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Journal of Power Sources

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LEAD ACID

6022638
LEAD-ACID BATTERY WITH HANDLE

Anthony R. Horton, Steven R. Peterson, Richard M. Sahli, William H. Kump, USA assigned to GNB Technologies Inc.

An electric storage battery, preferably a lead-acid battery, such as used for starting, lighting and ignition of an automobile or the like, includes a handle attached to the cover of the battery through a pin-and-button structure which is attached to the battery by insertion into an insertion aperture and is then moved into an assembly position where the handle can be rotated from a rest position adjacent the side of the cover to an upright, service position for carrying the battery.

6023146
BATTERY SYSTEM ELECTRICAL CONNECTION APPARATUS AND METHOD

Thomas J. Casale, Larry K.W. Ching, USA assigned to Optima Batteries Inc.

Disclosed is a battery system in which a battery is provided with a pair of quick connect electrical contact mechanisms. A battery tray, for receiving the battery, is also provided with a pair of quick connect electrical contact mechanisms which are adapted to connect and establish electrical continuity with the battery quick connect mechanisms. The battery pin assemblies may be molded into the battery cover and may be welded to the existing positives and negative battery posts. In this manner, the provision of the pins requires no additional penetrations of the battery container, thus reducing the potential for leakage of electrolyte from the container. The pins may be nested within indentations provided in the container. In this manner, the provision of the pins adds only minimally to the overall dimensions of the battery, thus resulting in a compact design. In the case of a spirally wound cell battery, the pins may be nested within the indentation formed between two of the battery cells and may be located either on the ends or the sides of the battery. Alternatively, in a spirally wound cell battery, the pins may be located in openings formed between four cells in the interior of the battery.

6025086
BATTERY VENT MECHANISM AND METHOD

Larry K.W. Ching, USA assigned to Optima Batteries Inc.

Disclosed herein is a venting mechanism for a battery. The venting mechanism includes a battery vent structure which is located on the battery cover and may be integrally formed therewith. The venting mechanism includes an opening extending through the battery cover such that the opening communicates with a plurality of battery cells located within the battery case. The venting mechanism also includes a vent manifold which attaches to the battery vent structure. The vent manifold includes a first opening which communicates with the battery vent structure opening and second and third openings which allow the vent manifold to be connected to two separate conduits. In this manner, a plurality of batteries may be interconnected for venting purposes, thus eliminating the need to provide separate vent lines for each battery. The vent manifold may be attached to the battery vent structure by a spin-welding technique. To facilitate this technique, the vent manifold may be provided with a flange portion which fits into a corresponding groove portion on the battery vent structure. The vent manifold includes an internal chamber which is large enough to completely house a conventional battery flame arrester and overpressure safety valve. In this manner, the vent manifold, when installed, lessens the likelihood of tampering with the flame arrester and safety valve.

6025088
LEAD-ACID BATTERY DESIGNED TO READILY RECEIVE CHARGING LEADS

William H. Kump, USA assigned to GNB Technologies Inc.

Herein is disclosed a lead-acid battery having terminals designed to readily receive charging leads. The battery terminal and the charging cable lead utilize complementary configurations which interlock and provide an intimate and reliable connection between the terminal and lead. More specifically, an interlocking connection formed by a lead having two parallel legs which slide into slots formed in the wall of the side terminal has proven to be particularly effective. The interlocking terminal–lead connections eliminate the need of threadingly engaging and disengaging fasteners or adapters during charging that are normally necessary for side terminal batteries.

6027832
LEAD ACID STORAGE BATTERY AND METHOD FOR PRODUCING THE SAME

Katsuhiro Takahashi, Tsuyoshi Hatanaka, Yoshiaki Nitta, Japan assigned to Matsushita Electric Industrial Company Ltd.

The invention provides a lead acid storage battery with a high utilization at a high rate discharge by incorporating a lead ion solubility adjusting agent into the electrolyte. The agent is selected from polysaccharides, chelating agents, their derivatives, and hydrazinium sulfate.

