compound has a cobalt content of 68.5 ± 6% by weight, its composition is substantially represented by a formula H_xCoO_y provided that $0 \leq x \leq 1.4$ and $1.3 \leq y \leq 2.2$, the half value width of a diffraction peak showing a maximum intensity in the neighborhood of $2\theta = 36-40^\circ$ in X-ray diffraction using Cu Kα as a radiation source is $>0.31^\circ$, and the relation between the cobalt content and the half value width is represented by the following formula: Half value width (degrees) $\geq 7.5–0.1 \times$ (Cobalt content) (wt.%). This provides an inexpensive and simple process for producing a lithium–cobalt composite oxide having uniform crystals, and a high-performance electrode active material for use in lithium secondary cells in high capacity and excellent in the charging–discharging cycle characteristics.

COMPONENTS AND/OR CHARGERS

6046573
SYSTEM FOR EQUALIZING THE LEVEL OF CHARGE IN BATTERIES

Bo Wikstrom, Sweden assigned to Xicon Battery Electronics AB

A system for equalizing the charge level of batteries comprising battery cells or battery blocks connected in series. Controlled voltage converters are on one side connected to a single or groups of battery cells or battery blocks and on another side connected to a common current path a positive conductor thereof being connected to a positive pole of the battery and the negative pole thereof being connected to a negative pole of the battery.

OTHER BATTERIES

6051038
METHOD FOR MAKING A HIGH RELIABILITY ELECTROCHEMICAL CELL AND ELECTRODE ASSEMBLY THEREFOR

William G. Howard, Roger W. Kelm, Douglas J. Weiss, Ann M. Crespi, Fred J. Berkowitz, Paul M. Skarstad, USA assigned to Medtronics Inc.

An electrochemical cell and electrode assembly in which an alkali metal anode and a cathode assembly are wound together in a unidirectional winding having substantially straight sides such that the winding will fit into a prismatic cell. The anode and cathode are arranged in the winding to provide for even utilization of reactive material during cell discharge by placing cathode and anode material in close proximity throughout the electrode assembly in the proportions in which they are utilized. The winding also contributes to even utilization of reactive material by employing multiple tabs on the cathode assembly to ensure that cathode material is evenly utilized throughout the electrode assembly during cell discharge and also so that connections to the tabs are readily made.

6051341
ORGANIC ELECTROLYTE BATTERY

Masanao Terasaki Japan assigned to Japan Storage Battery Company Ltd.

In an organic electrolyte battery, resistor layers having higher resisting values than those of electric conducting substrates retaining active material of an electrode are formed on the substrate surfaces.

FUEL CELL

6057051
MINIATURIZED FUEL CELL ASSEMBLY

Makoto Uchida, Yuko Fukuoka, Yasushi Sugawara, Nobuo Eda, Japan assigned to Matsushita Electric Industrial Company Ltd.

A miniaturized fuel cell assembly to power portable electronic equipment includes a hydride hydrogen storage unit, a control unit for controlling the flow of hydrogen, a hydrogen supply device interconnecting the hydrogen storage unit and the fuel cell body, and an air feed device to supply oxygen necessary for the generation of electricity. The fuel cell assembly may also have an air feed device to cool the interior of the equipment, including a water retention device for recovering and retaining water formed in the fuel cell body, and a humidifying device using the recovered water to humidify the hydrogen to be supplied to the fuel cell body. The miniaturized fuel cell assembly facilitates the effective transfer of waste heat from the fuel cell to the hydrogen storage unit, and as a result of its ability to be used repeatedly, can be utilized for a greater length of time than a conventional primary or secondary power cell.

6057053
COMPRESSION ASSEMBLY FOR AN ELECTROCHEMICAL FUEL CELL STACK

Peter Robert Gibb, Canada assigned to Ballard Power Systems Inc.

