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Journal of Power Sources



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LEAD ACID**5972535****METHOD AND APPARATUS FOR ATTACHING TERMINAL POST STRAPS TO A BATTERY PLATE GROUP**

Kump, William H.; Lund, David L.; DiMarco, Charles J.; West St. Paul, Minneapolis, Kansas City, UNITED STATES assigned to GNB Technologies Inc

A method of apparatus for more efficiently fusing the straps of pre-formed terminal post members with plate lugs of a battery plate group utilizing a non-reusable, inexpensive plastic mold insert, is presented. The method includes positioning the battery plate group into an open top container with the lugs of the positive plates in one row and the lugs of the negative plates in another row, positioning the plastic insert into the container with the lugs of the plate group extending upwardly through the mold insert, positioning the terminal post members on the plastic mold insert with fingers of the straps thereof disposed between plate lugs of the respective rows, supplying additional unmelted lead into remaining spaces between the plate lugs, and heating, melting, and fusing the plate lugs, strap fingers, and added lead by induction heating to form interconnections between the positive and negative plates in the respective terminals.

5981099**PRESSURE RELIEF VALVE FOR ELECTRIC STORAGE BATTERIES**

Bourbeau, Robert D.; Statesville, UNITED STATES assigned to Accuma Corporation

A valve for an electric storage battery, including a cap housing for being positioned in an access port in the battery, the cap housing having interior side walls defining a gas-flow orifice therethrough. A valve member is positioned in the gas-flow orifice of the cap housing, and comprises a valve body, including at least one vent defining a gas-flow passage from an upstream to a downstream side of the valve body, a resilient, radially outwards from the valve body in the downstream direction. The skirt has an outermost free and normally sealingly engaging the side walls of the cap housing defining the gas-flow orifice. The annular skirt and adjacent side walls of the cap housing define there between an annular recess in gas-flow communication with the vent. The recess progressively narrows in the downstream direction to a terminus at the outermost free end of the skirt. The skirt is adapted to be resiliently responsive to internal gas pressure in the recess acting on the skirt to disengage the side walls of the cap housing by radial, inward movement at a predetermined gas pressure in the battery to provide a gap between the free end of the skirt and the side walls of the cap housing for passing gas past the valve member and into the atmosphere.

5985484**BATTERY SEPARATION**

Young, James; Alexander, Francis E.; Weerts, Daniel E.; Sunriver, Corvallis, Albany, UNITED STATES assigned to AMTEK Research International LLC

A battery separator for use in flooded cell type lead acid batteries comprising a backweb of a porous, acid resistant, embossable material with a plurality of major ribs and submini-ribs extending across the width of the backweb from at least one planar surface of the backweb. The submini-ribs extend in a direction substantially parallel to the longitudinal axis of the backweb. The major ribs extend in a direction that is diagonal to the longitudinal axis of the backweb. Each major rib is an embossed corrugated structure comprised of alternating ridges and furrows. The separator is particularly useful in a flooded cell type lead acid battery having tubular plates.

5989749**STAMPED BATTERY GRID**

Kao, Wen-Hong; Mrotek, Edward N.; Brown Deer, Grafton, UNITED STATES assigned to Johnson Controls Technology Company

A stamped grid for a lead-acid battery having a grid pattern that is optimized for electrical performance. The stamped grid includes an electrically conductive grid body having opposed top and bottom frame elements, opposed first and second side frame elements and a plurality of interconnecting grid wire elements forming a grid pattern. The grid wire elements include a plurality of vertical wire elements electrically connected to both top and bottom frame elements, a plurality of vertical wire elements connected to the top frame element and one of either the first or second side frame elements and a plurality of cross grid elements that interconnect the vertical wire elements. Each of the vertical grid elements that is electrically connected to the top frame element and one of either the first or second side frame elements includes a plurality of the cross frame elements connected thereto at a substantially 90° angle. The vertical grid elements and the cross frame elements define open areas for supporting electrochemical paste where most of the open areas are within the 2% of being the same size.

5989750**LEAD-ACID BATTERY SEPARATOR AND METHOD FOR PRODUCING THEREOF**

Ohba, Katsumi; Ito, Shin; Shiga, JAPAN assigned to G.S. Kasei Kogyo K.K.

A separator contains thermoplastic synthetic fiber, and acid-resisting oxidation-resisting inorganic filler, wherein

the cumulative volume of pores having a pore size not smaller than 1 μm is not larger than 20% of the cumulative volume of all pores, and the maximum pore size is not larger than 10 μm .

