-controlled compressor upstream of the PEM fuel cell block

for supplying air at a volume flow rate. The speed of the compressor is controlled to a desired value for adjusting the electric current of the PEM fuel cell block to a given value. The desired value is derived from the given value of the electric current. This measure ensures a simple control of the air volume flow rate for the PEM fuel cell block with low apparatus requirements. A PEM fuel cell plant is also provided.

6180272

SYSTEM AND METHOD FOR AUTOMATICALLY PROVIDING FUEL TO A FUEL CELL IN RESPONSE TO A POWER FAILURE IN A PRIMARY POWER SYSTEM

Vincent M. Byrne; Marco A. Davila; Edward C. Fontana; Steven C. Stein; UNITED STATES assigned to Lucent Technologies Inc.

The present invention provides, in one embodiment, a system for providing fuel to a backup electrical fuel cell. In this particular embodiment, the system includes a sealed fuel container having a pierceable membrane with a container seal associated therewith, an acerate tube proximate the pierceable membrane, and an actuator. The actuator is coupled to the acerate tube and automatically drives the acerate tube through the pierceable membrane to provide fluid communication from the fuel container to the fuel cell in response to a failure of a primary electrical power system. The container seal is configured to form a seal about the acerate tube when the acerate tube pierces the pierceable membrane to prevent unnecessary loss of fuel, such as methanol, from the container. In alternative embodiments, the system may also include the primary power system and a backup electrical fuel cell that is electrically coupled to the primary power system.

6180273

FUEL CELL WITH COOLING MEDIUM CIRCULATION ARRANGEMENT AND METHOD

Takafumi Okamoto; JAPAN assigned to Honda Giken Kogyo Kabushiki Kaisha

A fuel cell is of a simple structure for preventing a partial temperature difference from being developed in a fuel cell structural body, and maintaining an effective operative area and performance. The fuel cell 10 includes a plurality of fuel cells 20 each sandwiched between separators 40, and has circulatory passages 29a, 29b defined therein for circulating cooling water, which has been used to cool the fuel cells 20, along opposite outer sides of electric generation sections 28 of the fuel cells 20.

6180274

CELL UNIT FOR FUEL CELLS

Yasunori Yoshimoto; Takashi Yasuo; Yasuo Miyake; Koji Nishio; JAPAN assigned to Sanyo Electric Company Ltd.

A cell unit for use in fuel cells of the type using an electrode portion having an anode formed of a plate or film on one surface of an electrolyte and a cathode formed of a plate or film on the other surface. An anode side plate of the invention has stepped portions to form recesses which accommodate the electrode and provide an anode side chamber facing the anode. A cathode side plate having a cathode side chamber facing the cathode is also accommodated in the recessed portions of the anode side plate. A fuel supply manifold and a fuel discharge manifold can extend through the stepped portions. Use of such cell units reduces the number of seal members required between fuel or oxidant manifolds when cell units are stacked to form a fuel cell stack. Such reduction in seal members simplifies fabrication of the units and renders the cell unit easier to maintain and repair.

6180275

FUEL CELL COLLECTOR PLATE AND METHOD OF FABRICATION

James C. Braun; John E. Zabriskie Jr.; Jay K. Neutzler; Michel Fuchs; Robert C. Gustafson; UNITED STATES assigned to Energy Partners L.C.

An improved molding composition is provided for compression molding or injection molding a current collector plate for a polymer electrolyte membrane fuel cell. The molding composition is comprised of a polymer resin combined with a low surface area, highly-conductive carbon and/or graphite powder filler. The low viscosity of the thermoplastic resin combined with the reduced filler particle surface area provide a moldable composition which can be fabricated into a current collector plate having improved current collecting capacity vis-a-vis comparable fluoropolymer molding compositions.

6180276

METHOD FOR FABRICATING MEMBRANE AND ELECTRODE ASSEMBLY FOR POLYMER ELECTROLYTE MEMBRANE FUEL CELLS

Chang-Soo Kim; Young-Gap Chun; Dong-Hyun Peck; Dong Ryul Shin; SOUTH KOREA assigned to Korea Institute of Energy Research

A method for fabricating an electrode and membrane assembly (MEA) for polymer electrolyte membrane fuel cells. The MEA comprises a polymer electrolyte membrane on each side of which an electrocatalyst layer is provided in a melted state. A perfluorosulfonyl fluoride copolymer powder ranging, in particle size distribution, from 20 to 200 μm is hot-pressed at 200–250°C to give a pre-formed sheet whose opposite sides are then coated with a catalyst ink consisting of Pt/C powder, glycerol and water. This catalyst ink-coated preformed sheet is again subjected to hot pressing at 200–250°C to embed the catalyst ink into the pre-formed sheet. Hydrolysis in NaOH/methanol or

H₂SO₄ solution converts the membrane of the sheet from a non-ionized form to an ionized form.

6183894

ELECTROCATALYST FOR ALCOHOL OXIDATION IN FUEL CELLS

Radoslav R. Adzic; Nebojsa S. Marinkovic; UNITED STATES assigned to Brookhaven Science Associates

Binary and ternary electrocatalysts are provided for oxidizing alcohol in a fuel cell. The binary electrocatalyst includes: (1) a substrate selected from the group consisting of NiWO₄ or CoWO₄ or a combination thereof; and (2) Group VIII noble metal catalyst supported on the substrate. The ternary electrocatalyst includes: (1) a substrate as described above; and (2) a catalyst comprising Group VIII noble metal, and ruthenium oxide or molybdenum oxide or a combination thereof, said catalyst being supported on said substrate.

6183895

FUEL CELL POWER GENERATING SYSTEM

Hitoshi Kudo; Noriyuki Yamaga; Mikio Shinagawa; Junji Adachi; Yoshinori Tokunaga; Toru Nakamura; Noboru Hashimoto; Manabu Mizobuchi; Kensaku Kinugawa; JAPAN assigned to Matsushita Electric Works Ltd.

A portable power generating system can be operated by using a portable pressure canister containing a liquefied butane fuel gas. In the power generating system, a part of the butane gas contained in the pressure canister is used as a fuel gas and remainder of the butane gas is used to prepare a reformed gas containing hydrogen gas by reaction with water. The hydrogen gas in the reformed gas and oxygen gas in air are used in a fuel cell to generate electric power. The power generating system is characterized in a compact portable one which further comprises a device for regulating the amount of the butane gas discharged from said pressure canister and a device for controlling a flow rate of the butane gas, installed in feed lines of supplying the butane gas from said pressure canister to said reforming device.

