

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

6004695

NON-AQUEOUS SECONDARY BATTERY

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

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

6007943

HIGH TEMPERATURE ELECTROCHEMICAL CELL WITH MOLTEN ALKALI METAL ANODE

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

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

LEAD ACID

6014798

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

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

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

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

6017653

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

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

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

FUEL CELL

6010798

PEM FUEL CELL

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

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

6013385

FUEL CELL GAS MANAGEMENT SYSTEM

Ronald Arthur DuBose; Marietta, USA assigned to Emprise Corporation

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

retention system for maintaining the total enthalpy of the anode stream exiting the fuel cell equal to the total enthalpy of the anode inlet stream; and a cooling water management system having segregated deionized water and cooling water loops interconnected by means of a brazed plate heat exchanger.

6013386

SOLID OXIDE FUEL CELLS WITH SPECIFIC ELECTRODE LAYERS

Robert Glyn Lewin; Stephen Vernon Barnett; Geoffrey Alan Wood; Preston, GREAT BRITAIN assigned to British Nuclear Fuels

A solid oxide fuel cell and method of production are provided. The cell may have a layer of electrolyte material and a first and second electrode on either side thereof. The electrodes are separated from the electrolyte by separator layers which are a mixed conductor. The fuel cell may be used in a stack.

6015633

FLUID FLOW PLATE FOR WATER MANAGEMENT, METHOD FOR FABRICATING THE SAME, AND FUEL CELL EMPLOYING THE SAME

Charles M. Carlstrom Jr.; William P. Acker; Clifton Park, Rexford, USA assigned to Plug Power

A fluid flow plate includes a generally porous portion and a generally non-porous portion, which together form on a first surface of the plate, a flow channel having at least one turn for distributing a reactant gas in a fuel cell. The porous portion defines an outer lateral portion of the at least one turn. Such fluid flow plate(s) provide a water management scheme for a fuel cell and/or fuel cell assembly in which the turn(s) in a flow channel of the fluid flow plate(s) are used for multi-point per flow channel addition, removal, and/or redistribution of water for regulation of the humidity of a stream of reactant gas for membrane hydration and/or cooling. Desirably, for removal of water, the inertia of large water droplets moving along with the reactant gas through the flow channel impact the porous portion which forms the outer lateral portion of the turn(s).

6015634

SYSTEM AND METHOD OF WATER MANAGEMENT IN THE OPERATION OF A FUEL CELL

Leonard J. Bonville Jr.; Deliang Yang; Marlborough, Vernon, USA assigned to International Fuel Cells

A PEM fuel cell system includes a PEM fuel cell that has an input and output port each for fuel or reformat, process air and coolant. A predetermined fraction of volume of moistened exhaust air leaving the air output port of the fuel cell is diverted back and combined with fresh air at ambient

temperature entering the air input port of the PEM fuel cell to maintain water balance in the fuel cell at high ambient operating temperatures. The recycle-to-air vent ratio is controlled by a processor which adjusts the recycle flow based on the ambient temperature and the power level of the fuel cell.

6015635

ELECTRODE FOR FUEL CELL AND METHOD OF MANUFACTURING ELECTRODE FOR FUEL CELL

Tatsuya Kawahara; Toyota, JAPAN assigned to Toyota Jidosha Kabushiki Kaisha

In a catalyst electrode, a plurality of catalyst clusters and a plurality of electrolyte clusters are connected and entwined with each other. Each catalyst cluster is formed by aggregation of a plurality of carbon particles with a catalyst 34 carried thereon, and the surface of the catalyst cluster is coated with an electrolyte layer. Each electrolyte cluster is formed by aggregation of an electrolyte. A supply of ions is fed to the catalyst for the electrochemical reaction via the electrolyte layer. The electrolyte clusters, on the other hand, ensure the pathway of ions moving from an electrolyte film towards a gas diffusion electrode. This arrangement of the present invention does not require the thick electrolyte layer for ensuring sufficient transmission of ions but enables a sufficient amount of gas (oxygen) to be fed into the catalyst.

6017646

PROCESS INTEGRATING A SOLID OXIDE FUEL CELL AND AN ION TRANSPORT REACTOR

Ravi Prasad; Christian Friedrich Gottzmann; Nitin Ramesh Keskar; East Amherst, Clarence, Grand Island, USA assigned to Praxair Technology Inc.