5990660

PROCESS FOR IMPROVING THE CHARGING AND DISCHARGING CAPACITY OF STORAGE BATTERIES

Meissner, Eberhard; Hofheim, GERMANY assigned to V B Autobatterie GmbH

The invention pertains to a process for improving the charging and discharging capacity of storage batteries at low temperatures. The improvement in the charging and discharging of storage batteries is accomplished by raising their temperature, using for this purpose the energy stored in the batteries. The process is conducted in such a way that the temperature and at least one value characterizing the state of charge are measured before the beginning of the heating and during the heating and the storage battery is discharged through an electrical component introducing thermal energy into it, at which time the discharge is terminated when either the target loadability in the discharging or charging was achieved or the state of charge decreases below a threshold value.

FUEL CELL

5972530

AIR-COOLED, HYDROGEN-AIR FUEL CELL

Shelekhin, Alexander B.; Bushnell, Calvin L.; Pien, Michael S.; Acton, Glastonbury, UNITED STATES assigned to Electro Chem Inc

An air-cooled, hydrogen-air solid polymer electrolyte (SPE) fuel cell with a membrane electrode assembly operatively associated with a fluid flow plate having at least one plate cooling channel extending through the plate and at least one air distribution hole extending from a surface of the cathode flow field into the plate cooling channel.

5976722

PROCESS FOR OPERATING A FUEL CELL INSTALLATION AND FUEL CELL INSTALLATION FOR CARRYING OUT THE PROCESS

Muller, Reinhard; Stuhler, Walter; Nolscher, Christoph; Erlangen, Hirschaid, Nurnberg, GERMANY assigned to Siemens Aktiengesellschaft

A process for operating a fuel cell installation and a fuel cell installation for carrying out the process include at least one fuel cell block. A process gas for the fuel cell block is fed into the fuel cell block with a liquid ring compressor. In this way, the process gas is humidified at the same time as it is compressed, thus using the compression heat

simultaneously as evaporation enthalpy, as well as the heat from the cooling circuit of the fuel cell stack.

5976724

FUEL CELL POWER PLANT WITH ELECTRO-CHEMICAL AUTOETHERMAL REFORMER

Bloomfield, David P.; Boston, UNITED STATES assigned to Niagara Mohawk Power Corporation

A fuel cell power plant includes an electrochemical autothermal reformed (EATR) which provides hydrogen to the fuel cell. The EATR includes an autothermal reformer region, an anode supply region, and a mixed ion conductor or membrane layer separating the autothermal reforming region from the reformer anode supply region. An anode gas loop, located between an anode supply region of the EATR and an anode compartment or section of the fuel cell circulates a mixture of hydrogen and a carrier gas between the two regions. The carrier gas ensures proper control of partial pressure of hydrogen in the two regions. A difference in operating temperature between the EATR and the fuel cell is exploited by heat exchanger which efficiently enable certain heating and cooling functions within the power plant.

5976725

FUEL CELL SYSTEM, FUEL FEED SYSTEM FOR FUEL CELL AND PORTABLE ELECTRIC APPLIANCE

Gamo, Takaharu; Kuranaka, So; Morita, Yoshio; Suzuki, Jo; Hamanishi, Mamoru; Nagai, Sadao; Hatoh, Kazuhito; Yasumoto, Eiichi; Fujiidera, Osaka, Suita, Tokyo, Daito, Katano, JAPAN assigned to Matsushita Electric Industrial Company Ltd

A fuel cell system has a fuel cell of solid polymer type, a rectangular parallelepiped sealing container for accommodating hydrogen occlusion alloy for occluding hydrogen to be supplied to said fuel cell, a connection portion provided in a hydrogen passage between said sealing container and said fuel cell for connecting said sealing container and said fuel cell detachably, a valve mechanism provided in said hydrogen passage for opening and shutting hydrogen gas, and a hydrogen flow rate control mechanism provided in said hydrogen passage for controlling the flow rate of hydrogen gas, and/or hydrogen pressure control mechanism for controlling the pressure of hydrogen gas.

5976726

ELECTROCHEMICAL CELL WITH FLUID DISTRIBUTION LAYER HAVING INTEGRAL SEALING CAPABILITY

Wilkinson, David P.; Stumper, Juergen; Campbell, Stephen A.; Davis, Michael T.; Lamont, Gordon J.; North Vancou-

ver, Vancouver, Maple Ridge, Port Coquitlam, New Westminster, CANADA assigned to Ballard Power Systems Inc

An electrochemical fuel cell comprises a pair of separator plates and a pair of fluid distribution layers interposed between the separator plates. At least one of the fluid distribution layers comprises a sealing region and an electrically conductive, fluid permeable active region, and a preformed sheet material extending into each of the sealing region and the active region. An ion exchange membrane is interposed between at least a portion of the fluid distribution layers, and a quantity of electrocatalyst is interposed between at least a portion of each of the fluid distribution layers and at least a portion of the membrane, thereby defining the active region. Compression of the preformed sheet material by urging of the pair of plates towards each other renders the at least one fluid distribution layer substantially fluid impermeable in a direction parallel to the major planar surfaces, in the sealing region. The performed sheet material included in the at least one fluid distribution layer thus has intrinsic sealing capability. This approach reduces or eliminates the need for separate gaskets or sealing components and integrates several functions, such as sealing, fluid distribution, and current collection, in a single layer.