An electrochemical fuel cell stack comprises a first end plate, a second end plate, and fuel cell assemblies interposed between the first and second end plates. The stack further includes a compression assembly comprising a compression mechanism and a restraining mechanism. The compression mechanism urges the first end plate towards the second end plate applying an internal compressive force to the fuel cell assemblies, even as the thickness of the fuel cell assemblies changes. The restraining mechanism prevents movement of the first end plate away from the second end plate by preventing deflection of the compression mechanism, which may occur, for example, when internal fluid pressure is increased.

6057054
MEMBRANE ELECTRODE ASSEMBLY FOR AN ELECTROCHEMICAL FUEL CELL AND A METHOD OF MAKING AN IMPROVED MEMBRANE ELECTRODE ASSEMBLY

Russell H. Barton, Peter R. Gibb, Joel A. Ronne, Henry H. Voss, Canada assigned to Ballard Power Systems Inc.

An improved membrane electrode assembly (MEA) comprises coextensive ion exchange membrane and electrode layers and a resilient fluid impermeable integral seal made by impregnating a sealing material into the porous electrode layers in the sealing regions. The integral seal preferably circumscribes the electrochemically active area of the MEA. In addition, the integral seal preferably extends laterally beyond the edge of the MEA, enveloping the peripheral region including the side edge of the MEA. The uncured sealant material is preferably a flow processable elastomer that is applied to the MEA using a vacuum injection molding process. In preferred embodiments, the seal has a plurality of spaced, parallel raised ribs with cross-ribs extending therebetween at spaced intervals. The parallel raised ribs and cross-ribs provide compartmentalized seals that provide improved protection against fluid leaks.

6060187
SOLID POLYMER TYPE FUEL CELL AND METHOD FOR MANUFACTURING THE SAME

Makoto Uchida, Yuko Fukuoka, Yasushi Sugawara, Nobuo Eda, Japan assigned to Matsushita Electric Industrial Company Ltd.

An electrode of solid polymer electrolyte fuel cells is produced by a step of preparing a mixed liquid containing an organic solvent, a noble metal catalyst-supporting carbon powder and a colloid of a solid polymer electrolyte having a particle size of from 1 to <400 nm, the colloid being adsorbed to the carbon powder and a step of forming an electrode by coating the mixed liquid on one side of a gas-diffusible layer. The solid polymer electrolyte is effectively adsorbed to the surface of the catalyst and thus a wide reaction area can be secured. Furthermore, thickness of the solid polymer electrolyte layer can be controlled to one in which hydrogen and oxygen can be easily diffused.

6060188
HIGH PRESSURE COAXIAL FUEL CELL

Sivakumar Muthuswamy, Steven D. Pratt, Ronald J. Kelley, Rudy Yorio, USA assigned to Motorola Inc.

A fuel cell can be constructed to be generally formed in the shape of a solid cylinder. The fuel cell has a porous central core of reticulated vitreous aluminum that is formed in the shape of a solid cylinder. The porous central core serves to distribute oxidant throughout the fuel cell. A cathode is situated coaxially around the porous central core, and has a catalytic layer on the outer side. A solid polymer electrolyte is situated coaxially around the cathode and in intimate contact with the catalytic layer. An anode is situated coaxially around the electrolyte, and a second layer of catalytic material is situated between the electrolyte and the anode. A fuel chamber is situated coaxially around and in intimate contact with the anode and arranged to distribute fuel throughout the fuel cell.

6060189
ELECTRICALLY CONDUCTIVE SEAL FOR FUEL CELL ELEMENTS

Robert Angelo Mercuri, Jeffrey John Gough, USA assigned to UCAR Carbon Technology Corporation

An electrically conductive seal comprising first and second thin sheets of flexible graphite 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.

6060190
ELECTROCHEMICAL FUEL CELL MEMBRANE ELECTRODE ASSEMBLY WITH POROUS ELECTRODE SUBSTRATE

Stephen A. Campbell, Juergen Stumper, David P. Wilkinson, Michael T. Davis, Canada assigned to Ballard Power Systems Inc.