6030723
LEAD BUSHING AND LEAD STORAGE BATTERY WITH LEAD BUSHING

Takuji Nagano, Kiyoshi Ano, Japan assigned to Miyagawa Kasei Industry Company Ltd.

A lead bushing is mounted on a terminal post in a terminal socket of a storage battery top wall. The lead bushing is a

hollow tube that is completely closed at one end by an end wall, whereby external welding of the terminal post to the bushing is avoided.

FUEL CELL

6024848
ELECTROCHEMICAL CELL WITH A POROUS SUPPORT PLATE
Bryan Franz Dufner, Richard David Breault, USA assigned to International Fuel Cells Corporation

An improved electrochemical cell such as a fuel cell is disclosed including a porous support plate for enhancing transport of fluids throughout the cell and for enhancing capacitance and transient response capability of the cell. The electrochemical cell includes an electrolyte having opposed major surfaces with an anode and a cathode electrode supported in intimate contact with the opposed major surfaces. A porous support plate is secured adjacent each electrode, and each porous support plate includes a contact bi-layer in intimate contact with the electrode. Each contact bi-layer is comprised of a hydrophobic phase including a mixture of carbon black and a hydrophobic polymer defining a network of hydrophobic gas passages and each contact bi-layer also includes a hydrophilic phase including a mixture of carbon black and a proton exchange resin defining a network of hydrophilic liquid passages integrated throughout the contact bi-layer. Each porous support plate also includes a porous substrate layer adjacent and supporting the contact bi-layer. A method of manufacture of the porous support plate includes the steps of preparing a hydrophobic phase compound, preparing a hydrophilic phase compound, mixing and filtering the two compounds to form a contact bi-layer, and transferring the contact bi-layer onto a porous substrate layer to form a porous support plate. An alternative method includes an additional step of activating the contact bi-layer in an acid bath at controlled electrical potentials to enhance capacitance of the cell.

6025083
FUEL CELL GENERATOR ENERGY DISSIPATER
Stephen Emery Veyo, Jeffrey Todd Dederer, John Thomas Gordon, Larry Anthony Shockling, USA assigned to Siemens Westinghouse Power Corporation

An apparatus and method are disclosed for eliminating the chemical energy of fuel remaining in a fuel cell generator when the electrical power output of the fuel cell generator is terminated. During a generator shut down condition, electrically resistive elements are automatically connected across the fuel cell generator terminals in order to draw current, thereby depleting the fuel inventory in the generator. The invention provides a safety function in eliminating the fuel energy, and also provides protection to the fuel cell stack by eliminating overheating.

6030718
PROTON EXCHANGE MEMBRANE FUEL CELL POWER SYSTEM
William A. Fuglevand, Shiblihanna I. Bayyuk, Greg Alden Lloyd, Peter David De Vries, David R. Lott, John P. Scartozzi, Gregory M. Somers, Ronald G. Stokes, USA assigned to Avista Corporation

A proton exchange membrane fuel cell power system for producing electrical power is described, which includes a plurality of discrete fuel cell modules having at least two membrane electrode diffusion assemblies, each of the membrane electrode diffusion assemblies having opposite anode and cathode sides; a pair of current collectors are individually disposed in juxtaposed ohmic electrical contact with opposite anode and cathode sides of each of the membrane electrode diffusion assemblies; and individual force application assemblies apply a given force to the pair current collectors and the individual membrane electrode diffusion assemblies. The proton exchange membrane fuel cell power system also includes an enclosure mounting a plurality of subracks which receive the discrete fuel cell modules. Additionally, a control system is disclosed which optimizes the performance parameters of the discrete proton exchange membrane fuel cell modules.