5976727

ELECTRICALLY CONDUCTIVE SEAL FOR FUEL CELL ELEMENTS

Mercuri, Robert Angelo; Gough, Jeffery John; Seven Hills, Olmsted Township, UNITED STATES assigned to UCAR Carbon Technology Corporation

An electrically conductive seal for bonding together individual electrical fuel cells into an assembly in the form of a stack in which the individual electrical fuel cells are electrically connected together by the electrically conductive seal.

5980716

WATER TREATMENT APPARATUS FOR A FUEL CELL SYSTEM

Horinouchi, Hiroshi; Nishizaki, Kunihiro; Sato, Shigeaki; Azakami, Fumio; Deguchi, Toshiaki; Tokyo, Kofu, Yokohama, Chiba, Sayama, JAPAN assigned to Tokyo Gas Company Ltd., Kurita Water Industries Ltd

Low conductivity cooling water for a fuel cell body is obtained by a water treatment apparatus which removes dissolved carbon dioxide gas in the exhaust gas condensate by a decarbonation column. Iron oxide is eliminated from the condensate as well as blowdown water by a MF membrane separator device. Iron ions are removed by a chelate resin column. Deionization occurs with an electrodeionizer which has an internal ion exchange resin.

5981096

FUEL CELL SYSTEM

Hornburg, Gerald; Lamm, Arnold; Urban, Peter; Elchingen, Thalfingen, Ulm, GERMANY assigned to Daimler Chrysler AG

A fuel cell system has an anode space and a cathode space which are separated from one another by a proton-conducting membrane, and an oxygen-containing gas flows through the cathode space. According to the invention, it is suggested to admit to the anode space a liquid fuel/coolant mixture, preferably a methanol/water mixture. By means of this combination of the fuel circulation and the coolant circulation, the system can be manufactured in a more compact and lower-cost manner.

5981097

MULTIPLE LAYER MEMBRANES FOR FUEL CELLS EMPLOYING DIRECT FEED FUELS

Rajendran, Govindarajulu; Hockessin, DE UNITED STATES assigned to E.I. du Pont de Nemours and Company

A cation exchange membrane having a laminated structure of at least three layers of cation exchange polymer is presented. In a membrane in accordance with the invention, the cation exchange polymer in the laminate has a polymer backbone and cation exchange groups carried on recurring side chains attached to the polymer backbone with the number of carbon atoms in the polymer backbone in relation to the cation exchange groups defining an ion exchange ratio (IXR) for each layer. The layers have differing IXR values, which provide one or more high IXR layers and one or more low IXR layers with the IXR of the low IXR layers being less than about 17 and the IXR of the high IXR layers being at least about 15. In a membrane in accordance with the invention, the high and low layers further provide a change in IXR of at least about 2 in at least two locations across the thickness of the membrane.

5981098

FLUID FLOW PLATE FOR DECREASED DENSITY OF FUEL CELL ASSEMBLY

Vitale, Nicholas G.; Albany, UNITED STATES assigned to Plug Power L.L.C.

A fluid flow plate includes first and second outward faces. Each of the outward faces has a flow channel thereon for carrying respective fluid. At least one of the fluids serves as reactant fluid for a fuel cell of a fuel cell assembly. One or more pockets are formed between the first and second outward faces for decreasing density of the fluid flow plate. A given flow channel can include one or more end sections and an intermediate section. An interposed member can be positioned between the outward

faces at an interface between an intermediate section, of one of the outward faces, and an end section, of that outward face. The interposed member can serve to isolate the reactant fluid from the opposing outward face. The intermediate section(s) of flow channel(s) on an outward face are preferably formed as a folded expanse.

5983488

SOL-CASTING OF MOLTEN CARBONATE FUEL CELL MATRICES

Erickson, Diane S.; Bernat, Charles R.; Downers Grove, Oak Park, UNITED STATES assigned to M-C Power Corporation

A process for the manufacture of molten carbonate fuel cell matrices in which an aluminate precursor material and a lithium salt are mixed in an aqueous or organic solvent, resulting in formation of a suspension, with the suspension heated to a temperature less than a boiling of the solvent, resulting in formation of a slurry comprising a lithium aluminate precursor material is presented. At least one casting additive is added to the slurry, the slurry is formed into a desired shape, the desired shape is dried or cured to yield a green molten carbonate fuel cell structure, and the green molten carbonate fuel cell structure is heated after assembly into a molten carbonate fuel cell to the molten carbonate fuel cell operating temperature, resulting in transformation of the lithium aluminate precursor material to lithium aluminate.