A membrane electrode assembly for an electrochemical fuel cell includes a pair of electrodes and an ion exchange membrane interposed therebetween. At least one of the electrodes comprises a porous electrode substrate. The substrate comprises a preformed macroporous web having a through-plane resistivity of >1 Ω cm. The web contains an electrically conductive filler. A method for preparing the membrane electrode assembly includes the steps of (a) forming a porous electrode substrate for an electrochemical fuel cell by filling a preformed macroporous web, the web having a through-plane resistivity of >1 Ω cm, with an electrically conductive filler and (b) consolidating the electrode pair and ion exchange membrane to form a unitary assembly.

6063141
CATHODE FOR A MOLTEN CARBONATE FUEL CELL AND METHOD FOR MANUFACTURING SAME

Hartmut Wendt, Hans-Juergen Salge, Manfred Bischoff, Germany assigned to MTU Motoren-Und Turbinen-Union Friedrichshafen GmbH

A method for manufacturing a cathode for a molten carbonate fuel cell includes oxidation of a porous precursor electrode and contact with molten carbonate. Following assembly of a layered arrangement containing the precursor electrode, a matrix layer made of molten carbonate, and a porous anode, the precursor electrode is anodically oxidized with a preset curve for the current density, and doped by contact with molten carbonate.

6063517
SPIRAL WRAPPED CYLINDRICAL PROTON EXCHANGE MEMBRANE FUEL CELLS AND METHODS OF MAKING SAME

Alan Montemayor, Edward Albert Bass, Michael Stewart, Narasi Sridhar, USA assigned to Southwest Research Institute

A pre-spiral bundle for making a spiral wrapped cylindrical fuel cell and cylindrical fuel cells made using the pre-spiral bundle. The pre-spiral bundle comprises a sleeve defining a hydrogen flowpath. The sleeve comprises a proton exchange membrane encapsulating a substantially planar anode in ionic communication with a catalytically effective amount of a noble metal catalyst. A first hydrogen inlet comprises a first edge of the sleeve and a second hydrogen inlet comprises an opposed, substantially parallel edge of the sleeve. The hydrogen flowpath is defined by the anode. A cylindrical fuel cell is made by abutting a flexible, porous cathode to the sleeve in ionic communication with a noble metal catalyst and wrapping the sleeve and the cathode around one of the hydrogen inlets.

6066408
FUEL CELL COOLER-HUMIDIFIER PLATE

Nicholas G. Vitale, Daniel O. Jones, USA assigned to Plug Power Inc.

A cooler-humidifier plate for use in a proton exchange membrane (PEM) fuel cell stack assembly is provided. The cooler-humidifier plate combines functions of cooling and humidification within the fuel cell stack assembly, thereby providing a more compact structure, simpler manifolding, and reduced reject heat from the fuel cell. Coolant on the cooler side of the plate removes heat generated within the fuel cell assembly. Heat is also removed by the humidifier side of the plate for use in evaporating the humidification water. On the humidifier side of the plate, evaporating water humidifies reactant gas flowing over a moistened wick. After exiting the humidifier side of the plate, humidified reactant gas provides needed moisture to the proton exchange membranes used in the fuel cell stack assembly. The invention also provides a fuel cell plate that maximizes structural support within the fuel cell by ensuring that the ribs that form the boundaries of channels on one side of the plate have ends at locations that substantially correspond to the locations of ribs on the opposite side of the plate.

6066410
ANODE CATALYST FOR FUEL CELLS WITH POLYMER ELECTROLYTE MEMBRANES

Emmanuel Auer, Walter Behl, Thomas Lehmann, Udo Stenke, Germany assigned to Degussa Aktiengesellschaft

A platinum/ruthenium alloy catalyst that includes finely dispersed alloy particles on a powdery, electrically conductive carrier material. The catalyst is particularly resistant to carbon monoxide poisoning when the alloy particles display mean crystallite sizes of 0.5 to <2 nm.

6068941
START UP OF COLD FUEL CELL

Thomas F. Fuller, Douglas J. Wheeler, USA assigned to International Fuel Cells LLC.