Herein is disclosed an integrated system utilizing a solid oxide fuel cell and at least one ion transport reactor to generate electric power and a product gas by delivering an oxygen-containing gas, typically air, to a first cathode side of the solid oxide fuel cell and delivering a gaseous fuel to a first anode side. Oxygen ions are transported through a membrane in the fuel cell to the first anode side and exothermally reacted with the gaseous fuel to generate electric power and heat. The heat and oxygen transport produces a higher-temperature, reduced-oxygen content gaseous retentate stream exiting the cathode side of the solid oxide fuel cell which is delivered to a first ion transport reactor where a substantial portion of the residual oxygen is transported through an oxygen-selective ion transport membrane. A product gas stream is then recovered.

6017649

MULTIPLE STEP FUEL CELL SEAL

Joseph M. Pondo; Bolingbrook, USA assigned to M-C Power Corporation

Herein is disclosed a separator plate for fuel cell stack comprising a multiple-step peripheral wet seal structure and a multiple-step manifold wet seal structure which utilizes lateral and vertical material displacement resulting from the application of cell clamping forces to provide improved fuel cell and stack reactant gas sealing.

6017650

**GAS-DIFFUSION ELECTRODES FOR
POLYMERIC MEMBRANE FUEL CELL**

Enrico Ramunni; Manfred Kienberger; S. Donato Milanese; Dietzenbach, GERMANY assigned to De Nora S.p.A.

The present invention describes an improved electrode suitable for application in solid polymer electrolyte fuel cells, comprising a thin, porous, planar, conductive substrate having one side coated with a pre-layer consisting of conductive carbon having a low surface area mixed with a first hydrophobic agent, to which is applied a catalytic layer consisting of platinum supported on conductive carbon with a high surface area, mixed with a second hydrophobic agent. The hydrophobic degree of the applied layers are suitably adjusted to obtain the best exploitation of the catalyst and to improve the water balance of the process.

6020083

**MEMBRANE ELECTRODE ASSEMBLY
FOR PEM FUEL CELL**

Richard D. Breault; Myron Krasij; No. Kingstown, Avon, USA assigned to International Fuel Cells

An improved membrane electrode assembly for PEM fuel cells is provided. Catalyst layers are disposed, respectively, on both sides of the full planform proton exchange membrane. Gas diffusion layers are disposed, respectively, on sides of the catalyst layers not in communication with the full planform proton exchange membrane. Porous substrates are disposed, respectively, on sides of the gas diffusion layers not in communication with the catalyst layers. The porous substrates are impregnated at their periphery with a sealant. The gas diffusion layers are coated with a sealant on respective sides thereof in regions which are in communication with sealant-impregnated regions of the porous substrates. The gas diffusion layers, the porous substrates, and the catalyst layers are co-extensive with the proton exchange membrane. The membrane electrode assembly is continuously manufactured to eliminate step discontinuities and the associated strict tolerance requirements and resultant high scrap rates.

BATTERY MATERIALS

6010582

**PROCESS FOR PRODUCING A
HYDROGEN-OCCLUSION ALLOY ELECTRODE
FOR AN ALKALINE STORAGE BATTERY**

Tadashi Ise; Hiroshi Fukuda; Nobuyasu Ishimaru; Tokushima, JAPAN assigned to Sanyo Electric Company Ltd.

An objective of the present invention is to provide a method for producing a hydrogen-absorbing alloy electrode for an alkaline storage battery which is efficient and effective enough to improve the performance of the battery. The method according to the present invention comprises the steps of: preparing a powdery hydrogen-absorbing alloy; and washing the powdery hydrogen-absorbing alloy with a strong acid solution and then with a weak acid solution having a higher pH value than the strong acid solution for a two-stage acid treatment.

6013113

**SLOTTED INSULATOR FOR UNSEALED
ELECTRODE EDGES IN ELECTROCHEMICAL
CELLS**

Mark L. Mika; Newfane, USA assigned to Wilson Greatbatch Ltd.