5985476

STABLE HIGH CONDUCTIVITY FUNCTIONALLY GRADIENT COMPOSITIONALLY LAYERED SOLID STATE ELECTROLYTES AND MEMBRANES

Wachsman, Eric D.; Jayaweera, Palitha; Lowe, David M.; Pound, Bruce G.; Palo Alto, Fremont, Hayward, Menlo Park, UNITED STATES assigned to Gas Research Institute

Stable high conductivity functionally gradient compositionally layered solid bodies suitable for use as electrolytes and membranes and providing improved oxygen-ion conductivity for electrolytes and improved mixed oxygen-ion and electronic conductivity for membranes are presented. The electrolytes provide solid oxide fuel cells with high efficiency operation at 300°C to 800°C.

5985477

POLYMER ELECTROLYTE FOR FUEL CELL

Iwasaki, Katsuhiko; Yamamoto, Taketsugu; Harada, Hiroshi; Terahara, Atsushi; Satoh, Kunihisa; Ehime, Ibaraki, JAPAN assigned to Sumitomo Chemical Company Limited

Provided is a polymer electrolyte which is cheap and easily synthesized, and has a high water resistance and

high output performance. The polymer electrolyte, comprising a sulfonated polymer having an ion-exchange group equivalent weight of 500 to 2500 g/mol, which is obtainable by sulfonating a structural unit represented by the structural formula (II) of a copolymer having 95 to 40 mol% of a structural unit represented by the following structural formula (I) and 5 to 60 mol% of a structural unit represented by the following structural formula (II), [Figure].

5989739

METHOD FOR OPERATING A FUEL CELL SYSTEM

Zur Megede, Detlef; Schussler, Martin; Bubesheim, Ulm, GERMANY assigned to Daimler Chrysler AG

The invention relates to a method for operating a fuel cell system consisting of a fuel cell, a reformer for generating a hydrogen-rich gas, and a combustion chamber in which the fuel cell exhaust gases are oxidized to generate the heat energy required in the reformer. According to the invention, in those operating states in which the heat energy supplied to the reformer from the combustion chamber is insufficient, additional amounts of fuel and oxygen are supplied to the reformer, so that additional heat energy is produced directly in the reformer by the oxidation of the fuel. At the same time, during the oxidation of the fuel in the reformer, steam is produced that can be used in steam reformation. Advantageously, adjustment of the additional amount of fuel and the oxygen supplied is performed as a function of the reformer temperature.

5989740

MOLTEN CARBONATE FUEL CELL

Tomimatsu, Norihiro; Ohzu, Hideyuki; Nakagawa, Kazuaki; Akasaka, Yoshihiro; Kawasaki, Yokohama, JAPAN assigned to Kabushiki Kaisha Toshiba

A molten carbonate fuel cell of high performance and long life, which is capable of preventing the corrosion at the contacting portion between collector plates (in particular, an oxidizing gas-side collector plate) and the interconnector so as to suppress an increase of contact resistance is presented. This molten carbonate fuel cell comprises a unit cell with an electrolyte body formed of a porous body impregnated therein with a mixed carbonate containing two or more kinds of carbonate mixed in a desired mixing ratio, a cathode disposed on one main surface of the electrolyte body, and an anode disposed on the other main surface of the electrolyte body, corrugated collector plates (each disposed on a surface of the anode and on a surface of the cathode), and interconnectors (each disposed on a surface of each of the collector plates), wherein a substance which is capable of reacting with the mixed carbonate at an operation temperature of the fuel cell thereby to change a composition ratio of the mixed carbonate is

deposited on a surface of at least one member selected from the collector plate and the interconnector.

5989742

BLEND MEMBRANES BASED ON SULFONATED POLY(PHENYLENE OXIDE) FOR ENHANCED POLYMER ELECTROCHEMICAL CELLS

Cabasso, Israel; Yuan, Youxin; Mittelsteadt, Cortney; Syracuse, UNITED STATES assigned to The Research Foundation of State University of New York

Solid polymer membranes comprised of a high charge density sulfonated poly(phenylene oxide) blended with poly(vinylidene fluoride) in varied ratios have improved membrane characteristics. These membranes possess very high ionic conductivity and are inexpensive and suitable for solid polymer electrolytes in electrochemical applications especially for the polymer electrolyte membrane (PEM) fuel cell. PEM fuel cell assemblies with this membrane have enhanced performance.