6183896

SOLID OXIDE FUEL CELL AND A CARBON DIRECT-OXIDIZING-TYPE ELECTRODE FOR THE FUEL CELL

Teruhisa Horita; Natsuko Sakai; Kawada; Tatsuya Kawada; Harumi Yokokawa; Masayuki Dokiya; JAPAN assigned to Agency of Industrial Science and Technology

There is disclosed a solid oxide fuel cell and a carbon direct-oxidizing-type electrode for the cell. The fuel cell comprises vanadium carbide which is used as the fuel electrode. The vanadium carbide and a carbon-series fuel are used in the fuel electrode.

6183897

VIA FILLED INTERCONNECT FOR SOLID OXIDE FUEL CELLS

Joseph Jay Hartvigsen; Khandkar; Ashok Chandrashekhara Khandkar, Singaravelu Elangovan; UNITED STATES assigned to Sofco

An interconnect for a solid oxide fuel cell comprises a gas separator plate and at least one fill material. The gas separator plate includes at least one via extending there-through. The at least one fill material is positioned within the at least one via, and operatively associated with at least one of a cathode or anode. The invention likewise includes a method for manufacturing the interconnect for a solid oxide fuel cell.

6183898

GAS DIFFUSION ELECTRODE FOR POLYMER ELECTROLYTE MEMBRANE FUEL CELLS

Arthur Koschany; Thomas Schwesinger; Christian Lucas; Georg Frank; Gregor Deckers; Thomas Soczka-Guth; Harald Bonsel; GERMANY assigned to Hoescht Research and Technology Deutschland GmbH and CompanyKG

A particularly inexpensive, homogeneous and porous gas diffusion electrode which comprises at least one electrically conductive, hydrophobic and gas-permeable gas diffusion layer, comprising a mechanically stable support material which is impregnated with at least one electrically conductive material having a bulk conductivity of greater than or equal to 10 mS/cm is produced. The gas diffusion electrode can be coated with a catalytically active layer. The electrodes of the invention are particularly suitable for use in fuel cells and electrolysis cells.

6187231

PROCESS FOR PRODUCING POLYMERIC FILMS FOR USE AS FUEL CELLS

Michael J. Sansone; Frank J. Onorato; Stuart M. French; Faruq Marikar; UNITED STATES assigned to Celanese Ventures GmbH

A method for producing polymeric, e.g. polybenzimidazole (PBI) films, is provided by forming a porous membrane by coagulating a polymeric dope solution in a liquid coagulation bath containing a non-solvent alone or a mixture of a non-solvent and solvent; submerging the resulting membrane into a non-solvent bath to remove any residual solvent; placing the membrane into an acid solution, whereby the pores become filled with the acid solution; and drying the membrane to remove residual non-solvent which collapses the porous structure entrapping the acid and forming a dense film. An alternative method involves coagulating said polymer solution directly into an acid/solvent/non-solvent mixture to produce a porous membrane which imbibes the acid solution, followed by drying.

6187464**METHOD FOR ACTIVATING FUEL CELL**

Eiichi Yasumoto; Hisaaki Gyoten; Kazuhito Hato; Kazufumi Nishida; Teruhisa Kanbara; JAPAN assigned to Matsushita Electric Industrial Company Ltd.

A method for activating a polymer electrolyte type fuel cell comprising at least one unit cell which is configured by including a proton conductive polymer electrolyte, an electrode layer having a catalytic activity arranged on the both faces of said polymer electrolyte membrane and a gas-supplying path is disclosed. This method comprises at least one of the step (a) of enhancing the catalytic activity of said electrode and the step (b) of giving a wetting condition to said polymer electrolyte. According to the present invention, it is possible to readily activate the fuel cell and to cause the same to demonstrate a high cell performance.

6187466**FUEL CELL WITH WATER CAPILLARY EDGE SEAL**

Craig R. Schroll; Glenn W. Scheffler; Donald L. Maricle; UNITED STATES assigned to International Fuel Cells Corporation

A fuel cell, having a proton exchange membrane, an anode and a cathode, and cathode and anode water transport plates includes a water capillary edge seal to optimize and greatly improve fuel cell operation without the need for additional seals or impregnation of the water transport plates. The water filled porous bodies of the water transport plates use the capillary forces of the water, which is a product of the electrochemical reaction of the fuel cell and the preferred coolant, to prevent gas intrusion into the water system and over board leakage of the gases as well as the resultant hazardous mixture of gaseous fuel and oxidizing gas.

6187467**IONOMER IMPREGNATION OF ELECTRODE SUBSTRATES FOR IMPROVED FUEL CELL PERFORMANCE**

Jiujun Zhang; Kevin M. Colbow; David P. Wilkinson; CANADA assigned to Ballard Power Systems Inc.

Liquid feed fuel cell performance can be increased by impregnating electrode substrates with a proton conducting ionomer prior to incorporation of the electrocatalyst, and optionally also after application of the electrocatalyst. Ionomer impregnation is particularly effective for direct methanol fuel cell anodes that comprise carbonaceous substrates.

6187468**ELECTRODES FOR FUEL CELLS**

Hiroshi Shinkai; Ichirou Tanaka; Minako Onoedera; Kazuhiko Iwasaki; Tsugio Ohba; Hideo Kato; Ichirou Baba; JAPAN assigned to Honda Giken Kogyo Kabushiki Kaisha

This invention provides an electrode for a fuel cell comprising a catalyst layer obtained by a first step of homogeneously

mixing carbon supporting platinum which is an electrode catalyst, an alcohol solution of an ion conductive component which is a solid polymer electrolytic membrane component, and an organic solvent, by means of a stirrer having a grinding effect to produce electrode paste in which the carbon is highly dispersed; a second step of stirring said electrode paste by means of a three-dimensional vibrating stirrer in order to obtain highly structured carbon on which platinum is supported; and a third step of coating a gas diffusion electrode material and/or a solid polymer electrolytic membrane with the electrode paste in which the carbon is highly structured, followed by removal of the organic solvent.

6190430**METHOD FOR PRODUCING HYDROGEN-CONTAINING GAS FOR FUEL CELL**

Yohei Fukuoka; Keizo Tomokuni; Hitoshi Nakajima; JAPAN assigned to Asahi Kasei Kogyo Kabushiki Kaisha

An efficient method for producing a hydrogen-containing gas for a fuel cell by using a gas produced by reforming reaction of an organic compound is disclosed. The method comprises the following steps: adding an oxygen-containing gas to a hydrogen-containing gas containing carbon monoxide to form a mixed gas, and bringing the mixed gas into contact with a catalyst comprising a ruthenium metal as a main component and having a carbon monoxide adsorption of not less than 1 mmol/g-ruthenium and a carbon monoxide adsorption index of not less than 0.5, to thereby oxidize and remove carbon monoxide.