A proton exchange membrane fuel cell has methanol or ethanol fed into the coolant passages during shut down so as to prevent water trapped therein from freezing in sub-freezing environments. Upon start-up, a controlled amount of air is fed through the cathode reactant flow field so that alcohol diffusing to the cathode catalyst is oxidized, producing heat which will raise the temperature of the fuel cell above freezing, and to a normal operating temperature. A heat exchanger in the coolant water circulating loop may be bypassed during start-up.

6068942
PROCESS FOR OPERATING A PEM FUEL CELL INSTALLATION

Karl Strasser, Willi Bette, Regina Hornung, Germany assigned to Siemens Aktiengesellschaft

A process for operating a PEM fuel cell installation includes providing at least one PEM fuel cell module having an inlet valve for hydrogen H_2 and an inlet valve for oxygen O_2. In order to switch off the PEM fuel cell module, the oxygen O_2 inlet valve is closed in a first step, and the hydrogen H_2 inlet valve is closed in a second step when a predetermined oxygen O_2 partial pressure at a cathode part of the PEM fuel cell module is reached. Reliable operation of the PEM fuel cell installation is guaranteed by this measure.

6068943
FUEL CELL APPARATUS AND METHOD OF INCREASING THE POWER DENSITY OF FUEL CELLS USING CARBON-CONTAINING FUELS

Jiri Divisek, Hans-F. Oetjen, Volkmar M. Schmidt, Germany assigned to Forschungszeutrum Julich GmbH

In a method and an apparatus for processing fuel for a fuel cell to which fuel is supplied through a fuel line, a reactor is disposed in the fuel line and an oxygen-containing compound is added to the fuel in the fuel line and is decomposed in the reactor for releasing oxygen which oxygen is adsorbed by the reactor. Impurities in the fuel which can be oxidized are also adsorbed by the reactor and are oxidized by the oxygen adsorbed by the reactor.

BATTERY MATERIALS

6057060
ULTRA-THIN, SINGLE-PLY BATTERY SEPARATOR

Wei-Ching Yu, USA assigned to Celgard Inc.

A battery separator is made from a microporous polyolefin membrane having a thickness of about 0.33–0.5 mills.

6057061
ETHYLENE-VINYL ALCOHOL COPOLYMER BATTERY SEPARATOR

Robert W. Callahan, Hongkyu Kim, USA assigned to Celgard Inc.

The present invention is directed to a battery separator being an oriented microporous film containing ethylene-vinyl alcohol copolymer with a filler, and a battery containing that separator.

6057062
METHOD FOR PREPARING NONAQUEOUS ELECTROLYTES FOR ALKALI ION ELECTROCHEMICAL CELLS CONTAINING UNSYMMETRIC ORGANIC CARBONATES

Hong Gan, Marcus J. Palazzo, Esther S. Takeuchi, USA assigned to Wilson Greatbatch Ltd.

The present invention relates to an improved method for synthesizing unsymmetric linear organic carbonates comprising the reaction of two symmetric dialkyl carbonates, R_1 and R_2, in the presence of a nucleophilic reagent or an election donating reductant as a catalyst, wherein R_1 and R_2 can be either saturated or unsaturated alkyl or aryl groups, is described. The presence invention further provides a preparation method for a nonaqueous organic electrolyte having an unsymmetric linear organic carbonate as a co-solvent.

6059943
COMPOSITE MEMBRANE SUITABLE FOR USE IN ELECTROCHEMICAL DEVICES

Oliver J. Murphy, Alan J. Cisar, USA assigned to Lynntech Inc.

The invention relates to novel inorganic-organic composite membranes especially useful as ionically conducting membranes in electrochemical devices. The composites consist of a polymeric matrix, which may or may not be an ionic conductor in its unfilled form, filled with an inorganic material having a high affinity for water, capable of exchanging cations such as protons, and preferably with a high cation mobility, either on its surface or through its bulk.

6060184
INORGANIC AND ORGANIC NITRATE 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 nitrate 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 alkali metal nitrate, alkaline earth metal nitrate and/or an organic alkyl nitrate additive.