BATTERY MATERIALS

5972536

NEGATIVE ELECTRODE MATERIAL FOR NON-AQUEOUS LIQUID ELECTROLYTE SECONDARY CELL, METHOD FOR PRODUCING SAME AND NON-AQUEOUS LIQUID ELECTROLYTE SECONDARY CELL EMPLOYING SAME

Yamada, Shinichiro; Akashi, Hiroyuki; Imoto, Hiroshi; Azuma, Hideto; Kitamura, Kenichi; Adachi, Momoe; Sasaki, Terue; Tanaka, Kohichi; Kanagawa, Tokyo, JAPAN assigned to Sony Corporation

A negative electrode material for a secondary cell for a non-aqueous liquid electrolyte for realizing a high charging/discharging capacity and a high discharging efficiency, a method for producing such material and a non-aqueous liquid electrolyte secondary cell employing such material. The negative electrode material contains at least one carbonaceous material selected from the group consisting of coffee beans, tea leaves, cane sugar, corns, fruits, straws of cereals and husks of cereals, a carbonaceous material derived from a plant-origin high molecular material containing a sum total of 0.2 to 20 wt.% of metal elements, phosphorus and sulphur calculated as elements or a carbonaceous material having a diffraction peak between 30° and 32° of the 2θ diffraction angle in the X-ray (CuKα) powder diffraction pattern. For producing the negative electrode material, at least one carbonaceous material selected from the group consisting of coffee beans, tea leaves, cane sugar, corns, fruits, straws of cereals and husks of cereals, or crystalline or fibrous cellulose admixed with at least one of metal elements, phosphorus or sulphur, is sintered for carbonization. The negative electrode material is used for a non-aqueous liquid electrolyte

secondary cell having a positive electrode formed of a lithium compound oxide and a negative electrode formed of a carbonaceous negative electrode material capable of doping and dedoping lithium ions as an active negative electrode material.

5972537

CARBON ELECTRODE MATERIAL FOR ELECTROCHEMICAL CELLS AND METHOD OF MAKING SAME

Mao, Zhenhua; Deng, Guoping; Kerzhner-Hal, Inna; Anani, Anaba A.; Zhang, Jinshan; Duluth, Lawrenceville, Auburn, Buffalo Grove, UNITED STATES assigned to Motorola Inc

A method of fabricating a carbon material for use as an electrode in an electrochemical cell (10) includes the steps of carbonizing a lignin material to result in the carbon material and subsequently washing the carbon material with acid.

5972538

CURRENT COLLECTOR FOR MOLTEN SALT BATTERY, PROCESS FOR PRODUCING MATERIAL FOR SAID CURRENT COLLECTOR, AND MOLTEN SALT BATTERY USING SAID CURRENT COLLECTOR

Saito, Kazuo; Hagiwara, Atsushi; Tokyo, JAPAN assigned to Nisshinbo Industries Inc

A current collector for a molten salt battery using liquid sodium as an anode active material, which current collector has an excellent electrolyte resistance and low electrical resistance and is able to be produced simply and rapidly at a low cost, and includes a current collector material in which a carbon composite material obtained by calcining a mixture of expanded powder with a thermosetting resin under a non-oxidizing atmosphere is bonded to a porous carbon material having a porosity of 99% to 30% and an average pore diameter of 0.5 mm to 5 μm. The above current collector is produced by a process including bonding a carbon composite material obtained by calcining a mixture of an expanded graphite powder with a thermosetting resin under a non-oxidizing atmosphere, to a porous carbon material having a porosity of 99% to 30% and an average pore diameter of 0.5 mm to 5 μm, or alternatively, bonding a carbon composite material precursor composed of a mixture of an expanded graphite powder with a thermosetting resin, to the above porous carbon material and then calcining the resulting assembly under a non-oxidizing atmosphere.

5976489

METHOD FOR PREPARING LITHIUM MANGANESE OXIDE COMPOUNDS

Saidi, M. Yazid; Saidi, Eileen; Stux, Arnold; Henderson, UNITED STATES assigned to Valence Technology Inc

A method of making a lithium manganese oxide intercalation compound in powder form comprises forming a solution of a manganese compound and a lithium compound in a solvent; and spray-drying the solution by atomizing the solution to form droplets thereof and contacting the droplets with a stream of non-oxidizing hot gas at a first elevated temperature to evaporate at least a major portion by weight of the solvent present in the solution thereby providing a precursor powder. The precursor powder is heated at a second elevated temperature, which is below the melting point of the lithium manganese oxide compound. The second temperature is sufficient to cause reaction among constituents in the precursor powder thereby providing the lithium manganese oxide compound having a spinel unit structure.