BATTERY MATERIALS

6022643
BORON COMPOUNDS AS ANION BINDING AGENTS FOR NON-AQUEOUS BATTERY ELECTROLYTES
Hung Sui Lee, Xia-Oing Yang, James McBreen, Caili Xiang, USA assigned to Brookhaven Science Associates

Novel fluorinated boron-based compounds which act as anion receptors in non-aqueous battery electrolytes are provided. When added to non-aqueous battery electrolytes, the fluorinated boron-based compounds of the invention enhance ionic conductivity and cation transference number of non-aqueous electrolytes. The fluorinated boron-based anion receptors include borane and borate compounds bearing different fluorinated alkyl and aryl groups.

6025085
PROTON CONDUCTING SOLID POLYMER ELECTROLYTES PREPARED BY DIRECT ACID CASTING
Robert F. Savinell, Morton H. Litt, USA assigned to Case Western Reserve University

Herein is disclosed a method for casting solid polymer electrolyte membranes comprising proton conducting polymers stable at temperatures in excess of 100°C directly from acid solution. The invention further relates to the enhanced performance of these membranes with respect to conduc-

tivity. Particularly, the invention relates to the use of trifluoroacetic acid (TFA) as an acid solvent doped with H_3PO_4 from which polybenzimiadazole (PBI) solid polymer electrolyte membranes may be cast.

6025096
SOLID STATE POLYMERIC ELECTROLYTE FOR ELECTROCHEMICAL DEVICES

Stephen F. Hope, USA.

Herein is disclosed a solid state polymeric electrolyte which is formed by complexing an alkaline metal triflate salt and polyethylene oxide with an ester an ether or a pyrrolidinone and an ether, or two ethers of different boiling points as co-solvents to form a solid or semi-solid state electrolyte.

6025437
BLOCK-GRAFT COPOLYMER, SELF-CROSSLINKED POLYMER SOLID ELECTROLYTE AND COMPOSITE SOLID ELECTROLYTE MANUFACTURED THROUGH USE OF THE BLOCK-GRAFT COPOLYMER, AND SOLID CELL EMPLOYING THE COMPOSITE SOLID ELECTROLYTE

Kazuhiro Hirahara, Toru Nakanishi, Yoshinobu Isono, Atsushi Takano, Japan assigned to Shin-Etsu Chemical Company Ltd.

Herein are disclosed a self-crosslinked polymer solid electrolyte, a composite solid electrolyte, and a method for manufacturing the same. A block-graft copolymer composed of a polymer block chain A represented by formula I and a polymer block chain B represented by formula III is irradiated with a high-energy ray in order to crosslink the entire system. A nonaqueous electrolytic solution is then added to the block-graft polymer to obtain a self-crosslinked polymer solid electrolyte. The self-crosslinked polymer solid electrolyte and an electrically insulating material are combined to obtain a composite solid electrolyte.

6030724
HYDROGEN-STORAGE ALLOY AND ALKALI SECONDARY BATTERY USING THE SAME

Takao Sawa, Takamichi Inaba, Yumiko Takahashi Japan assigned to Kabushiki Kaisha Toshiba

A hydrogen-storage alloy containing as a component element thereof an element easily reactive with hydrogen to be selected from among the elements of Group 1A, Group 3A, and Group 4A in the Periodic Table of the Elements and having a quasi-crystalline phase as at least part of the component phases thereof. The quasi-crystalline phase has an element of axial rotation selected from among 5-, 8-, 10-, and 12-fold symmetric axis. The hydrogen-storage alloy exhibits outstanding resistance to corrosion, permits effective prevention of comminution, and further excels in terms of the abundance of hydrogen to be absorbed and released. An alkali secondary battery is composed of an anode containing an element easily reactive with hydrogen as one of the component elements thereof and further incorporating therein a hydrogen-storage alloy possessing a quasi-crystalline phase as at least part of the component phases thereof, a cathode such as of the Ni-type, for example, and a separator serving to separate the cathode and the anode. This alkali secondary battery can realize both elongation of service life and expansion of capacity.