In the fabrication of conventional spirally wound cells, a length of separator is provided at least twice as long as one of the electrodes, for example, the cathode, and then folded to cover both sides of the electrode. The separator is also somewhat wider than the covered electrode to extend beyond the upper and lower edges thereof. The cathode assembly is then placed along side a strip of the anode material and rolled into a jellyroll configuration. The separator sheet is not sealed at the opposed upper and lower edges of the cathode, and during high shock and vibration conditions, the edges tend to mushroom, which can lead to short circuit conditions. The insulator of the present invention is a slotted member that covers the upper and lower edges of the other electrode not covered by the separator, for example, the anode with the anode leads extending through the slots to shield them from short circuit conditions with the cell casing or other leads if the cell should be subjected to severe shock forces and the like.

6013192

**SODIUM HYDROXIDE COMPOSITIONS FOR
USE IN BATTERY SYSTEMS**

Steven P. Tucker; Raymond W. Roberts; Eric G. Dow; James R. Moden; Portsmouth, Esmond, Barrington, Bristol, USA assigned to The United States of America as represented by the Secretary of the Navy

The present invention relates to a dry composition of materials to be used in a battery system. The dry composition comprises a mixture consisting of sodium hydroxide and sodium oxide. In a first reservoir in the battery system, the mixture is present in an amount sufficient to form with water a heated sodium hydroxide electrolyte solution having a 15% by weight concentration of sodium hydroxide. In a second reservoir in the battery system, the mixture is present in an amount sufficient to form with water a heated sodium hydroxide electrolyte solution having to up to an about 75% by weight concentration of sodium hydroxide. The present

invention also relates to a battery system and a method for generating electrical power which utilize the aforementioned dry composition of materials.

6015637

PROCESS OF PRODUCING LITHIUM NICKEL OXIDE AND NONAQUEOUS SECONDARY BATTERY USING THE SAME

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

Herein is disclosed a process of preparing lithium nickel oxide as a positive electrode active material comprising: dissolving a water-soluble lithium compound and a water-soluble nickel compound in water to prepare a homogeneous aqueous solution; co-precipitating, from the aqueous solution, a lithium salt and a nickel salt which are slightly soluble in water; isolating the resulting co-precipitate and calcining the co-precipitate to obtain lithium nickel oxide.

6015638

BATTERIES, CONDUCTIVE COMPOSITIONS, AND CONDUCTIVE FILMS CONTAINING ORGANIC LIQUID ELECTROLYTES AND PLASTICIZERS

Susanna C. Ventura; Subhash C. Narang; Georgina Hum; Peikang Liu; Prema Ranganathan; Luying Sun; Los Altos, Redwood City, Menlo Park, Cupertino, Stoughton, USA assigned to SRI International

Novel liquid electrolyte plasticizers having enhanced ambient temperature conductivity are provided. These plasticizers have the following general structures in which R^a , R^b , R^c , R^e , R^f , R^i , α , β , γ , l , p and q are as defined herein. Also provided are conductive compositions containing these novel plasticizers, particularly film compositions, and batteries formulated with such compositions.

6019908

ION-CONDUCTIVE POLYMER ELECTROLYTE

Michiyuki Kono; Kenji Motogami; Shigeo Mori; Neyagawa, Takatsuki, Kyoto, JAPAN assigned to Dai-Ichi Kogyo Seiyaku Company Ltd.

An ion-conductive polymer electrolyte comprises an organic polymer, a soluble electrolyte salt and an organic solvent. The organic polymer is a compound obtained by cross-linking an organic compound having an average molecular weight of 500–50,000 and a structure of the following general formula 1, in which Z is a residue of a compound having at least one active hydrogen; Y is an active hydrogen group or polymerizable functional group; k is an integer in the range 1–12; E is a structure of the following general formula 2, wherein p is an integer in the range 0–25 and R is

an alkyl, alkenyl, aryl or alkylaryl group having 1–20 carbon atoms; A is $-(CH_2-CH_2-O)-$; m is an integer in the range 1–220; n is an integer in the range 1–240 and $m + n \geq 4$; and E and A are random-copolymerized. The organic solvent is at least one selected from the group consisting of tetrahydrofuran, 2-methyltetrahydrofuran, 1,3-dioxolan, 4,4-dimethyl-1,3-dioxolan, γ -butyrolactone, ethylene carbonate, propylene carbonate, butylene carbonate, sulfolan, 3-methylsulfone, *tert*-butyl ether, iso-butyl ether, 1,2-dimethoxyethane, 1,2-ethoxymethoxyethane and ethylene glycol diethyl ether.