5977277

ACRYLIC ESTER, NOVEL ALLYL ETHER, NOVEL ALLYL CARBONATE, ACRYLIC ESTER POLYMER, ALLYL ETHER POLYMER, ALLYL CARBONATE POLYMER AND POLYMERIC SOLID ELECTROLYTE

Yokoyama, Keiichi; Sasano, Takako; Hiwara, Akio; Torida, Masahiro; Mita, Satoko; Watanabe, Masayoshi; Sodegaura, Yokohama, JAPAN assigned to Mitsui Petrochemical Industries Ltd

The novel acrylic ester, allyl ether and allyl carbonate of the present invention are characterized by having the structures represented by the following general formulae (I) to (IV): The above acrylic ester, allyl ether and allyl carbonate are used as a starting monomer which forms a polymer matrix for use in a polymeric solid electrolyte. The novel polymer of the present invention comprises structural units derived from at least one compound selected from a group of the compounds represented by the above general formulae (I) to (IV). The polymeric solid electrolyte comprising the above novel polymer as a polymer matrix exhibits high ionic conductivity and is chemically stable.

5985475

MEMBRANE FOR SELECTIVE TRANSPORT OF OXYGEN OVER WATER VAPOR AND METAL-AIR ELECTROCHEMICAL CELL INCLUDING SAID MEMBRANE

Reynolds, Thomas Alan; Brose, Daniel John; Golovin, Milton Neal; Bend, Marietta, UNITED STATES assigned to AER Energy Resources Inc

A permeable membrane comprising a gas-permeable substrate film and a layer of a polymeric perfluoro compound on the substrate exhibits selective transport of oxygen over water vapor and a metal-air electrochemical cell comprising such a membrane has enhanced control over its water content. Suitable polymeric perfluoro compounds

include perfluoropolyalkylene oxides such as polyperfluoropropylene oxide or polyperfluoropropylene oxide co-perfluoroformaldehyde. The polymeric perfluoro compound layer is desirably crosslinked to form a thin layer on the substrate film or to form a self-supporting membrane. A suitable substrate film is a microporous polymer membrane.

5985487

CURABLE ALKANE MULTIFUNCTIONAL ACRYLATES BASED SOLID ELECTROLYTES AND ELECTROLYTIC CELLS PRODUCED THEREFROM

Chaloner-Gill, Benjamin; Golovin, M. Neal; Santa Clara, Marietta, UNITED STATES assigned to Valence Technology Inc

This invention is directed to a solid electrolyte containing an alkane multifunctional acrylate polymeric matrix, a salt, a solvent, and preferably a viscosifier, as well as, electrolytic cells prepared from such solid electrolytes.

LITHIUM BATTERIES

5981107

LITHIUM ION SECONDARY BATTERY AND METHOD OF FABRICATING THEREOF

Hamano, Kouji; Shiota, Hisashi; Shiraga, Shou; Aihara, Shigeru; Yoshida, Yasuhiro; Murai, Michio; Inuzuka, Takayuki; Tokyo, JAPAN assigned to Mitsubishi Denki Kabushiki Kaisha

To obtain a lithium ion secondary battery having excellent charge and discharge characteristics in which electric connection between active material layers and a separator can be maintained without requiring a strong armor metal case, so that it can be made into thin forms having large energy density, convex parts and concave parts are formed on at least two surfaces. They are formed among surfaces of a positive electrode active material layer 7 and a negative electrode active material layer 9 both adjacent to a separator 4 and surfaces of the separator 4 facing both the active material layers 7 and 9, and these three means are bonded and closely adhered by an adhesive resin layer 11 and electrically connected by keeping a lithium ion-containing electrolytic solution in the separator 4 and voids 12 formed by a bonded surface 11a of the convex parts and the concave parts.

5985237

PROCESS FOR PRODUCING LITHIUM MANGANESE OXIDE SUITABLE FOR USE AS CATHODE MATERIAL OF LITHIUM ION SECONDARY BATTERIES

Lu, Qi; Yoshida, Gohei; Hirao, Kazuhiko; Honjo, Yukinori; Osaka, Nara, Tokyo, JAPAN assigned to Honjo Chemical Corporation

A process for producing a lithium manganese oxide which has a formula of Li_xMnO_2 in which x is between 0.1 and 1 and which is suitable for use as a 3-V cathode material, is disclosed. It comprises mixing at least one lithium compound with at least one manganese compound at a Li/Mn atomic ratio of 0.1:1 in a solvent selected from an aliphatic lower alcohol having from 1 to 3 carbon atoms, water and a mixture of the alcohol and water, allowing the resultant mixture to form a gel-like mixture, drying the gel-like mixture as required, and calcining the resulting product in an oxidative atmosphere at a temperature of 200–350°C.