6030725
NEGATIVE ELECTRODE FOR ALKALINE STORAGE BATTERIES

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

The present invention provides alkaline storage batteries whose high-rate discharge characteristic at low temperature, cycle life, and storage performance at high temperature are improved in good balance and the cost performance is superior even when the content of cobalt is made extremely low by using in the negative electrode consisting of hydrogen-absorbing alloy powders based on MmNi system alloys comprising $MmNi_5$ system alloy which remains mostly crystalline in phase when absorbing hydrogen and Mm_2Ni_7 system alloy which turns mostly amorphous in phase upon absorbing hydrogen.

6030727
ALKALINE BATTERY SEPARATOR AND PROCESS FOR PRODUCING THE SAME

Masanao Tanaka, Nobutoshi Tokutake, Japan assigned to Japan Vilene Company Ltd.

An alkaline battery separator comprising a hydrophilic nonwoven fabric obtainable from a fiber web prepared by a wet-laid method from (1) dividable composite fibers capable of producing polyolefin fine fibers, (2) high-strength fibers having a single-fiber strength of 5 g/denier or more, and (3) fusible fibers containing at least on a surface thereof a resin component having a melting point lower than the melting point of the dividable composite fibers and lower than the melting point of the high-strength fibers: by dividing the dividable composite fibers, entangling the fibers, and fusing the fusible fibers, to obtain a heat-fused and entangled nonwoven fabric, and imparting a hydrophilic property to the resulting heat-fused and entangled nonwoven fabric; wherein an average fiber length of the constituent fibers of the hydrophilic nonwoven fabric is 10 mm or more, is disclosed. The alkaline battery separator according to the present invention exhibits an excellent electrolyte-holding capacity, tensile strength, tear strength and bending resistance, and can be used to stably prepare a battery. An electrode flash rarely penetrates the separator to thereby cause a short circuit between electrodes.

LITHIUM BATTERIES

6022640
SOLID-STATE RECHARGEABLE LITHIUM BATTERY, STACKING BATTERY, AND CHARGING METHOD FOR THE SAME

Kazunori Takada, Makoto Fujino, Kazuya Iwamoto, Shigeo Kondo, Japan assigned to Matsushita Electric Industrial Company Ltd.

Here, a solid-state secondary lithium battery with excellent charge and discharge cycle characteristics, using a negative electrode active material which shows discontinuous change of potential caused by the lithium ion insertion and extraction reactions, wherein the amount of the lithium ion inserted, until discontinuous change of potential of the negative electrode takes place, is equal to or smaller than the maximum amount of extraction of lithium ions within the range where lithium ions are inserted and extracted into or from the lithium transition metal oxide reversibly, and a battery assembly using these batteries, are disclosed.

6022641
NON-AQUEOUS ELECTROLYTE SECONDARY CELL

Takuya Endo, Kimio Takahashi, Japan assigned to Sony Corporation

Disclosed is a non-aqueous electrolyte secondary cell comprising a cathode made from a cathode compound that comprises a manganese oxide or a lithium–manganese composite oxide, a lithium metal anode or an anode comprising lithium or capable of doping and dedoping lithium ions, and a non-aqueous electrolyte, which is characterized in that the cathode compound contains an alkali metal carbonate that is 0.5–20% by weight of the dry cathode compound. Even when used at high temperatures over room temperature for a long period of time, the cell is little deteriorated.

6022642
LITHIUM ION BATTERY CONTAINING AN ELECTRICALLY INSULATIVE FILM

Hisashi Tsukamoto, Shigeo Komatsu, Japan assigned to Japan Storage Battery Company Ltd.

A lithium ion battery includes a thin film of an electrical insulating material such as resin, a positive collector made of an electrically conductive thin film provided on one side of the said electrically insulative thin film, a positive compound layer provided on the said positive collector, a negative collector made of an electrically conductive thin film provided on the other side of the said electrically insulative thin film, a negative compound layer provided on the said negative collector, and an electrolyte film provided in contact with at least one of the said positive compound layer and the said negative compound layer.