6020087

POLYMER ELECTROLYTES CONTAINING LITHIATED FILLERS

Feng Gao; Henderson, USA assigned to Valence Technology Inc.

Herein is provided a method of improving the structural integrity of polymer electrolytes of electrochemical cells by employing lithiated fillers that are represented by the formula $Li_{16-2x}D_x(TO_4)_4$ where $0 < x < 4$, D is Zn or Mg and T is Si or Ge.

6020089

ELECTRODE PLATE FOR BATTERY

Keizo Harada; Masayuki Ishii; Kenichi Watanabe; Shosaku Yamanaka; Itami, JAPAN assigned to Sumitomo Electric Industries Ltd.

An electrode plate for a battery is constructed from a porous metal body having at least one low-porosity part selectively arranged therein. A porous resin core is coated with a paste having a metal component, passed through rolls provided with at least one recess to thereby form at least one low-porosity part and sintered. The resultant electrode plate for a battery is not only ensured with respect to strength and capable of improving battery performance but also advantageous in that it is available at lowered cost and free from apprehension of supply of raw materials.

LITHIUM BATTERIES

6013393

IONIC CONDUCTIVE POLYMER GEL AND LITHIUM-ION BATTERY USING THE SAME

Masahiro Taniuchi; Tomohiro Inoue; Toshiyuki Kabata; Toshiyuki Ohsawa; Okitoshi Kimura; Yokohama, Sagami-hara, Kawasaki, JAPAN assigned to Ricoh Company Ltd.

An ionic conductive polymer gel for secondary battery includes an electrolyte salt component which includes a sulfonated derivative with formula (A): wherein X is N, C, B, O or $-C(R^2)_m-$ in which R^2 is a hydrogen atom, an alkyl group having 1–12 carbon atoms, and m is an integer in the range 1–2; R^1 is a halogenated alkyl group having 1–12 carbon atoms; and n is an integer in the range 1–3; a non-

aqueous solvent; and a polymer matrix prepared by polymerizing a polymerizable material comprising at least one acrylate monomer with a molecular weight of 1000 or less, in the presence of the electrolyte salt component and the non-aqueous solvent. A lithium-ion battery utilizes the ionic conductive polymer gel.

6017651

METHODS AND REAGENTS FOR ENHANCING THE CYCLING EFFICIENCY OF LITHIUM POLYMER BATTERIES

Yevgeniy S. Nimon; May-Ying Chu; Steven J. Visco; Walnut Creek, Oakland, Berkeley, USA assigned to PolyPlus Battery Company Inc.

Batteries including a lithium electrode and a sulfur counter electrode that demonstrate improved cycling efficiencies are described. In one embodiment, an electrochemical cell having a lithium electrode and a sulfur electrode including at least one of elemental sulfur, lithium sulfide, and a lithium polysulfide is provided. The lithium electrode includes a surface coating that is effective for increasing the cycling efficiency of the said electrochemical cell. In a more particular embodiment, the lithium electrode is in an electrolyte solution, and more particularly, an electrolyte solution including either elemental sulfur, a sulfide, or a polysulfide. In another embodiment, the coating is formed after the lithium electrode is contacted with the electrolyte. In a more particular embodiment, the coating is formed by a reaction between the lithium metal of the lithium electrode and a chemical species present in the electrolyte.

6017654

CATHODE MATERIALS FOR LITHIUM-ION SECONDARY CELLS

Prashant Nagesh Kumta; Chun-Chieh Chang; Mandyam Ammanjee Sriram; Pittsburgh, Beaverton, USA assigned to Carnegie Mellon University

Crystalline lithiated transition metal oxide materials having a rhombohedral R-3m crystal structure include divalent cations selected and added in amounts so that all or a portion of the divalent cations occupy sites in transition metal atom layers within the materials' crystal lattice. The lithiated transition metal oxides are useful as cathode materials in lithium-ion secondary cells. The materials include, but are not limited to, $\text{Li}_{1+x}\text{Ni}_{1-y}\text{M}_y\text{N}_x\text{O}_{2(1+x)}$ and $\text{Li}_1\text{Ni}_{1-y}\text{M}_y\text{N}_x\text{O}_p$, wherein M is a transition metal selected from among titanium, vanadium, chromium, manganese, iron, cobalt, and aluminum, and N is a Group II element selected from among magnesium, calcium, strontium, barium, and zinc. The materials provide improved cyclability and high voltage capacity as cathodes in lithium-ion secondary cells. Processes for producing the divalent cation-containing lithium transition metal oxide materials of the invention are also disclosed.