5985485

SOLID STATE BATTERY HAVING A DISORDERED HYDROGENATED CARBON NEGATIVE ELECTRODE

Ovshinsky, Stanford R.; Young, Rosa, T.; Bloomfield Hills, Troy, UNITED STATES

A solid state battery comprising a substrate; at least one multilayered electrochemical cell deposited onto the substrate, each multilayered electrochemical cell comprising: a layer of disordered hydrogenated carbon material, negative electrode material capable of electrochemically adsorbing and desorbing lithium ions, or both lithium and hydrogen ions during charge and discharge; a layer of positive electrode material capable of electrochemically desorbing and adsorbing lithium ions, or both lithium and hydrogen ions during charge and discharge; and a layer of insulating/conducting material disposed between the layer of positive electrode material and the layer of negative electrode material, where the layer of insulating/conducting material is electrically insulating and capable of readily conducting or transporting lithium ions or both lithium and hydrogen ions from the layer positive electrode material to the layer of negative electrode material while the battery is charging, and from the layer of negative electrode material to the layer of positive electrode material while the battery is discharging; and an electrically conductive layer deposited atop the last of the at least one multilayered electrochemical cells, the electrically conductive layer providing one battery terminal.

5985488

PROCESS FOR PREPARING POSITIVE ELECTRODE ACTIVE MATERIAL, AND NONAQUEOUS SECONDARY BATTERY UTILIZING THE SAME

Mitate, Takehito; Torata, Naoto; Yoneda, Tetsuya; Minato, Kazuaki; Iida, Toyoshi; Makino, Tetsushi; Hamano, Shigeyuki; Kameda, Naoyoshi; Inada, Tomohiko; Yamotakada, Kitakatsuragi-gun, Nabari, Osaka, Fukui, JAPAN assigned to Sharp Kabushiki Kaisha, Tanaka Chemical Corporation

A process for preparing lithium nickeloxide (LiNiO_2) for use as a positive electrode active material for a non-aqueous secondary battery, which comprises the following steps. (a) Using as the raw materials a lithium compound and a nickel compound at least one of which has a melting point not higher than 300°C; (i) in case where both of the lithium compound and the nickel compound have a melting point not higher than 300°C, mixing the above two compounds after their melting, or mixing the above compounds, melting the mixture and mixing the melted mixture; (ii) in case where either one of the lithium compound and the nickel compound has a melting point higher than 300°C, mixing said one having a melting point higher than 300°C with the remaining one before or after its melting. (b) Calcining the resulting mixture at a temperature of 700°C to 950°C in air or in an atmosphere containing oxygen in a higher concentration than an atmospheric oxygen concentration.

5985489

CARBON FOR A LITHIUM SECONDARY BATTERY, LITHIUM SECONDARY BATTERY, AND MANUFACTURING METHODS THEREFOR

Ohsaki, Takushi; Yazaki, Ryuichi; Taira, Hiroshi; Inui, Takashi; Kigure, Mitsuo; Nakamura, Akihiro; Kitakomagan, JAPAN assigned to Nippon Sanso Corporation

A superior lithium secondary battery having high total discharge capacity, high effective discharge capacity, high total discharge efficiency, and high effective discharge rate can be obtained by using, as a carbon electrode for a lithium secondary battery, a carbon for a lithium secondary battery obtained by successively conducting a halogenation treatment, a dehalogenation treatment, and a pore adjustment treatment on a dry-distilled charcoal, or by successively conducting a crushing treatment, a molding treatment, and a carbonization treatment on a dry-distilled charcoal.

5989745

LITHIUM SECONDARY BATTERY

Kamauchi, Masahiro; Takada, Yoshinori; Itami, JAPAN assigned to Mitsubishi Cable Industries Ltd

A lithium secondary battery comprising a positive electrode composed of a positive electrode active material comprising an oxide compound comprising at least Li and Ni, and a negative electrode comprising an Li–Ag–Te alloy, a positive electrode active material for a lithium secondary battery, which is composed of an oxide compound represented by the formula: wherein $0.80 < w$ and < 1.10 , $0 < x$ and < 0.015 , $0 < y$ and < 0.03 and $1.8 \leq z \leq 2.2$, and a lithium secondary battery comprising said positive electrode active material. The lithium secondary battery of the present invention shows large charge–discharge capacity, high energy density, less

degradation by the repetitive charge–discharge and is superior in cycle property. The positive electrode active material of the present invention, which is composed of an oxide compound represented by the formula $\text{LiNi}_w\text{Al}_x\text{P}_y\text{O}_z$ is economical and superior in the supply of starting materials, and the lithium secondary battery comprising said positive electrode active material is advantageous in that it has high capacity, is superior in cycle property, and can be prepared stably at low costs.

5989748

**CYANOETHYLATED COMPOUNDS AS
ADDITIVES IN LITHIUM/LITHIUM
BATTERIES**

Nagasubramanian, Ganesan; Albuquerque, UNITED STATES assigned to The United States of America as represented by the United States Department of Energy

The power loss of lithium/lithium ion battery cells is significantly reduced, especially at low temperatures, when about 1% by weight of an additive is incorporated in the electrolyte layer of the cells. The usable additives are organic solvent soluble cyanoethylated polysaccharides and poly(vinyl alcohol). The power loss decrease results primarily from the decrease in the charge transfer resistance at the interface between the electrolyte and the cathode.