6190623**APPARATUS FOR PROVIDING A PURE HYDROGEN STREAM FOR USE WITH FUEL CELLS**

Robert J. Sanger; Gavin P. Towler; Kishore J. Doshi; Kurt M. Vanden Bussche; John J. Senetar; UNITED STATES assigned to UOP LLC

An apparatus is provided which comprises two burner zones using a single igniter separated by a heat transfer zone for use in low-cost hydrogen generation units. When used in conjunction with a control system which limits the effluent temperature to less than about 700°C, the apparatus can be constructed of materials such as carbon steel and stainless steel rather than more exotic materials. This simplified structure and the use of less exotic materials provides an efficient, low-cost combined partial oxidation reactor for small-scale hydrogen production systems, especially for hydrogen production systems associated with fuel cell operation for the production of electricity.

6190791**PROTON EXCHANGE MEMBRANE (PEM) FUEL CELL SYSTEM AND PROCESS OF OPERATING SAME**

Gerald Hornburg; GERMANY assigned to Xcellsis GmbH

A proton exchange membrane fuel cell system includes a proton exchange membrane fuel cell; a first compressor for compressing the process air supplied to the fuel cell; a first expander coupled with compressor for driving the first compressor; and a catalytic burner as the heat source. The cathode offgas from the fuel cell is fed to the catalytic burner as an air supply and the expander is operated by the exhaust air from the catalytic burner. A portion of the gas from the burner is expanded in a second expander, which is coupled to a second compressor which further compresses the air from the first compressor.

6190793

ELECTROCHEMICAL FUEL CELL STACK WITH AN IMPROVED COMPRESSION ASSEMBLY

Russell H. Barton; Joel A. Ronne; Henry H. Voss; CANADA assigned to Ballard Power Systems Inc.

An electrochemical fuel cell stack with an improved compression assembly comprises a tension member which is electrically non-conductive and preferably non-metallic. The tension member can be made from a composite material which has similar expansion and contraction properties as the stack materials, thereby reducing undesirable fluctuations in the compressive force applied to the stack. An improved apparatus for securing the improved tension member to the rest of the compression assembly is also provided. Preferred embodiments of an improved compression assembly employ a collet and wedges to grip the tension member and compress a resilient member which imparts a tensile force to the tension member and a compressive force to the fuel cell assemblies. In other embodiments, an improved compression assembly employs a unitary resilient member and fastener in combination with a tension member. The improved apparatus is easier to assemble in high speed manufacturing processes because the compression assembly can be assembled or installed using the same machinery which is used to compress the stack in one fixturing because the compression assembly is assembled by being stacked in essentially the same direction as the other fuel cell components. An improved method of assembling a compression assembly for an electrochemical fuel cell stack is also provided.

6194092

FUEL CELL APPARATUS

Hideo Ohara; Makoto Uchida; Yasushi Sugawara; JAPAN assigned to Matsushita Electric Industrial Company Ltd.

A fuel cell apparatus of a compact size uses a hydrogen storage alloy, in which heat can be efficiently transmitted from fuel cell bodies to the hydrogen storage alloy. The fuel cell apparatus includes a plurality of fuel cell bodies, a hydrogen storage tank, a hydrogen supply device for supplying hydrogen to the fuel cell bodies from the hydrogen storage tank, an air feed device for supplying the air,

supplying oxygen, a secondary battery, and a casing receiving the above components therein which casing has air intake ports and an air discharge port for the air feed device, and is formed as to enable the hydrogen storage tank to be introduced into and removed from the casing. The hydrogen storage tank is disposed on that side surface of each of at least one pair of fuel cell bodies, facing away from a cathode thereof, through a heat transmission device. With this construction, the energy of heat, generated by the fuel cell bodies, is efficiently transmitted to the hydrogen storage tank, and the stable supply of the hydrogen can be achieved, and the whole of the power system can be formed into a compact design.

6194094

POLYMER ELECTROLYTE FUEL CELL

Yasushi Sugawara; Makoto Uchida; Hideo Ohara; Yuko Fukuoka; Nobuo Eda; JAPAN assigned to Matsushita Electric Industrial Company Ltd.

A gas diffusion layer including an electroconductive porous material and 16–55% by weight of fluororesin added to the electroconductive porous material is used for at least one of the positive electrode and the negative electrode of a membrane/electrodes assembly of a polymer electrolyte fuel cell. As a result, the water-retaining property of the inside of the membrane/electrodes assembly is improved without hindering gas diffusion, thus enabling polymer electrolyte to be moistened with water formed at the positive electrode, and thereby providing a polymer electrolyte fuel cell which operates by using unhumidified gas.

6194095

NON-BIPOLAR FUEL CELL STACK CONFIGURATION

Robert G. Hockaday; UNITED STATES

A non-bipolar fuel cell stack configuration where non-bipolar fuel cell arrays, manufactured on reel-to-reel sheets of porous plastic substrate material, are electronically connected in parallel with air and/or oxidizing gas flowing between the arrays. Separator plates of conventional type bipolar fuel cell stacks are eliminated in this approach and many of the electrical contact problems associated with conventional fuel cell stack are overcome. The present invention enables large power fuel cells, with relatively low total mass, to be readily manufactured at low cost.

BATTERY MATERIALS

6180278

RECLAMATION OF ACTIVE MATERIAL FROM METAL HYDRIDE ELECTROCHEMICAL CELLS

Orville G. Prickett; Robert Czajkowski; Nelson C. Citta; Michael R. Klein; E. Lee Huston; Paul W. Galbraith;

UNITED STATES assigned to Eveready Battery Company Inc.

Methods are presented for reclaiming active material used in formation of secondary electrochemical cells and similar electrodes. Active materials such as nickel-metal hydride are removed from cell electrodes together with the binders used to secure the active materials to the electrode substrates. Because the binders and other agents are recovered without loss or degradation, the active materials may be easily and simply reconstituted and reused to form new electrodes. The methods are particularly applicable to electrodes fabricated by deposition of active material on flexible conductive substrates. The reclamation methods include mechanical separation, such as bending and ultrasonic beating, to remove the active materials without adding other chemical agents. The removed active materials are ground and sized. Solvent is added to dissolve binders and form a reconstituted active material paste. This paste may then be introduced to an electrode fabrication process in combination with, or in replace of, virgin paste. Devices are presented for the effective mechanical separation of active material from electrode substrates. One embodiment of these devices includes a pair of bending wheels which bend the electrodes repeatedly into a rough wave form. By bending the electrode repeatedly at adjacent locations, substantially all the active material and other constituents may be recovered. Bending at an angle smaller than a determined critical angle is required for effective separation and recovery.