6018229

LITHIUM-ION BATTERY PACK WITH INTEGRAL SWITCHING REGULATOR USING CUTOFF TRANSISTOR

Nathan Mitchell; Joseph F. Freiman; Thomas Sawyers; The Woodlands, Cypress, Houston, USA assigned to Compaq Computer Corporation

Herein is disclosed a sealed rechargeable lithium-ion battery pack which includes a switching voltage regulator. The regulator uses the normal cutoff transistors as the switching devices, and also includes a discrete inductor in the battery pack. The regulator is operated with programmable voltage and current parameters, under control of a microcontroller which is also inside the sealed battery pack enclosure.

6019801

ADDITIVES FOR LUBRICATING AGENTS USED IN THE LAMINATION OF LITHIUM SHEETS INTO THIN FILMS

Michel Gauthier; Patrick Bouchard; Paul-Emile Guerin; Michel Armand; La Prairie, Fleurimont, Cap-De-La-Madeleine, Grenoble, FRANCE assigned to Hydro-Quebec

These additives are represented by the following general formula: in which L designates a hydrocarbon radical which serves as a lubricating segment; S designates an oligomer segment which serves as a solvating segment of metallic salts and Y designates a chemical bond which joins the hydrocarbon radical and the oligomer segment. With these additives, there is no longer any need to subsequently wash the surface of laminated lithium.

NICKEL METAL HYDRIDE BATTERIES

6013387

HYDROGEN ABSORBING ALLOY FOR BATTERY APPLICATION

Li-Ho Yao; Yongchang Huang; Wenhua Liu; Taipei, Shanghai, Beijing, CHINA assigned to Li-Ho Yao

A hydrogen absorbing alloy is disclosed for use as the negative electrode in alkaline batteries. The general formula of the alloy is AB_xM_y , wherein A is either the rare earth element La or a mischmetal thereof; B is selected from the group consisting of Ni, Fe, Mn, Cr, Cu, Co, and mixtures thereof; M is selected from the group consisting of Al, In, Zn, Sn, Ga, Si, Ge, Bi, and mixtures thereof; $4.5 \leq x \leq 5.5$; and $0.3 < y \leq 0.6$. This alloy has a longer cycle life, along with larger capacity and better reactivity.

6020722

TEMPERATURE-COMPENSATED VOLTAGE-LIMITED FAST CHARGE OF NICKEL CADMIUM AND NICKEL METAL HYDRIDE BATTERY PACKS

Joseph F. Freiman; Cypress, USA assigned to Compaq Computer Corporation

Herein is disclosed a method for charging nickel metal hydride and comparable batteries; in which the applied voltage is clamped to a temperature-dependent and current-dependent value which is greater than the constant voltage during most of the charging cycle; but less than any voltage at which gassing can occur.

COMPONENTS AND/OR CHARGERS

6014014

STATE OF CHARGE OF MEASURABLE BATTERIES

Geraint Owen; Timothy F. Myers; Palo Alto, Philomath, USA assigned to Hewlett-Packard Company

A storage device allows the state of charge of a main battery to be determined by measuring the state of charge of a dummy battery. The storage device may provide power to an electronic appliance such as a portable computer. The main and dummy batteries each have a storage capacity and a self-discharge rate. The storage capacity of the dummy battery is less than the storage capacity of the main battery; for example, the storage capacity of the dummy battery may be only about 1% of that of the main battery. The main and dummy batteries are configured so that the self-discharge rates thereof are substantially equal. The storage device also includes discharge circuitry which is configured so that the dummy battery discharges at a rate faster than the main battery when a load is connected to and drawing current from the main battery.

6016047

BATTERY MANAGEMENT SYSTEM AND BATTERY SIMULATOR

Petrus H.L. Notten; Hendrik J. Bergveld; Wanda S. Kruijt; Eindhoven, THE NETHERLANDS assigned to US Philips Corporation

A battery management system comprises input means for receiving input signals, such as current or voltage, which represent a physical quantity of a battery. In operation, processing means 105 of the battery management system calculates a physical quantity of the battery, such as the state of charge, based on the input signals by using an electrochemical/physical model of the battery. The model includes a representation of a main electrochemical storage reaction, whose behaviour is calculated in dependence on the battery temperature. The processing means 105 calculates the battery temperature based on a temperature model of the temperature development in the battery. The battery management system comprises output means for outputting an output signal which is derived from a state of the electrochemical storage reaction. The battery management system is advantageously used in a smart battery or a battery charger/discharger. The model is advantageously used in a battery simulator also.

