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Journal of Power Sources

LEAD-ACID**6255014****CENTER POINT VENT COVER FOR BATTERY**

Thomas J. Dougherty; Michael G. Andrew; James A. Lenz; USA assigned to Johnson Controls Technology Company

The apparatus of the present invention provides a cover for venting gases from thin metal film battery cells having vents disposed at the center of one end of the cells. The vents comprise cylindrical wells that recess into, and substantially fill, the top portions of battery cell cavities within a battery housing. The cavities are sized to hold the battery cells securely and are configured to provide an electrical serial connection. The wells include pipes which extend outward from the bottom of the wells and lead from openings in the bases of the wells. The openings in the pipes are covered with flexible valve caps and well lids cover the wells. The center point arrangement of the recessed wells permit gases from the battery cells to escape through the openings, yet restrict the electrolyte from exiting the housing. The base of the battery housing does not have vent openings and is interchangeable with the cover so that the battery housing may be oriented with the terminals near the top or the bottom of the case.

6265108**FLOODED VALVE REGULATED LEAD-ACID BATTERY HAVING IMPROVED LIFE**

Subhas Chandra Chalasani; USA

A valve regulated lead-acid battery having a plurality of negative and positive-electrode plates, a plurality of separators soaked with electrolyte interleaved between the plates, a negative strap and positive strap interconnecting the respective plurality of negative and positive-electrodes includes separator material soaked with electrolyte disposed adjacent to the negative strap to thereby increase oxygen reduction.

6274263**SEMI-FLOODED LEAD-ACID BATTERY CELL**

William E.M. Jones; Bahamas

A lead-acid storage battery cell having a sealed housing in which a positive-electrode and a negative-electrode are immersed in a liquid electrolyte. The negative-electrode is partially exposed to a gas space within the battery cell housing. A pressure relief valve allows excess gas to escape the battery cell while preventing air from outside the cell from entering the gas space. Exposing a section of the negative plate to oxygen gas that evolves within the battery and collects in the gas space reduces water consumption of the cell and extends the maintenance-free life of the battery. The addition of a catalyst to recombine oxygen and hydrogen offers further improvement.

6274274**MODIFICATION OF THE SHAPE/SURFACE FINISH OF BATTERY GRID WIRES TO IMPROVE PASTE ADHESION**

Charles J. Schaeffer; Jeffrey L. Troxel; M. Eric Taylor; Wen-Hong Kao; Christian P. Hansen; Yu-Lin Chen; Dan J. Cantillon; Bart Sauer; USA assigned to Johnson Controls Technology Company

A method of forming battery grids or plates that includes the step of mechanically reshaping or refinishing battery grid wires to improve adhesion between the battery paste and the grid wires. The method is particularly useful in improving the paste adhesion to battery grids formed by a continuous battery grid making process (such as strip expansion, strip stamping, continuous casting) that produces grid wires and nodes with smooth surfaces and a rectangular cross-section. In a preferred version of the method, the grid wires of battery grids produced by a stamping process are deformed such that the grid wires have a cross-section other than the rectangular cross-section produced by the stamping process. The method increases the cycle life of a battery.

BATTERY MATERIALS**6265107****BINDER FOR RECHARGEABLE BATTERY WITH NON-AQUEOUS ELECTROLYTE AND BATTERY ELECTRODE DEPolarizing MIX PREPARED USING THE SAME**

Tetsuo Shimizu; Yoshihide Higashihata; Takayuki Nakamura; Tadashi Ino; Kenji Ichikawa; Japan assigned to Daikin Industries Ltd.

To provide a binder for secondary battery using non-aqueous electrolyte which is soluble in usual organic solvents, does not swell in a non-aqueous electrolyte and besides enhances battery performance. As the binder, a copolymer comprising 50–80 mol% of vinylidene fluoride, 17–50 mol% of tetrafluoroethylene and <3 mol% of a monomer copolymerizable therewith is used.