6180280

TRILAYER BATTERY SEPARATOR

Robert M. Spotnitz; UNITED STATES assigned to Celgard Inc.

A trilayer shutdown battery separator is provided having two microporous strength layer membranes sandwiching one microporous shutdown layer membrane. The strength layers are made by a stretch method. The shutdown layer is made by a phase inversion method. The preferred method of making such a trilayer separator comprises: making microporous strength layers by a stretch method; forming a microporous shutdown layer by phase inversion process; and bonding two microporous strength layers and one microporous shutdown layer into the trilayer battery separator.

6180287

POLYETHER COPOLYMER AND SOLID POLYMER ELECTROLYTE

Masayoshi Watanabe; Katsuhito Miura; Masanori Yanagida; Hiroki Higobashi; Takahiro Endo; JAPAN assigned to Daiso Company Ltd.

A solid polymer electrolyte obtained by blending (1) a polyether copolymer having a main chain, which is derived from ethylene oxide, and a side chain having

two oligooxyethylene groups; (2) an electrolyte salt compound, and, if necessary; (3) a plasticizer which is any one of an aprotic organic solvent or a derivative or metal salt of a polyalkylene glycol having a number-average molecular weight of 200–5000 or a metal salt of the derivative, is superior in ionic conductivity and also superior in processability, moldability and mechanical strength to a conventional solid electrolyte. A secondary battery is constructed by using the solid polymer electrolyte in combination with a lithium metal negative electrode and a lithium cobaltate positive electrode.

6180800

FLUORINE-SUBSTITUTED CYCLIC CARBONATE AND ELECTROLYTIC SOLUTION AND BATTERY CONTAINING THE SAME

Keiichi Yokoyama; Takako Koiso; Akio Hiwara; JAPAN assigned to Mitsui Chemicals Inc.

Monofluoromethyl ethylene carbonate, difluoromethyl ethylene carbonate and trifluoromethyl ethylene carbonate are provided as novel compounds. These compounds are very useful as solvents because they are chemically and physically stable, have a high dielectric constant, can readily dissolve organic substances and have a wide application temperature range. These compounds have excellent charge and discharge cycle characteristics, have a high flash point, and are safe as non-aqueous electrolytes. Hence, batteries using these compounds withstand voltage and have excellent charge and discharge cycle characteristics.

6183906

CADMIUM NEGATIVE ELECTRODE FOR ALKALINE STORAGE BATTERY AND MANUFACTURING METHOD OF THE SAME

Kazuki Shimozono; Toyoshige Muto; Masayuki Terasaka; JAPAN assigned to Sanyo Electric Company Ltd.

A cadmium negative electrode capable of enhancing a utilization rate of metallic cadmium contained therein as an active material in charged state. In the cadmium negative electrode, a mixture paste of a main active material in form of cadmium oxide or cadmium hydroxide and metallic cadmium powder containing yttrium component is deposited on a metallic active material retention substrate.

6183907

BINDER FOR AN ELECTRODE OF AN ELECTROCHEMICAL SYSTEM WITH A NON-AQUEOUS ELECTROLYTE

Sylvie Barousseau; Florence Martin; Bernard Simon; FRANCE assigned to Alcatel

The present invention consists in a binder for an electrode in an electrochemical system with a non-aqueous electrolyte, characterized in that it contains acrylonitrile-butadiene

rubber and carboxymethylcellulose with an average molecular weight of over about 200 000.

6183913

ALKALINE BATTERY SEPARATOR AND PROCESS FOR PRODUCING THE SAME

Masanao Tanaka; Koji Kimura; Nobutoshi Tokutake; JAPAN assigned to Japan Vilene Company Ltd.

An alkaline battery separator comprising a hydrophilic non-woven fabric obtainable by heat-fusing and hydro-entangling (1) polyolefin dividable composite fibers having an average fiber length of 20–60 mm, (2) high-strength fibers having an average fiber length of 30–60 mm and a fiber strength of 5 g/denier or more, and (3) polyolefin heat-sensitive-adhesive fibers having an average fiber length of 30–60 mm, to obtain a heat-fused and hydro-entangled non-woven fabric by a dry-laid method, and imparting a hydrophilic property to the resulting heat-fused and hydro-entangled non-woven fabric; these high-strength fibers accounting for 20–45% by mass with respect to a total mass of the polyolefin dividable composite fibers, the high-strength fibers and the polyolefin heat-sensitive-adhesive fibers. The alkaline battery separator exhibits an excellent breaking strength, and has practical and sufficient tensile strength and electrolyte-holding capacity properties.

6187157

MULTI-PHASE SOLID ELECTROLYTE IONIC TRANSPORT MEMBRANE AND METHOD FOR FABRICATING SAME

Chieh-Cheng Chen; Ravi Prasad; UNITED STATES assigned to Praxair Technology Inc.

A multi-phase solid electrolyte ion transport membrane comprising at least two phases wherein one of the phases comprises an oxygen ion single conductive material, or a mixed conductor. The other phase comprises an electronically-conductive metal or metal oxide that is incorporated into the membrane by deposition of the metal or metal oxide from a polymer made by polymerizing a chelated metal dispersion in a polymerizable organic monomer or prepolymer. The multi-phase composition advantageously comprises a first phase of a ceramic material and a second phase of a metal or metal oxide bound to a surface of the ceramic material. The multi-phase composition is advantageously prepared in an in situ fashion before fabricating the membrane matrix. As another alternative, a preformed ceramic matrix is surface-coated with a metal or metal oxide.

6190575

POLYMER ELECTROLYTE, A POLYMER AGGREGATING AGENT PREPARED THEREFROM, AND A DISPOSAL OF WASTE WATER

Yasuhito Inagaki; Tsutomu Noguchi; Haruo Watanabe; Miyuki Kuromiya; JAPAN assigned to Sony Corporation

A polymer electrolyte which contains an inorganic pigment, having a sulfonated polystyrene resin as a principal ingredient, and is soluble to water.