6063526
DICARBONATE 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 dicarbonate 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 dicarbonate additive.

6066417
GLASS–POLYMER COMPOSITE ELECTROLYTE AND A METHOD OF PREPARING THE SAME

Jae-phil Cho, Geun-bae Kim, South Korea assigned to Samsung Display Devices Company Ltd.

A glass–polymer composite electrolyte includes a glass electrolyte having a lithium compound and at least one compound selected from P_2S_5, SiS_2 or GeS_2, and a polymer electrolyte comprising a lithium salt.

6068948
HYDROGEN ABSORBING ALLOY ELECTRODE, METHOD OF FABRICATING HYDROGEN ABSORBING ALLOY ELECTRODE, AND ALKALI SECONDARY BATTERY

Teruhiko Imoto, Yoshinori Matsuura, Nobuyuki Higashiyama, Mamoru Kimoto, Mitsuzou Nogami, Ikuo Yonezu, Koji Nishio, Japan assigned to Sanyo Electric Company Ltd.

In the present invention, a hydrogen absorbing alloy treated upon immersed in an acid solution containing at least a quinone compound, a hydrogen absorbing alloy immersed in water to which at least a quinone compound is added, or a hydrogen absorbing alloy treated upon being immersed in an acid solution containing at least a quinone compound and then immersed in water to which at least a quinone compound is added is used for a hydrogen absorbing alloy electrode, and the hydrogen absorbing alloy electrode is used as a negative electrode of an alkali secondary battery.

6068949
ALKALI METAL ION BATTERY ELECTRODE MATERIAL

Dale R. Shackle, USA assigned to Rentech Inc.

A method for forming a metal ion intercalation compound and the use thereof as the cathode material in an alkali metal battery. In one embodiment, a metal ion intercalation compound is mixed with an electrically conductive material. The metal ion intercalation compound is represented by the formula: wherein M is an alkali metal ion, wherein T is a metal ion capable of existing in more than one stable oxidation state, and wherein A is a multi-element anion with a negative charge >1.

6068950
ORGANIC PHOSPHATE 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 phosphate 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 phosphate additive.

LITHIUM BATTERIES

6057058
ORGANIC ELECTROLYTE LITHIUM SECONDARY BATTERY

Nobuharu Koshiba, Tatsuo Mori, Emi Asaka, Akira Kakinuma, Japan assigned to Matsushita Electric Industrial Company Ltd.

The invention provides a lithium secondary battery with improved withstanding overcharge and overdischarge characteristics which employs a cathode active material of lithium-containing manganese dioxide having a crystal structure of the Ramsdellite-type. An electrolyte combined with the cathode includes $LiN(CF_3SO_2)_2$ as a solute. The solute is preferably dissolved in ethylene carbonate. A graphite or LiAl alloy is applied for an anode. LiAl alloy is corrosion-resistant, thereby improving high temperature as well as charge–discharge cycle life characteristics.

6059987
IONIC CONDUCTIVE MATERIAL AND ELECTROCHEMICAL DEVICE COMPRISING THE SAME

Fusaji Kita, Akira Kawakami, Yurii Yagupolskii, Tatyana Savina, Natalya Kirij, Leonid Markovsky, USA assigned to Hitachi Maxell Ltd.

An ionic conductive material chosen from a metal or a hydrogen ion and on anion portion comprising a resonance structure containing a Group IVB atom as the anion portion, and an electron-withdrawing group which is bonded to said resonance structure through a Group VIB atom, which has a good high voltage stability. These materials find applicability in lithium cells.

6060185
PROTECTIVE DEVICE FOR SECONDARY BATTERIES

Tadashi Okutoh, Japan assigned to Nippon Moli Energy Corporation

The invention provides a protective device for batteries having a high energy density such as lithium ion batteries. The protective device comprises a battery voltage-monitoring means, an overcharge-detecting means for sending out a charge-finishing signal when a voltage detected by the battery voltage-detecting means is higher than a preset value, a charge-finishing means for finishing charge in response to the charge-finishing signal, an output-counting means for counting the number of charge-finishing signals sent out of the charge-finishing means, and a cutoff means for cutting off conduction of a current in said batteries when a counted value reaches a preset value, thereby limiting the number of permissible overcharging cycles.