OTHER BATTERIES

6010799

CATHODE MEMBER FOR WATER-ACTIVATED STORAGE BATTERY

Ash Jafri; Richmond Hill, CANADA assigned to Prosar Technologies

Disclosed is a water-activated battery, comprising an anode member and a cathode member which comprises a cuprous halide, graphite, and at least a Group IV–Group VIII transition metal salt of a chalcogen-containing acid, and can additionally include a 200–400 mesh metal powder.

6010801

CYLINDRICAL STORAGE BATTERY

Hisao Nakamaru; Norio Suzuki; Toshihide Eguchi; Masato Onishi; Kamakura, Chigasaki, Fujisawa, JAPAN assigned to Matsushita Electric Industrial Company Ltd.

A cylindrical storage battery has a spirally coiled electrode plate assembly in which the shape of the current collector welded to the end part of the electrode plate assembly and the crossing parts of the rib-formed projections of the current collector and the electrode plate terminal edges are welded with sufficient strength to permit a high-rate charge and discharge. A storage battery having a spirally coiled electrode plate assembly includes a positive electrode plate, a negative electrode plate, a separator, and rectangular current collectors, respective ones of which are welded, respectively, to terminal edges of the electrodes, respectively, projecting outward from the upper and the lower end planes of the electrode assembly. The current collector welded to the end part of the electrode plate assembly has a flat plate part provided with rectangular cutout parts, in a radial manner and with equal intervals between them at four places, and which extend from the neighborhood of the center to the outer peripheral edge of the plate part, and rib-formed projections which are formed integrally, bent downward, at the two opposed edge parts of the respective cutout parts and are made to cross the terminal edge of the electrode plate and are welded thereto.

6010806

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

Keiichi Yokoyama; Sodegaura, 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 dissolve organic substances well and have a wide application

temperature range. These compounds are excellent in charge and discharge cycle characteristics, have a high flash point, and are safe as non-aqueous electrolytes, and hence, batteries using these compounds are excellent in withstanding voltage and in charge and discharge cycle characteristics.

6013389

CYLINDRICAL STORAGE BATTERY

Hisao Nakamaru; Norio Suzuki; Toshihide Eguchi; Masato Onishi; Kamakura, Chigasaki, Fujisawa, JAPAN assigned to Matsushita Electric Industrial Company Ltd.

An improvement is provided in the shape of current collectors welded to the respective terminal edges of electrode plates projecting from the upper and the lower end plane of a spirally coiled electrode plate assembly incorporated in a cylindrical storage battery. In the preferred embodiment, the current collector formed essentially of a rectangular flat plate is provided with an I-shaped cutout hole which passes the center of the plate and ends inside the plate near its outer peripheral edge and two of the rectangular cutout parts which are approximately at a right angle to the I-shaped hole and extend from the neighborhood of the center of the plate to its outer peripheral part without intersecting the I-shaped hole, downward rib-formed projections being, respectively, formed integrally at the edge parts of the cutout hole and the respective cutout parts, the respective rib-formed projections crossing the terminal edges of the electrode plate and being welded to the terminal edges at a plurality of spots. Particularly, the rib-formed projection of the I-shaped cutout hole crosses the electrode plate coiling start terminal part also of the electrode plate assembly, and hence, can secure welding spots over a wide region in the diameter direction of the electrode plate assembly, and thus, permits high rate charge and discharge.

6013390

ALKALINE STORAGE BATTERY

Hirokazu Kimiya; Hidekatsu Izumi; Youichi Izumi; Hiroyuki Sakamoto; Akihiro Maeda; Isao Matsumoto; Kyoto, Neyagawa, Moriguchi, Kobe, Osaka, JAPAN assigned to Matsushita Electric Industrial Company Ltd.