6190805

POLYMERIZABLE COMPOUND, SOLID POLYMER ELECTROLYTE USING THE SAME AND USE THEREOF

Masataka Takeuchi; Shuichi Naijo; Takashi Ohkubo; Ayako Nishioka; Masaaki Nishioka; JAPAN assigned to Showa Denko Kabushiki Kaisha

The polymer compound of the present invention which contains a poly- or oligo-carbonate group and is preferably obtained by utilizing a polymerization reaction using a polymerizable functional group represented by formula (2) and/or formula (3) below: (figure) exhibits good strength even when it is formed into a thin film and has high ion conductivity and excellent workability. By the use of this polymer compound, solid polymer electrolyte, battery and/or electric double layer capacitor having high-temperature characteristics and large current characteristics are provided.

LITHIUM BATTERIES

6180282

CATHODE FOR LITHIUM SECONDARY BATTERY
Yasunori Nishida; Kenichiro Kami; Kenji Nakane; Hitoshi Miura; JAPAN assigned to Sumitomo Chemical Company Limited

A cathode for a lithium secondary battery wherein the surface of the cathode of which a composition containing a cathode active material, a conductive substance and a binder is supported on a current collector, is coated with at least one ion-permeable resin selected from resins having a temperature of deflection under load (measured at 18.6 kg/cm² load according to JIS K 7207) not lower than 100°C, provide a lithium secondary battery with high energy density having improved safety.

6183718

METHOD OF MAKING STABILIZED ELECTRO-CHEMICAL CELL ACTIVE MATERIAL OF LITHIUM MANGANESE OXIDE

Jeremy Barker; M. Yazid Saidi; Chariclea A. Scordilis-Kelley; UNITED STATES assigned to Valence Technology Inc.

A method for forming the composition stabilized against capacity degradation comprises particles of spinel lithium manganese oxide (LMO) enriched with lithium by a decomposition product of lithium carbonate forming a part of each said particle and characterized by a reduced surface area and increased capacity expressed in milliampere hours per gram as compared to non-enriched spinel.

6183908**NEGATIVE ELECTRODE MATERIAL FOR NON-AQUEOUS SECONDARY BATTERY AND NON-AQUEOUS SECONDARY BATTERY COMPRISING SAME NEGATIVE ELECTRODE MATERIAL**

Tsutomu Miyasaka; Shigeru Nakamura; JAPAN assigned to Fuji Photo Film Company Ltd.

The present invention provides a lithium ion non-aqueous secondary battery having a high discharge capacity and excellent high rate characteristics. A novel negative electrode material for a lithium ion non-aqueous secondary battery is disclosed, comprising a composite metal oxide containing an amorphous structure synthesized by a sol-gel method.

6183910**ELECTROCHEMICAL LITHIUM SECONDARY ELEMENT**

Hans-Walter Praas; Sibylle Kemmler-Sack; Peter Endres; GERMANY assigned to Varta Batterie Aktiengesellschaft

Suitable as active cathode material for an electrochemical lithium secondary cell are oxygen-deficient spinels $\text{Li}_{1+x}\text{Mn}_{2-x}\text{O}_{4-\delta}$, where 0 less than or equal to x less than or equal to 0.33 and 0.01 less than or equal to δ less than or equal to 0.5. Their region of existence in a phase diagram laid out between the corner points MnO , MnO_2 and Li_2MnO_3 for lithium manganese oxide compounds is defined by the corner compounds LiMn_2O_4 , $\text{Li}_2\text{Mn}_4\text{O}_7$, $\text{Li}_8\text{Mn}_{10}\text{O}_{21}$ and $\text{Li}_{4/3}\text{Mn}_{5/3}\text{O}_4$, all the compounds along the lines LiMn_2O_4 - $\text{Li}_{4/3}\text{Mn}_{5/3}\text{O}_4$ and LiMn_2O_4 - $\text{Li}_2\text{Mn}_4\text{O}_7$ being excepted. The spinels are produced by a modified ceramic process from a mixture of Li-containing and Mn-containing starting substances whose reaction product is reduced by roasting in an Ar/H_2 atmosphere. The Li components x can be replaced partially or completely by foreign monovalent or multivalent cations from the series consisting of Co, Mg, Zn, Ni, Ca, Bi, Ti, V, Rh or Cu.

6183912**HIGH ENERGY GLASS CONTAINING CARBON ELECTRODE FOR LITHIUM BATTERY**

Gholam-Abbas Nazri; UNITED STATES assigned to Delphi Technologies Inc.

A novel high energy density electrode for rechargeable lithium batteries, and process of making same has been developed. The process forms a composite which (1) comprises submicron particles of lithium-alloying sp elements embedded in a conductive matrix of carbon, graphite or a lithium-containing, ionically-conductive glass; and (2) is capable of reversibly accepting and donating lithium. The particles are produced within the conductive matrix through the reaction of halides (e.g. Cl) of the sp elements with Si, B, S or P, which forms volatile halides (e.g. SiCl_x , SCl_x , BCl_x and PCl_x) and submicron size (i.e. less than 0.1 μm , and

preferably nm size) sp element particles distributed throughout the matrix. By sp element is meant an element whose valence electrons reside in the s and p orbitals of the atoms and are found in the third, fourth and fifth rows of the groups III, IV and V elements of the periodic table. Hence, elements such as Pb, Sn, Sb, Bi, Al, Ga, Ge, In and Ti are seen to be useful with this invention. Carbon/graphite is the preferred conductive matrix because it has a capability of retaining some reversible lithium itself. Lithium ion-conducting glasses are also useful. Electrochemical studies of the composite anodes in Li cells indicate superior energy capacity over carbonaceous anodes currently used in commercial batteries (e.g. LiC_6). Anodes made according to this invention will contain about 10–80%, by weight, of the submicron elemental material, and the balance conductive matrix, binder materials (e.g. Ca 6–8% PVDF or EPDM), and some (e.g. about 1–12%) conductive dilutents (e.g. carbon particles). The anodes will preferably contain about 10–20% of the submicron elemental material for achieving prolonged cycle life.

6187282**MANUFACTURING METHOD OF LITHIUM COMPLEX OXIDE COMPRISING COBALT OR NICKEL**

Koji Hattori; Yasuhisa Yamashita; Yukio Sakabe; JAPAN assigned to Murata Manufacturing Company Ltd.

A method of manufacturing a lithium complex oxide involves the steps of (1) atomizing and pyrolyzing an aqueous or alcohol solution of metallic salt compounds constituting a lithium cobalt complex oxide or a lithium nickel complex oxide; and (2) annealing said lithium cobalt complex oxide or said lithium nickel complex oxide to increase the average particle diameter thereof to between about 1 and 5 μm and adjust the specific surface area thereof to between about 2 and 10 m^2/g . The lithium complex oxide provided by this method is homogeneous and enables a long cycle life to withstand repeated charging and discharging and a high level of storage stability to be realized when used as an cathode active material of a secondary lithium battery.