6060864
BATTERY SET STRUCTURE AND CHARGE/DISCHARGE CONTROL APPARATUS FOR LITHIUM-ION BATTERY

Hironori Ito, Shigeru Sekine, Masahiko Kasashima, Hisao Tsukazawa, Yuichiro Hino, Shizuo Morioka, Nobuyuki Hosoya, Yoshiaki Ukiya, Katsuo Ozawa, Hirohito Motomiya, Masaru Harashima, Masahiko Hagiwara, Masanori Morita, Akihiko Uchida, Naoki Tashiro, Masayasu Tanaka, Keiichi Mitsui, Naoki Isooka, Japan assigned to Kabushiki Kaisha Toshiba

In a battery-driven portable computer, a battery pack is constituted by m battery sets connected in series each including n lithium-ion secondary battery cells connected in parallel. A voltage monitor for monitoring the voltage of the terminal electrode of each battery set and a charger for independently appropriately charging each battery set in accordance with a monitor result are arranged, thereby realizing battery driving by a lithium-ion secondary battery pack having a large capacity. A computer system monitors the voltages of the battery cells which are part of a secondary battery by comparing the battery voltages with a predetermined voltage value in order to detect overdischarge (undervoltage) or overcharge (overvoltage), outputs this information outside of the battery pack, and terminates processing prior to a circuit disconnect.

6063142
PROCESS FOR PRODUCING A RECHARGEABLE LITHIUM BATTERY HAVING AN IMPROVED ANODE COATED BY A FILM CONTAINING A SPECIFIC METAL OXIDE MATERIAL

Soichiro Kawakami, Shinya Mishina, Naoya Kobayashi, Masaya Asao, Japan assigned to Canon Kabushiki Kaisha

An anode for a rechargeable lithium battery which comprises an anode substrate and a coat disposed so as to cover at least a surface of said anode substrate opposed to said cathode, said coat comprising a film comprised of a metal oxide material of 1.5 or less in standard electrode potential difference with respect to lithium and capable of intercalating or deintercalating lithium ions generated during battery reaction. A process for producing said anode, characterized in that said film is formed using a polyacid or a peroxo polyacid. A rechargeable lithium battery is provided with said anode.

6063519
GRID PLACEMENT IN LITHIUM ION BI-CELL COUNTER ELECTRODES

Jeremy Barker, Wade Guindy, Howard Kisner, Porter Mitchell, Mohammad Parsian, USA assigned to Valence Technology Inc.

Disclosed herein is a battery design for bi-cell polymer matrix batteries. Each bi-cell comprises, sequentially, a first counter electrode, a first separator membrane, a centrally located electrode, a second separator membrane, and a second counter electrode. The current collector of each of the counter electrodes is positioned other than medially within the counter electrode. Generally, the current collector of the counter electrode is located within the outer half of the counter electrode. When the current collector is located at the extreme outer edge of the counter electrode, a capping film of polymer matrix material is preferably laminated to the perforated current collector, and, through the perforated current collector, to the counter electrode material itself.

6066413
METHOD FOR INCREASING REVERSIBLE LITHIUM INTERCALATION CAPACITY IN CARBON ELECTRODE SECONDARY BATTERIES

Luc Aymard, Florence Disma, Jean-Marie Tarascon, France assigned to Telcordia Technologies Inc.

Mechanical grinding of graphite, soft carbon coke, or hard carbon over the range of 20–80 h produces carbon powders which may be incorporated into secondary lithium battery electrodes to yield improved reversible lithium intercalation capacity of up to about 708 mAh/g, thus approximating Li_2C_6, with irreversible intercalation of only about 328 mAh/g.