6024773
METHOD FOR FABRICATING A LITHIUM ION SECONDARY BATTERY

Takayuki Inuzuka, Yasuhiro Yoshida, Michio Murai, Kouji Hamano, Hisashi Shiota, Shou Shiraga, Shigeru Aihara, Japan assigned to Mitsushita Denki Kabushiki Kaisha

A process for producing a lithium ion secondary battery which can have any arbitrary shape, such as a thin shape, and yet exhibit high performance, is provided. In a method for fabricating a battery comprising a positive electrode, a negative electrode, and a separator, a binder resin solution mainly comprising polyvinylidene fluoride is applied to the separator, and the positive electrode 1 and the negative electrode 4 are laid thereon, followed by drying to form a battery laminate, which is then impregnated with an electrolytic solution.

6024934
METHOD FOR PRODUCING POSITIVE ACTIVE MATERIAL OF LITHIUM SECONDARY BATTERY

Khalil Amine, Hideo Yasuda, Yuko Fujita, Japan assigned to Japan Storage Battery Company Ltd.

Lithium compound and nickel oxyhydroxide containing a transition metal (Me) such as V, Cr, Mn, Fe, Zn and Co are suspended in water or in an organic solvent, and the solution is reacted with each other in an autoclave by a hydrothermal method to thereby synthesize transition metal-containing lithium nickelate.

6025093
LITHIUM ION CELL

Rudolf Herr, Germany assigned to Varta Batterie Aktiengesellschaft

The invention relates to a lithium ion cell, comprising a positive electrode which contains a chalkogen compound, containing lithium, of a transition metal, a non-aqueous electrolyte and a negative electrode which is separator-isolated and contains carbon, which is characterized in that the cell contains lithium metal or a lithium alloy in a form physically separated from the electrodes, the lithium metal or the lithium alloy having a connection for the main lead of an electrode, and via the electrolyte, an ionic connection for the electrodes.

6027833
NONAQUEOUS ELECTROLYTE SECONDARY CELL

Naoki Ueda, Hiroshi Ueshima, Kazuaki Minato, Takehito Mitate, Kazuo Yamada, Naoto Nishimura, Japan assigned to Denso Corporation, Sharp Kabushiki Kaisha

A nonaqueous secondary cell comprises at least one pair of electrodes, and a separator provided between those two paired electrodes and impregnated with a nonaqueous electrolyte containing a mixed solvent of propylene carbonate and ethylene carbonate. At least one electrode out of the one pair of electrodes has, at least on surfaces thereof, an active substance layer made of composite carbon particles, which individually comprise a core of crystalline carbon and a low crystallinity or amorphous carbon layer formed on at least a part of the surfaces of the core, and a carbon matrix covering at least a part of the composite carbon particles and uniformly dispersing and holding the composite carbon particles therein.

6030421
ULTRA THIN SOLID STATE LITHIUM BATTERIES AND PROCESS OF PREPARING THE SAME

Michel Gauthier, Ginette Lessard, Guy Vassort, Patrick Bouchard, Alain Vallee, Michel Perrier, Canada assigned to Hydro-Quebec

Herein is provided a mother battery containing at least the following films: an anode of metallic lithium or sodium, a polymer electrolyte which is conductive towards the alkaline ions of the anode and also acts as a separator between the electrodes, and a composite cathode consisting of a compound which is reducible to lithium or sodium, an additive of electronic conduction and a polymer electrolyte binder. The mother battery also includes an electronically conductive thin coating on the external face of the anode and possibly on the external face of the cathode too, in which the conductive material is chemically inert towards the electrode material and which also serves to establish permanent electrical contacts on the external faces. The laminated mother battery having a larger surface area and which is at least partially charged is thereafter subjected to a sharp mechanical cutting out to give thin polymer electrolyte batteries with lithium or sodium anode. The thus cut out batteries substantially preserve their voltage after mechanical cutting out, which is recovered by a mechanism of self-healing.