6187476**METHOD FOR MAKING ELECTRODE OF LITHIUM SECONDARY CELLS**

Su Il Pyun; Yong Min Choe; SOUTH KOREA assigned to Korean Advanced Institute of Science and Technology Representative

A method for making an electrode for lithium secondary cells. Lithium and cobalt ions are co-precipitated in an alkaline solution in such a way that the ratio of the former to the latter is 1.05:1 or more and then, are thermally treated to give LiCoO_2 powder. This ternary system compound is combined with a current collector and a binder. The electrode has an initial discharge capacity of 160 mAh/g and retains 90% of the initial capacity even after 400 times of charge-discharge cycle.

6187477**LITHIUM SECONDARY BATTERY AND CATHODE COMPOSITION THEREFOR**

Isao Watanabe; Hiroshi Horiuchi; Kensuke Yoshida; Tsutomu Miyashita; Tamotsu Yamamoto; Masami Tsutsumi; JAPAN assigned to Fujitsu Limited

A lithium secondary battery includes a cathode which can be dischargeably charged with lithium ions, an anode made of lithium metal, a lithium alloy or any other anode material which can be releasably doped with lithium ions, and an electrolyte which allows migration of lithium ions between both electrodes. The cathode contains a halogen compound which releases halogen atoms, halogen ions or a reactive halogen-containing substance for reacting with the anode, thereby deactivating the anode to prevent excessive heat generation before oxygen released from the cathode due to a temperature rise reacts with the anode.

6190800**LITHIATED MANGANESE DIOXIDE**

Nikolay Ilchev; Paul A. Christian; William L. Bowden; Peter R. Moses; Klaus Brandt; UNITED STATES assigned to The Gillette Company

A lithiated manganese dioxide for use in primary lithium electrochemical cells. The lithiated manganese dioxide is prepared by stepwise treatment with a liquid source of lithium cations that can include an aqueous solution of a lithium base or a low melting point lithium salt resulting in formation of a lithiated manganese dioxide product. Lithium cations in the lithium base or molten lithium salt can be ion-exchanged with hydrogen ions in the manganese dioxide crystal lattice and additional lithium ions reductively inserted into the lattice during subsequent heat-treatment to form the lithiated manganese dioxide product $\text{Li}_y\text{MnO}_{2-\delta}$. The primary lithium cell utilizing the lithiated manganese dioxide product as active cathode material exhibits increased operating voltage and enhanced high rate, low temperature, and pulse discharge performance compared with untreated manganese dioxide.

6190803**NON-AQUEOUS SECONDARY BATTERY**

Hideki Tomiyama; Yoshiaki Noda; JAPAN assigned to Fuji Photo Film Company Ltd.

A non-aqueous secondary battery is disclosed, comprising a positive electrode sheet containing a lithium-containing transition metal oxide as a positive electrode active material, a negative electrode sheet containing a negative electrode material capable of intercalating and deintercalating lithium, and a non-aqueous electrolyte containing a lithium salt, wherein a current collector of said positive electrode sheet is made of an aluminum foil containing 0.6–2% by weight of manganese and not more than 1.5% by weight of magnesium

and has a thickness of 5–200 μm . The positive electrode current collector has improved mechanical strength against stress imposed during activation and charge and discharge cycles.

6190806**SOLID COMPOSITE ELECTROLYTES FOR LITHIUM BATTERIES**

Binod Kumar; Lawrence G. Scanlon Jr.; UNITED STATES assigned to The University of Dayton

Solid composite electrolytes are provided for use in lithium batteries which exhibit moderate to high ionic conductivity at ambient temperatures and low activation energies. In one embodiment, a polymer-ceramic composite electrolyte containing poly(ethylene oxide), lithium tetrafluoroborate and titanium dioxide is provided in the form of an annealed film having a room temperature conductivity of from 10^{-5} to 10^{-3} S cm^{-1} and an activation energy of about 0.5 eV.

6193946**PROCESS FOR THE PREPARATION OF A LITHIUM COMPOSITE METAL OXIDE**

Tomoko Kawano; Shigeo Kobayashi; Shoichiro Watanabe; Takafumi Fujiwara; Akira Hashimoto; Yasuhiko Syoji; JAPAN assigned to Matsushita Electric Industrial Company Ltd.

Lithium composite metal oxides prepared by mixing at least one type of hydroxides, oxides, and carbonates of a metal selected from the group of transition metal, IIA metal, and IIIA metal, and a lithium compound of which the D50 value is in the range of 5–50 μm , the D90 value is 90 μm or smaller, and in which particles 100 μm or greater do not exist, and calcining in the temperature range 700–1000°C for 2–30 h, and grinding, are used as the active material of a positive electrode which is laminated with a negative electrode with a separator interposed and spirally wound thereby forming an electrode group. By using the positive active materials prepared in this manner, discharge capacity and cycle characteristic of a non-aqueous electrolyte secondary cell can be improved.

6193947**PROCESS FOR PREPARING LAYERED ROCK-SALT TYPE LITHIUM MANGANESE OXIDE BY MIXED ALKALINE HYDROTHERMAL METHOD**

Mitsuharu Tabuchi; Kazuaki Ado; Hironori Kobayashi; Hiroyuki Kageyama; JAPAN assigned to Agency of Industrial Science and Technology

Hydrothermal treatment of at least one manganese source material, for example, an oxide of manganese, such as Mn_2O_3 , MnO , or MnO_2 , in an aqueous solution containing at least one water-soluble lithium salt, such as lithium hydroxide, lithium chloride, lithium nitrate, lithium fluoride,

or lithium bromide, and an alkaline metal hydroxide, such as potassium hydroxide, at 130–300°C can realize the preparation of a lithium manganese oxide (LiMnO₂) having a layered rock-salt structure in a single stage.

6194067

CARBONACEOUS PARTICLES AND CARBONACEOUS FIBERS BOTH COATED WITH BORON NITRIDE, AND LITHIUM SECONDARY CELLS PRODUCED BY USING THE SAME AS NEGATIVE ACTIVE MATERIAL

Takeshi Hamada; Tsutomu Sugiura; Kimihito Suzuki; Taro Kohno; Koki Inada; Yoshitaka Yamana; JAPAN assigned to Nippon Steel Corporation

Carbonaceous particles and carbonaceous fibers whose surfaces are covered with a boron nitride thin film, wherein the atomic concentration of boron $C(B)$, the atomic concentration of carbon $C(C)$ and the atomic concentration of nitrogen $C(N)$ satisfy the following inequalities: in the surface region as measured by photoelectron spectroscopy. Also, lithium secondary batteries which employ these carbonaceous particles and carbonaceous fibers as negative electrode active materials.