6066414
MATERIAL OF NEGATIVE ELECTRODE AND NONAQUEOUS-ELECTROLYTE SECONDARY BATTERY USING THE SAME

Hiroshi Imoto, Shinichiro Yamada, Japan assigned to Sony Corporation

A material for a negative electrode having excellent performance for doping lithium and de-doping lithium and a nonaqueous-electrolyte secondary battery having a large capacity are provided. The nonaqueous-electrolyte secondary battery is disclosed which has a negative electrode mainly composed of a compound containing at least any one of silicon, germanium and tin, nitrogen and oxygen, a positive electrode made of composite metal oxide containing lithium or an interlayer compound containing lithium and nonaqueous electrolyte.

NICKEL METAL HYDRIDE BATTERIES

6057057
CONDUCTIVE AGENT AND NON-SINTERED NICKEL ELECTRODE FOR ALKALINE STORAGE BATTERIES

Mutsumi Yano, Mitsuzo Nogami, Katsuhiko Shinyama, Masao Inoue, Hiroshi Watanabe, Reizo Maeda, Ikuo

Yonezu, Koji Nishio, Japan assigned to Sanyo Electric Company Ltd.

A conductive agent for use in alkaline storage batteries in accordance with one aspect of the present invention contains 0.1–10 wt.% sodium. This sodium content results from cobalt or a cobalt compound, to which an aqueous solution of sodium hydroxide is added and heated to 50–200°C A non-sintered nickel electrode for use in alkaline storage batteries is also proposed. In this electrode, the aforesaid conductive agent in accordance with the present invention is added to a pulverulent active material consisting of grains of nickel hydroxide or grains mainly constituted by nickel hydroxide such that 1–20 parts by weight of the conductive agent is added to 100 parts by weight nickel hydroxide contained in the pulverulent active material. Another non-sintered nickel electrode for use in alkaline storage batteries is also proposed. In this electrode, an active material takes the form of composite particles consisting of grains of nickel hydroxide or grains mainly constituted by nickel hydroxide, each of which has a surface formed with an electric conduction layer consisting of a cobalt compound containing 0.1–10 wt.% sodium.

6060195
NON-SINTERED NICKEL ELECTRODE FOR ALKALINE STORAGE BATTERY

Katsuhiko Shinyama, Reizo Maeda, Yoshinori Matsuura, Mitsuzo Nogami, Ikuo Yonezu, Koji Nishio, Japan assigned to Sanyo Electric Company Ltd.

In the non-sintered nickel electrode for an alkaline storage battery according to the present invention, the active material powder is made up of composite particles, each comprising a nickel hydroxide-containing core particle and a shell layer coating the nickel hydroxide-containing core particle, the shell layer containing a bismuth-containing compound, or is made up of composite particles, each comprising a nickel hydroxide-containing core particle, an inner shell layer coating the nickel hydroxide-containing core particle and an outer shell layer coating the inner shell layer, the inner shell layer containing a bismuth-containing compound and the outer shell layer containing cobalt metal, cobalt monoxide, cobalt hydroxide, cobalt oxyhydroxide or a sodium-containing cobalt compound prepared by adding an aqueous solution of sodium hydroxide to cobalt metal, cobalt monoxide, cobalt hydroxide or cobalt oxyhydroxide to obtain a mixture and heat-treating the mixture in the presence of oxygen. Provided is a non-sintered nickel electrode for an alkaline storage battery, having a high active material utilization rate not only when charged at normal temperatures but also when charged at high temperatures, and having good charge–discharge cycle characteristics.

6063524
HYDROGEN ABSORBING ALLOY FOR A NEGATIVE ELECTRODE OF AN ALKALINE STORAGE BATTERY

Masaki Kasashima, Noriaki Hamaya, Naofumi Shinya, Satoshi Shima, Japan assigned to Shin-Etsu Chemical Company Ltd.