5989751

**HIGH ENERGY DENSITY, FLEXIBLE LITHIUM
PRIMARY BATTERIES**

Cotte, John M.; Datta, Madhav; New Fairfield, Yorktown Heights, UNITED STATES assigned to International Business Machines Corporation

A primary lithium battery particularly adapted for use in self-contained self-powered devices (SSPD) for mobile communication and computing products, such as radio frequency identification tags, PCMCIA cards, and smart cards. The battery has a flexible and compact design which eliminates use of a separate electrolyte membrane by utilizing an electrolyte-bearing composite cathode that preferably has a polyacrylonitrile matrix. Performance of the battery is optimized by controlling the amount of aprotic organic solvents within the composite cathode within a prescribed range of ratios. In so doing, the performance characteristics of the battery closely approximate those having conventional liquid electrolytes without the safety concerns associated with liquid electrolyte leakage, and exhibit enhanced performance at sub-ambient temperatures. A further feature is that the composite cathode is encapsulated within a polymeric matrix that eliminates the exposure hazard posed by the lithium intercalation compounds used within the cathode. The battery is enclosed in a customized laminate stack for sealing and encapsulation. Alternative packaging embodiments are also disclosed.

NICKEL METAL HYDRIDE BATTERIES

5990662

**NICKEL BATTERY CHARGING METHOD AND
APPARATUS**

Yang, Yi-Fu; Aichi-ken JAPAN assigned to Toyota Jidosha Kabushiki Kaisha

Raising the charging acceptability of nickel battery. The setting of the initial state of charge (SOC) of hybrid electric vehicle battery to X% (for example 50%) is performed by two steps. The first one is a constant current charge until a fully charged state (S11, S12). Secondly, a discharging is performed until the target SOC of X% is obtained (S13, S14). This enables the interior part of the nickel positive electrode active particles to be assumed as a charged state so that during normal operation, charging and discharging can be performed relatively in the surface layer. This can increase the efficiency of oxidation–reduction in the nickel positive electrode, thereby raising the charging acceptability.

COMPONENTS AND /OR CHARGES

5973478

BATTERY RECHARGER USING TAPER CHARGE

Keating, Joseph; Schroeder, Brent D.; Denver, Belgrade, UNITED STATES assigned to Bolder Technologies Corporation

An electrochemical cell is recharged in series with a constant voltage source and a resistor, wherein the charging current declines as a function of increasing cell voltage. When the change in voltage of the battery with respect to time decreases to near zero, the charging cycle is ended or converted to a maintenance charge.

OTHER BATTERIES

5972533

**ELECTROCHEMICAL CELL COMPRISING A
MOLTEN SALT ELECTROLYTE CONTAINING
SODIUM IODIDE**

Coetzer, Johan; Vlok, Isak L.; Pretoria, Centurion, SOUTH AFRICA assigned to Electro Chemical Holdings Societe Anonyme

The invention provides a high temperature rechargeable electrochemical power storage cell a method of operating such cell, a cathode for the cell and a method of making the cell. A solid electrolyte sodium ion conductor separates a cell housing into anode and cathode compartments respectively containing molten sodium anode material and a nickel-containing active anode material. The active cathode material is dispersed in a porous matrix which is electronically conductive and has a sodium aluminium

halide molten salt electrolyte, containing sodium and chlorine ions, impregnated therein. The cathode compartment contains an additional metal selected from iron, cobalt, antimony and mixtures thereof. The molten salt electrolyte has, dissolved therein, sodium iodide, which forms 1–20% by mass of the sodium halide in the cathode compartment.

5989744

**NON-AQUEOUS ELECTROLYTE SECONDARY
CELL**

Yamaura, Kiyoshi; Kanagawa JAPAN assigned to Sony Corporation

The present invention provides a non-aqueous electrolyte secondary cell in which charge/discharge property and energy density are significantly improved. The non-aqueous electrolyte secondary cell according to the present invention is provided with a positive electrode whose active material is $\text{Li}(\text{Ni}_{1-y}\text{CO}_y)_{1-z}\text{B}_z\text{O}_2$ (wherein y and z represent Ni, Co and B composition ratio which satisfies the relationships $0.1y \leq z$ and $< 0.05y + 0.026$, y and > 0 , and 0 and $< z \leq 0.03$); a negative electrode capable of doping and de-doping lithium; and a non-aqueous electrolytic solution made from lithium salt dissolved or dispersed in a non-aqueous medium.



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