Disclosed is a sealed alkaline storage battery with an increased utilization of a positive electrode active material comprising a nickel oxide and with drastically enhanced capacity density. The positive electrode active material is a nickel-based multi-metals oxide containing at least one element such as Mn which promotes the formation of γ phase during charging. The ratio A_γ/A_β of the integrated intensity A_γ of the diffraction peak at $d \approx 7 \text{ \AA}$ attributed to the γ phase to the integrated intensity A_β of the diffraction peak at $d \approx 4.5\text{--}5.0 \text{ \AA}$ attributed to the β phase of the oxide in the completely charged state is not smaller than 0.4. The electrolyte comprises an aqueous solution containing at

least one of K^+ and Na^+ as a cationic component and the total concentration of the above-mentioned cationic component in the completely charged state is within a range between 4 and 12 mol/l.

6013394

ORGANIC SULFATE ADDITIVES FOR NONAQUEOUS ELECTROLYTE IN ALKALI METAL ELECTROCHEMICAL CELLS

Hong Gan; Esther S. Takuchi; East Amherst, 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 organic sulfate 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 a dialkyl sulfate additive.

6017647

ELECTRODE STRUCTURE FOR SOLID STATE ELECTROCHEMICAL DEVICES

Sten A. Wallin; Midland, USA assigned to The Dow Chemical Company

Herein is disclosed a composite oxygen electrode/electrolyte structure for a solid state electrochemical device having a porous composite electrode in contact with a dense electrolyte membrane, whose electrode includes: (a) a porous structure having interpenetrating networks of an ionically-conductive material and an electronically-conductive material; and (b) an electrocatalyst different from the electronically-conductive material, dispersed within the pores of the porous structure. This electrode structure is relatively simple to manufacture, requiring relatively few steps to infiltrate an electrocatalyst precursor material to obtain an electrode structure which will perform advantageously in a solid oxide fuel cell, has a relatively low internal resistance, and permits the selection of an optimal electronically-conductive material and electrocatalyst.

6017656

ELECTROLYTE FOR ELECTROCHEMICAL CELLS HAVING CATHODES CONTAINING SILVER VANADIUM OXIDE

Ann M. Crespi; Kevin Chen; Minneapolis, New Brighton, USA assigned to Medtronic Inc.

An electrochemical cell containing a cathode comprising silver vanadium oxide and an anode comprising lithium is disclosed that includes an improved electrolyte composition having the solvents propylene carbonate and 1,2-dimethoxyethane, and an additional third solvent that reduces the

solubility of the composition of the silver vanadium cathode material. Preferably, the third solvent is a dialkyl carbonate such as dimethyl carbonate, diethyl carbonate or ethylmethyl carbonate. The improved electrolyte composition reduces the build up of resistance in the cell during cell discharge, and may affect the cell's performance in implantable cardiac defibrillator applications. The cell of the present invention may include a hybrid cathode containing a mixture of silver vanadium oxide and carbon monofluoride (CF_x).

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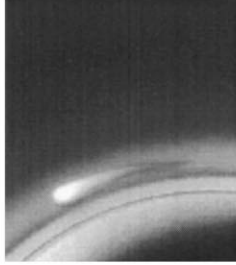
NONAQUEOUS SECONDARY BATTERY AND PROCESS FOR PRODUCING THE SAME USING A DISPERSION AID

Hiroshi Ishizuka; Hideki Tomiyama; Kanagawa, JAPAN
assigned to Fuji Photo Film Company Ltd.

The invention relates to a process for producing nonaqueous secondary battery comprising, in a battery case, positive and negative electrodes capable of intercalating and deintercalating lithium and a nonaqueous electrolyte containing a

lithium salt, the electrodes being prepared by applying a water-dispersion electrode material mixture paste containing at least an active material capable of intercalating and deintercalating lithium and at least one conducting agent comprising a carbonaceous compound onto a collector and drying, wherein at least one of the electrodes is prepared from a water-dispersion electrode material mixture paste which is prepared by using a dispersion comprising water having dispersed therein at least one conducting agent together with a dispersion aid. The invention also relates to a nonaqueous secondary battery wherein at least one of the positive and negative electrode sheets is prepared from a water-dispersion electrode material mixture paste which is prepared by using a dispersion comprising water having dispersed therein at least one conducting agent together with a dispersion aid. The water-dispersion paste used in the negative electrode sheet has a pH of 5–10. The thickness of the electrode material mixture on one side of the negative electrode is 5–80 μm and that of the positive electrode is 90–180 μm at the time of battery assembly.

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