6268088**GEL POLYMER ELECTROLYTE OF VINYL ACETATE**

Boo-Keun Oh; Young-Roak Kim; Dong-Won Kim; Chang-Woo Baek; South Korea assigned to Cheil Industries

A gel polymer electrolyte according to the present invention comprises a polymer selected from the group consisting of vinyl acetate copolymer, poly(ethylene/vinylacetate/carbon oxide: EVACM), and poly(ethylene/vinylacetate/maleic acid anhydride: EVAMA); an inorganic filler; and a liquid electrolyte that a lithium salt is dissolved in an aprotic solvent. It is preferable that the polymer material

in a gel polymer electrolyte according to the present invention is in the range of 20–30 wt.%, the inorganic material filler is in the range of 5–20 wt.%, and the liquid electrolyte is in the range of 60–80 wt.%. As a specific functional group which has a high compatibility with a liquid electrolyte in the present invention is contained in the polymer material, a lithium-ion becomes to move with ease in electrolyte, and the ionic conductivity is over 0.5 mS/cm which is the demand level of a gel polymer electrolyte. Also, it provides the gel polymer electrolyte material with a high film formability, a good property of containing an electrolyte, a good adhesion, and a good mechanical strength.

6270636

INTEGRATED MEMBRANE AND ELECTRODE SUPPORT SCREEN AND PROTECTOR RING FOR AN ELECTROCHEMICAL CELL

Robert H. Byron, Jr.; Trent M. Molter; Mark E. Dristy; USA assigned to Proton Energy Systems Inc.

The present invention is an integrated screen comprising a screen portion having openings and an integral protector edge disposed about the periphery of the screen portion. This integrated screen protector edge can be utilized individually as the membrane support/flow field in an electrochemical cell or in conjunction with one or more subsequent screen layers. When utilized with subsequent screen layers, the integrated screen protector edge is disposed adjacent to and in intimate contact with the membrane assembly.

6270642

FABRICATION OF ZIRCONIA ELECTROLYTE FILMS BY ELECTROPHORETIC DEPOSITION

Rajendra N. Basu; Merrilea J. Mayo; Clive A. Randall; USA assigned to The Penn State Research Foundation

A method for deposition of an electrolyte material on a porous substrate in which a suspension of particles having a controlled surface charge and suitable for use as an electrolyte is formed and the porous substrate, which is made of an electrode material is immersed. A voltage is applied across the suspension between an electrode in contact with the suspension and the porous substrate, whereby at least a portion of the particles migrate toward the porous substrate and are deposited on the porous substrate.

6274276

ORGANIC ELECTROLYTE ELECTROCHEMICAL SYSTEM INCLUDING A POLYMERIC SEPARATOR

Xavier Andrieu; Francois Boudin; Ib Ingemann Olsen; France assigned to Alcatel

A polymeric separator for an organic electrolyte electrochemical system comprises an elastomeric polymer, optionally, a

polymer which swells in the organic electrolyte and with which the elastomeric polymer forms an alloy and, optionally, an inorganic compound. The polymeric separator has a microporous structure characterized by a porosity in the range 30–95% and pores with an average diameter in the range 0.1–5 μm .

6277261

METHOD OF PRODUCING ELECTROLYTE UNITS BY ELECTROLYTIC DEPOSITION OF A CATALYST

Jiri Divisek; Hans-Friedrich Oetjen; Volkmar M. Schmidt; Germany assigned to Forschungszentrum Julich GmbH

In a method for the manufacture of an electrode–electrolyte unit with a catalytically active layer a metal salt solution is placed layer-like between an electrolyte layer and an electrolyte and the metal in the metal salt solution is precipitated from the metal salt in situ between the two layers.