6194092

FUEL CELL APPARATUS

Hideo Ohara; Makoto Uchida; Yasushi Sugawara; JAPAN assigned to Matsushita Electric Industrial Company Ltd.

A fuel cell apparatus of a compact size uses a hydrogen storage alloy, in which heat can be efficiently transmitted from fuel cell bodies to the hydrogen storage alloy. The fuel cell apparatus includes a plurality of fuel cell bodies, a hydrogen storage tank, a hydrogen supply device for supplying hydrogen to the fuel cell bodies from the hydrogen storage tank, an air feed device for supplying the air, supplying oxygen, a secondary battery, and a casing receiving the above components therein which casing has air intake ports and an air discharge port for the air feed device, and is formed as to enable the hydrogen storage tank to be introduced into and removed from the casing. The hydrogen storage tank is disposed on that side surface of each of at least one pair of fuel cell bodies, facing away from a cathode thereof, through a heat transmission device. With this construction, the energy of heat, generated by the fuel cell bodies, is efficiently transmitted to the hydrogen storage tank, and the stable supply of the hydrogen can be achieved, and the whole of the power system can be formed into a compact design.

6194094

POLYMER ELECTROLYTE FUEL CELL

Yasushi Sugawara; Makoto Uchida; Hideo Ohara; Yuko Fukuoka; Nobuo Eda; JAPAN assigned to Matsushita Electric Industrial Company Ltd.

A gas diffusion layer including an electroconductive porous material and 16–55% by weight of fluoro-resin added to the electroconductive porous material is used for at least one of the positive electrode and the negative electrode of a membrane/electrodes assembly of a polymer electrolyte fuel cell. As a result, the water-retaining property of the inside of the membrane/electrodes assembly is improved without hindering gas diffusion, thus enabling polymer electrolyte to be moistened with water formed at the positive electrode, and thereby providing a polymer electrolyte fuel cell which operates by using unhumidified gas.

6194095

NON-BIPOLAR FUEL CELL STACK CONFIGURATION

Robert G. Hockaday; UNITED STATES

A non-bipolar fuel cell stack configuration where non-bipolar fuel cell arrays, manufactured on reel-to-reel sheets of porous plastic substrate material, are electronically connected in parallel with air and/or oxidizing gas flowing between the arrays. Separator plates of conventional type bipolar fuel cell stacks are eliminated in this approach and many of the electrical contact problems associated with conventional fuel cell stack are overcome. The present invention enables large power fuel cells, with relatively low total mass, to be readily manufactured at low cost.

6194099

ELECTROCHEMICAL CELLS WITH CARBON NANOFIBERS AND ELECTROACTIVE SULFUR COMPOUNDS

Yordan M. Gernov; Zhe-Sheng Xu; UNITED STATES assigned to Moltech Corporation

The present invention pertains to solid composite cathodes which comprise (a) an electroactive sulfur-containing cathode material which, in its oxidized state, comprises a polysulfide moiety of the formula, S_m , wherein m is an integer from 3 to 10; and (b) non-activated carbon nanofibers. The present invention also pertains to electric current producing cells comprising such solid composite cathodes, and methods of making such solid composite cathodes and electric current producing cells.

6194100

METHOD FOR MAKING VALVE-REGULATED LEAD-ACID BATTERY WITH VACUUM DRAW DOWN

David G. Vutetakis; Christopher R. Cestone; Stanley K. Wilkie; UNITED STATES assigned to Douglas Battery Manufacturing Company

The present invention relates to a method for making a valve-regulated lead-acid battery cell including forming a flooded electrolyte lead-acid cell having an interior

head space, positive and negative plates and fibrous plate separators positioned between the plates. The plates and the separators are housed in a container having flexible side walls. A vacuum is then drawn in the cell interior sufficient to create a flexure force on the cell side walls sufficient to push excess electrolyte from the fibrous mat separators leaving an amount of residual and absorbed electrolyte in the cell corresponding to proper saturation of the fibrous plate separators. The vacuum is then released thereby permitting any residual electrolyte to be absorbed into the fibrous separator material. Desirably the vacuum drawn in the cell interior is up to about 28 in. of mercury.

6194617

LITHIUM TERTIARY ALKOXIDES

Robert C. Morrison; Conrad W. Kamienski; James A. Schwindeman; UNITED STATES assigned to FMC Corporation

A process for quickly preparing easily separable solutions of lithium tertiary-alkoxides. Comprising the steps of reacting lithium metal in bulk solid form, containing less than 0.1% by weight of sodium, with a tertiary alcohol in mole ratios of metal to alcohol ranging from 2 to 1 and 10 to 1 in a solvent selected from ethereal or hydrocarbon solvents under an inert atmosphere at elevated temperature for 1 to 10 h, cooling the product and separating the product solution from the unreacted lithium metal in the reactor, and optionally adding solvent and sufficient lithium metal and alcohol to said unreacted metal in said reactor to maintain said mole ratio of lithium metal to alcohol, and continuing the reaction, thereby to form further lithium *tert*-alkoxide, and repeating said steps a number of times.

NICKEL HYDRIDE BATTERIES

6183909

ALKALINE STORAGE BATTERY

Akihiro Maeda; Hirokazu Kimiya; Yoshio Moriwaki; Isao Matsumoto; JAPAN assigned to Matsushita Electric Industrial Company Ltd.

A high energy density alkaline storage battery which uses a positive electrode including mainly nickel oxide is provided by increasing the capacities of the positive electrode and negative electrode. For increasing the capacity density of the positive electrode, the active material is incorporated as a solid solution with at least one element selected from manganese, chromium, aluminum and calcium in the range of from not less than 3 mol% to not more than 15 mol% relative to the active material, and the surface and/or the neighborhood of the surface of the active material are coated with a cobalt oxyhydroxide having a high electric conductivity of a specific resistance of 15 Ω cm or less and a low crystallinity.

OTHER BATTERIES

6180284

ELECTROCHEMICAL POWER CELLS AND METHOD OF IMPROVING ELECTROCHEMICAL POWER CELL PERFORMANCE

Pinakin M. Shah; Marvin L. Kronenberg; Richard F. Bis; Donald L. Warburton; Joseph J. Bytella; Dayal T. Meshri; UNITED STATES assigned to Mine Safety Appliances Company

A small, portable electrochemical power cell, having an output voltage of over 4 V, and preferably over 5 V, includes an anode, a cathode comprising a fluorine compound and an electrolyte to maintain ionic conductivity between the anode and the cathode. A method of fabricating such an electrochemical power cell includes the step of adding a fluorine compound to the cathode and/or to the electrolyte solvent.