6030719
LITHIUM ION ELECTROLYTIC CELL HAVING A CONTROLLED ELECTRODE SURFACE INTERFACE

Denis G. Fauteux, Jie Shi, Kazuko Otani, Eitaro Takahashi, Kenji Okahara, Japan assigned to Mitsubishi Chemical Corporation

The present invention is directed to a lithium ion electrolytic cell having a controlled electrode surface interface, and an associated electrochemical process. The lithium ion electrolytic cell includes an electrode with a carbonaceous surface and a passivating layer, and an electrolyte having a solvent. The passivating layer includes lithium, carbon and at least one of an additive or the product of interaction of the additive with the carbonaceous surface. The passivating layer has, as measured by X-ray photoelectron spectroscopy, a relative thickness index within the range from about 10 to about 90, and a lithium ion content index in the range from about 0.1 to about 0.7.

6030720
LIQUID ELECTROLYTE LITHIUM–SULFUR BATTERIES

May-Ying Chu, Lutgard C. De Jonghe, Steven J. Visco, Bruce D. Katz, USA assigned to PolyPlus Battery Company Inc.

Disclosed are electrolyte solvents for ambient-temperature lithium–sulfur batteries. The disclosed solvents include at least one ethoxy repeating unit compound of the general formula $R_1(CH_2CH_2O)_nR_2$, where n ranges between 2 and 10 and R_1 and R_2 are different or identical alkyl or alkoxy groups (including substituted alkyl or alkoxy groups). Alternatively, R_1 and R_2 may together with $(CH_2CH_2O)_n$ form a closed ring. Examples of linear solvents include the glymes ($CH_3O(CH_2CH_2)_nCH_3$). Some electrolyte solvents include a donor or acceptor solvent in addition to an ethoxy compound as described. Examples of donor solvents include hexamethylphosphoramide, pyridine, *N*,*N*-diethylacetamide, *N*,*N*-diethylformamide, dimethylsulfoxide, tetramethylurea, *N*,*N*-dimethylacetamide, *N*,*N*-dimethylformamide, tributylphosphate, trimethylphosphate, *N*,*N*,*N*′,*N*′-tetraethylsulfamide, tetramethylenediamine, tetramethylpropylenediamine, and pentamethyldiethylenetriamine. These assist in solvation of the lithium ions. Examples of acceptor solvents include alcohols, glycols, and polyglycols. These assist in solvation of the sulfide and polysulfide anions.

6030726
LITHIUM SECONDARY BATTERY HAVING NEGATIVE ELECTRODE OF CARBON MATERIAL WHICH BEARS METALS

Seiji Takeuchi, Hidetoshi Honbo, Yasushi Muranaka, Shuko Yamauchi, Masanori Yoshikawa, Japan assigned to Hitachi Ltd.

A lithium secondary battery having a high energy density, a long life, a low cost, an improved safety and a high output density uses a high crystalline carbon or an amorphous carbon bearing fine particles of a metal which forms an alloy with lithium, and a metal which does not form any alloy with lithium, in the range of 5–10% by weight, as a material for the negative electrode thereof.

6030728
HIGH PERFORMANCE LITHIUM POLYMER ELECTROLYTE BATTERY

John M. Cotte, Madhav Datta, USA 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 is disclosed. The battery utilizes a solid polymer electrolyte membrane that preferably has a polyacrylonitrile matrix. Performance of the electrolyte membrane is optimized by controlling the amount of aprotic organic solvents within the membrane within a prescribed range of ratios. The battery cathode is encapsulated within a polymeric matrix that eliminates the exposure hazard posed by lithium intercalation compounds used within the cathode. Use of stainless steel foil current collectors gives a high open circuit voltage of 3.8 V and high cell capacity. A method for determining the optimum cathode thickness in the battery is also described. This provides a means of maximizing volumetric and gravimetric energy densities by using the optimum amount of cathode material. Batteries fabricated by using optimal materials can be operated under pulsed and dc discharge conditions over a temperature range between about -40 and $+80^{\circ}$C.