The object is to provide a hydrogen absorbing alloy suitable for the negative electrode of a Ni-hydrogen storage battery which is effective at low temperatures. The object can be attained by a $LaNi_5$ type hydrogen absorbing alloy, wherein the content of Mg in the hydrogen absorbing alloy is 50–500 ppm, and it is represented by a general formula RNi_a $Company_b$ Al_cM_d, wherein R comprises not <77 wt.% La and 23 wt.% or less of one or more metals other than La, Ni, Co, Al and M, M comprises at least one kind of metals selected from the group consisting of Fe, Cr, Cu and Mn, and a to d denote a positive number within a predetermined range. In addition, it is important to contain a small amount of Ti, Pb, oxygen, carbon and/or sulfur in said alloy.

OTHER BATTERIES

6057052
CELL FOR A METAL–AIR BATTERY

Yaron Shrim, Vladimir Schneider, Alex Gutkin, Yoel Gilon, Israel assigned to Electric Fuel (E.F.L.) Ltd.

The invention provides a modular zinc air cell for use in an electrochemical zinc–air multi-cell battery, each cell being of the type provided with a housing having, two outer major surfaces, and two spaced-apart inner walls, the inner walls defining a first inner chamber for containing therein a zinc electrode, and in conjunction with the outer major surfaces defining two outer chambers for receiving reaction air; two generally planar, gas-permeable, but liquid-impermeable air electrodes, each of the electrodes being installed in a window-like opening provided in each of the inner walls, an electrolyte in contact with the zinc electrode and the air electrodes, and means for directing a flow of the reaction air into a first inlet provided in a first outer side surface of the housing through both of the outer chambers substantially in a uniform flow distribution across the outer faces of both of the air electrodes, and out of a second outlet provided in an opposite outer side surface of the housing.

6057061
ETHYLENE-VINYL ALCOHOL COPOLYMER BATTERY SEPARATOR

Robert W. Callahan, Hongkyu Kim, USA assigned to Celgard Inc.

The present invention is directed to a battery separator being an oriented microporous film containing ethylene-

vinyl alcohol copolymer with a filler, and a battery containing that separator.

6060196
STORAGE-STABLE ZINC ANODE BASED ELECTROCHEMICAL CELL

John H. Gordon, John J. McEvoy, Strahinja K. Zecevic, Ashok V. Joshi, USA assigned to Ceramtec Inc.

A zinc alloy anode-based electrochemical cell, which generates gases and/or energy, is disclosed. The structure of the cell is such that a zinc alloy anode material is the integral part of housing and is in contact with an alkaline electrolyte containing minor amounts of corrosion inhibitors. The electrolyte which contains no zinc powder metal, may be in direct contact with the cathode thereby simplifying cell construction by elimination of a separator material. The cell is environmentally friendly, containing no mercury or cadmium or other toxic metals and is cost effective as it eliminates expensive amalgamated zinc powder and separator material.

6060197
ZINC BASED ELECTROCHEMICAL CELL

John T. McEvoy, Strahinja K. Zecevic, Ashok V. Joshi, USA assigned to Ceramtec Inc.

An anode for use in an electrochemical cell, wherein the electrochemical cell includes a metallic casing, an electrolyte, a cathode, and an anode within the metallic casing. The anode comprises at least one perforated electrochemical zinc based sheet conductively attached to the metallic casing. A process for fabricating an electrochemical cell comprises the steps of fabricating an anode having at least one perforated electrochemical zinc based sheet conductively attached to a casing, associating a cathode with the electrochemical cell, associating an insulating microporous separator between the anode and cathode, and introducing an alkaline electrolyte to the anode and cathode through the microporous separator.

6064293
THERMAL FUSE FOR HIGH-TEMPERATURE BATTERIES

Rudolph G. Jungst, James R. Armijo, Darrel R. Frear, USA assigned to Sandia Corporation

A thermal fuse, preferably for a high-temperature battery, comprising leads and a body therebetween having a melting point approximately between 400 and 500°C. The body is preferably an alloy of Ag–Mg, Ag–Sb, Al–Ge, Au–In, Bi–Te, Cd–Sb, Cu–Mg, In–Sb, Mg–Pb, Pb–Pd, Sb–Zn, Sn–Te, or Mg–Al.

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