6183899

MAINTENANCE-FREE OPEN INDUSTRIAL TYPE ALKALINE ELECTROLYTE STORAGE BATTERY

Patrick Sanchez; Edith Metayer; Marc Bariand; Jean-Louis Liska; FRANCE assigned to Alcatel

A maintenance-free open industrial storage battery includes an electrode assembly comprising at least one positive electrode, one negative electrode, one separator disposed between the negative electrode and the positive electrode, an alkaline electrolyte covering the top end of the assembly before electrical cycling and a valve the relative operating pressure of which is less than 1 bar. The total capacity of the negative electrodes is greater than the total capacity of the positive electrodes. The separator is permeable to oxygen and the storage battery contains an oxygen recombination device such that after at least one cycle of charging and discharging the storage battery operates without loss of electrolyte at a charging current at least equal to $I_c/10$ where I_c is the current discharging the capacity of the storage battery in 1 h.

6183900

ALKALINE STORAGE BATTERY WITH A NEGATIVE ZINC ELECTRODE

Guy Bronoel; Noelle Tassin; Alain Millot; FRANCE assigned to Laboratoires Sorapec

An alkaline storage battery comprising at least one positive electrode and a negative zinc electrode in contact with an electrolyte via at least one electrolyte-impregnated separator is disclosed. The electrodes are clamped against two respective bipolar screens supported by a sealing frame. The positive electrode is in contact with a first electrolyte having a predetermined volume and composition via at least one first separator, the negative electrode is in contact with a second electrolyte having a predetermined volume and

composition different from those of the first electrolytes via at least 1 s separator, and the first and second electrolytes are separated by a membrane forming a zincate and optionally aluminate filter, particularly an anionically conductive membrane defining first and second compartments.

6190792

CATHODE CYLINDER FOR USE IN METAL-AIR FUEL CELL BATTERY SYSTEMS AND METHOD OF FABRICATING THE SAME

Sadeg M. Faris; Tsepin Tsai; Thomas J. Legband; Wayne Yao; Muguo Chen; UNITED STATES assigned to Reveo Inc.

In an air-metal fuel cell battery (FCB) system, wherein metal-fuel tape, the ionically-conductive medium and the cathode structures are transported at substantially the same velocity at the locus of points at which the ionically-conductive medium contacts the moving cathode structure and the moving metal-fuel tape during discharging and recharging modes of operation. In a first generalized embodiment of the present invention, the ionically-conductive medium is realized as an ionically-conductive belt, and the metal-fuel tape, ionically-conductive belt, and movable cathode structure are transported at substantially the same velocity at the locus of points which the ionically-conducting belt contacts the metal-fuel tape and the cathode structure during system operation. In a second generalized embodiment of the present invention, the ionically-conductive medium is realized as a solid-state (e.g. gelatinous) film layer integrated with the metal-fuel tape. In a third generalized embodiment of the present invention, the ionically-conductive medium is realized as a solid-state film layer integrated with the movable cathode structure. By transporting the movable cathode structure, ionically contacting medium and metal-fuel tape within the system as described above, generation of frictional forces among such structures are minimized during system operation, and thus the damage to the cathode structure and metal-fuel tape is substantially reduced.

6190801

SEALED ALKALINE-ZINC STORAGE BATTERY

Mitsunori Tokuda; Mutsumi Yano; Mitsuzou Nogami; Shin Fujitani; Koji Nishio; JAPAN assigned to Sanyo Electric Company Ltd.

The invention provides a sealed alkaline-zinc storage battery including a tubular positive electrode containing, as an active material, a material having reversibility in a charge-discharge reaction; a separator; a negative electrode disposed within the tubular positive electrode with the separator sandwiched therebetween; and an alkaline electrolyte, in which the positive electrode has a capacity smaller than a capacity of the negative electrode at least in initial charge-discharge cycles, and the amounts of an

uncharged active material and zinc to be packed in the negative electrode in manufacture of the sealed alkaline-zinc storage battery are set so that a theoretical capacity P of the uncharged active material existing in the negative electrode can be 0.3 through 1.8 times as large as a battery capacity in a completely charged state in the initial charge-discharge cycles, and that a theoretical capacity Q of zinc existing in the negative electrode can be 0.6 through 2.5 times as large as the battery capacity in a completely discharged state in the initial charge-discharge cycles. Thus, a sealed alkaline-zinc storage battery with high charge-discharge cycle performance is obtained.

6190804

SOLID BATTERY

Eriko Ishiko; Michiyuki Kono; Tsutomu Sada; JAPAN assigned to Dai-Ichi Kogyo Seiyaku Company Ltd.

A solid battery using a solid electrolyte obtained by dissolving a tetrafunctional high-molecular compound and an electrolyte salt in a solvent and crosslinking the solution by the irradiation of an actinic radiation and/or by heating, wherein the solid electrolyte is one obtained by using a tetrafunctional terminal acryloyl-modified alkylene oxide polymer having a high-molecular chain represented by following formula (I) as the above-described tetrafunctional high-molecular compound, compounding the solvent with the polymer at a ratio of from 220 to 1900% by weight to the above-described tetrafunctional high-molecular compound, and crosslinking the compounded mixture: (figure) wherein R^1 and R^2 each represents a hydrogen atom or a lower alkyl group; R^3 represents a hydrogen atom or a methyl group; m and n each represents 0 or an integer of at least 1; in one high-molecular chain, $m + n$ greater than or equal to 35. The solid battery has a high performance and a high-energy density, prevents the occurrence of liquid leakage and gas spouting, and has an excellent mechanical strength.

6194099

ELECTROCHEMICAL CELLS WITH CARBON NANOFIBERS AND ELECTROACTIVE SULFUR COMPOUNDS

Yordan M. Gernov; Zhe-Sheng Xu; UNITED STATES assigned to Moltech Corporation

The present invention pertains to solid composite cathodes which comprise (a) an electroactive sulfur-containing cathode material which, in its oxidized state, comprises a polysulfide moiety of the formula, S_m , wherein m is an integer from 3 to 10; and (b) non-activated carbon nanofibers. The present invention also pertains to electric current producing cells comprising such solid composite cathodes, and methods of making such solid composite cathodes and electric current producing cells.