NICKEL METAL HYDRIDE BATTERIES

6025095
BATTERY ELECTRODE AND MANUFACTURING METHOD THEREOF

Hiroshi Kawamura, Japan assigned to Japan Storage Battery Company Ltd.

After a band-like nickel fiber felt is joined to the surface of a belt-shaped punching metal having a large number of openings and sintered, the positive electrode active material is carried on the nickel fiber felt to fabricate a positive electrode.

6027834
NICKEL POSITIVE ELECTRODE AND ALKALINE STORAGE BATTERY USING THE SAME

Kiyoshi Hayashi, Katsuyuki Tomioka, Nobuyasu Morishita, Munehisa Ikoma, Japan assigned to Matsushita Electric Industrial Company Ltd.

For providing an alkaline storage battery having a high energy density in a broader temperature range, the charge efficiency of a nickel positive electrode at the time of charging at high temperatures is enhanced by incorporating verbium and at least two elements selected from the group consisting of yttrium, and ytterbium in the form of a compound and further at least one element selected from the group consisting of lanthanum, praseodymium, neodymium, samarium, gadolinium, terbium, dysprosium, holmium, thulium, cerium, promethium, europium, and lutetium in the form of a compound into a positive electrode paste containing a major component of nickel oxide as an active material.

COMPONENTS AND/OR CHARGERS

6023150
OPTIMIZED METHOD FOR DETERMINING REMAINING LIFE CYCLES IN A RECHARGEABLE BATTERY

Joseph Patino, Russell L. Simpson, USA assigned to Motorola Inc.

A method for estimating existing and/or remaining life cycles of a battery pack having an internal battery cell and battery pack circuitry is based on determining an impedance value of the internal battery cell (Zcell), measuring the battery pack temperature, compensating the internal battery cell impedance based on the temperature, and estimating the remaining battery life based on the compensated internal battery cell impedance. The estimated life cycle value is then communicated to a user through either a charger or a radio.

OTHER BATTERIES

6022637
HIGH TEMPERATURE BATTERY

John T.R. Wilson, USA.

A high temperature battery of one or more cells is disclosed in which each cell is made by holding an anode electrode and a cathode electrode, of different metallic substances, together through a fused flux wetted to an electrode, whose fused flux is an electrolyte, to make an anode-to-cathode contact, and the anode-to-cathode contact is heated, by a heat source, to a high temperature range above a threshold temperature to generate voltaic voltage, in excess of any thermoelectric voltage; such batteries with electrodes of various mechanical configurations are disclosed. The flux, such as borax, may have powdered, vegetable-growth ashes or powdered chemical constituents of ashes, such as lithium carbonate, added to the flux or to the electrolyte to catalyze or improve the current-generating capability of the battery. The preferred anode substance is aluminum, and the preferred cathode substance is copper. With the preferred cathode and anode substances and a fused borax flux between the cathode and anode, the open circuit voltage generated per cell when heated increases from 0.05 V at 304°C to 1.3 V at 651°C; the threshold temperature in this case is 279°C. Also disclosed is means to move the anode metal with respect to the cathode metal, when the electrolyte is fluid, for changing the battery characteristics.

6027827
ORGANIC NITRITE ADDITIVES FOR NONAQUEOUS ELECTROLYTE IN ALKALI METAL ELECTROCHEMICAL CELLS

Hong Gan, Esther S. Takuchi, USA assigned to Wilson Greatbatch Ltd.

An alkali metal, solid cathode, nonaqueous electrochemical cell capable of delivering high current pulses, rapidly recovering its open circuit voltage and having high current capacity, is described. The stated benefits are realized by the addition of at least one nitrite additive to an electrolyte comprising an alkali metal salt dissolved in a mixture of a low viscosity solvent and a high permittivity solvent. A preferred solvent mixture includes propylene carbonate, dimethoxyethane and an alkyl nitrite additive.

LEAD ACID

6037081
EXPANDED GRID FOR ELECTRODE PLATE OF LEAD-ACID BATTERY
Go Kashio, Yasuyuki Yoshihara, Japan assigned to Matsushita Electric Industrial Company Ltd.

A slit is formed in a clad sheet integrating a thin layer of lead alloy containing at least one of tin and antimony at least on one side of a parent material made of lead or lead–calcium system alloy. The clad sheet is processed by expanding to twist the rib of the formed grid, and the thin layer of the lead alloy containing at least one of tin and antimony is spirally oriented in multiple directions, as the positive electrode plate. An expanded grid is thus formed. In this manner, charging reception characteristics after long-term storage following deep discharge at high temperature of a lead-acid battery are improved.

FUEL CELLS

6033794
MULTI-STAGE FUEL CELL SYSTEM METHOD AND APPARATUS
Thomas J. George, William C. Smith, USA assigned to The United States of America as represented by the United States Department of Energy

A high-efficiency, multi-stage fuel cell system method and apparatus are provided. The fuel cell system is comprised of multiple fuel cell stages, whereby the temperatures of the fuel and oxidant gas streams and the percentage of fuel consumed in each stage are controlled to optimize fuel cell system efficiency. The stages are connected in a serial, flow-through arrangement such that the oxidant gas and fuel gas flowing through an upstream stage are conducted directly into the next adjacent downstream stage. The fuel cell stages are further arranged such that unspent fuel and oxidant-laden gases too hot to continue within an upstream stage because of material constraints are conducted into a subsequent downstream stage which comprises a similar cell configuration, but which is constructed from materials having a higher heat tolerance and designed to meet higher thermal demands. In addition, fuel is underutilized in each stage, resulting in a higher overall fuel cell system efficiency.

6037072
FUEL CELL WITH METAL SCREEN FLOW FIELD
Mahlon S. Wilson, Christine Zawodzinski, USA assigned to Regents of the University of California

A polymer electrolyte membrane (PEM) fuel cell is provided with electrodes supplied with a reactant on each side of a catalyzed membrane assembly (CMA). The fuel cell includes a metal mesh defining a rectangular flow-field pattern having an inlet at a first corner and an outlet at a second corner located on a diagonal from the first corner, wherein all flow paths from the inlet to the outlet through the square flow field pattern are equivalent to uniformly distribute the reactant over the CMA. In a preferred form of metal mesh, a square weave screen forms the flow-field pattern. In a particular characterization of the present invention, a bipolar plate electrically connects adjacent fuel cells, where the bipolar plate includes a thin metal foil having an anode side and a cathode side; a first metal mesh on the anode side of the thin metal foil; and a second metal mesh on the cathode side of the thin metal foil. In another characterization of the present invention, a cooling plate assembly cools adjacent fuel cells, where the cooling plate assembly includes an anode electrode and a cathode electrode formed of thin conducting foils; and a metal mesh flow field there between for distributing cooling water flow over the electrodes to remove heat generated by the fuel cells.

6037073
BIPOLAR PLATE/DIFFUSER FOR A PROTON EXCHANGE MEMBRANE FUEL CELL
Theodore M. Besmann, Timothy D. Burchell, USA assigned to Lockheed Martin Energy Research Corporation

A combination bipolar plate/diffuser fuel cell component includes an electrically conducting solid material having: a porous region having a porous surface; and a hermetic region, the hermetic region defining at least a portion of at least one coolant channel, the porous region defining at least a portion of at least one reactant channel, the porous region defining a flow field medium for diffusing the reactant to the porous surface.

6037076
MOLTEN CARBONATE FUEL CELL AND METHOD OF MANUFACTURING RETAINING MATERIAL FOR ELECTROLYTE BODY OF MOLTEN CARBONATE FUEL CELL
Norihiro Tomimatsu, Hideyuki Ohzu, Yoshihiro Akasaka, Kazuaki Nakagawa, Japan assigned to Kabushiki Kaisha Toshiba

A molten carbonate fuel cell comprises a fuel electrode, an oxidizing agent electrode, and an electrolyte body prepared by impregnating a porous body including a retaining material and a reinforcing material with an electrolyte containing