6277514

PROTECTIVE COATING FOR SEPARATORS FOR ELECTROCHEMICAL CELLS

Qicong Ying; Steven A. Carlson; Terje A. Skotheim; USA assigned to Moltech Corporation

This invention pertains to separators for use in electrochemical cells which comprise at least one microporous pseudo-boehmite layer, which separator is in contact with at least one protective coating layer positioned on the anode-facing side of the separator opposite from the cathode active layer in the cell; electrolyte elements comprising such separators; electrical current producing cells comprising such separators; and methods of making such separators, electrolyte elements and cells.

6277516

LEAD FOR USE WITH LITHIUM-ION SECONDARY CELL, LEAD RIBBON, LITHIUM-ION SECONDARY CELL AND METHOD OF SEALING CONTAINER OF LITHIUM-ION SECONDARY CELL

Yoshinari Sasaki; Koichi Muto; Hisashi Ohba; Japan assigned to Sony Corporation

A lithium-ion secondary cell is provided to remarkably improve a mechanical peel strength of heat fusion-bonding portions of a container as well as to improve a moisture permeability resistance, a sealing performance, a barrier property, a safety or the like of the container. A lead for use with a lithium-ion secondary cell according to the present invention is sandwiched by heat fusion-bonding portions of a container so as to be exposed in the outside of the container when the container is sealed by heat fusion-bonding. The lead is coated with a heat fusion-bonding seal material. This heat fusion-bonding seal material has an excellent adhesion to

the lead rather than a material of a sealant layer. Also, in the lithium-ion secondary cell, an end portion on the outside portion in the longitudinal direction of the lead in the layer made of the heat fusion-bonding seal material is exposed from the end face of the container. Moreover, the lithium-ion secondary cell may have the lead having a mesh structure.

6277518

ELECTRODE MATERIALS FOR USE IN BATTERIES, AND ELECTRODES AND BATTERIES USING SAME

Katsuhiko Naoi; Shunzou Suematsu; Ari Manago; Junko Kurihara; Toshihiko Nishiyama; Gaku Harada; Shinako Okada; Koji Sakata; Japan assigned to NEC Corporation

A polymer composed of structural units having a fused ring structure derived from a nitrogen-containing cyclic compound and a quinone compound as represented by the following formula is used as an electrode material for use in batteries. This makes it possible to provide batteries having excellent cycle characteristics and a high power density.

6277522

NON-AQUEOUS ELECTROLYTE SECONDARY CELL CATHODE MATERIAL AND NON-AQUEOUS ELECTROLYTE SECONDARY CELL EMPLOYING THE CATHODE MATERIAL

Atsuo Omaru; Naoyuki Nakajima; Masayuki Nagamine; Japan assigned to Sony Corporation

Carbon fiber having cross-sectional shape which satisfies area replenishment rate of 0.8 or more is used as anode material for non-aqueous electrolyte secondary battery. Alternatively, since value of fractal dimension of cross-section high order structure of the random radial type carbon fiber can be utilized as material parameter for evaluating the cross-sectional structure, carbon fiber in which the value of the fractal dimension is caused to fall within the range from 1.1 to 1.8 and the crystallinity has been controlled such that it falls within reasonable range is used as anode material for non-aqueous electrolyte secondary battery. Further, carbon fiber having cross-section high order structure such that the central portion is radial type structure and the surface layer portion is random radial type structure is used as anode material for non-aqueous electrolyte secondary battery. Furthermore, it is also effective to use carbon fiber having notch structure at the cross-section. In addition, graphitized carbon fiber having cross-sectional portions different in the crystal structure at predetermined periods in the fiber length direction is made up. By crushing the graphitized carbon fiber, thus, obtained, carbon fiber crushed powder having less unevenness and predetermined aspect ratio can be easily made up.

LITHIUM BATTERIES

6265110

LITHIUM SECONDARY BATTERY WITH FLAKE GRAPHITE NEGATIVE-ELECTRODE

Ningling Rao; Steen Yde-Andersen; Denmark assigned to Danionics A/S

A lithium secondary battery has a negative-electrode structure, an electrolyte and a positive cathode structure, the negative-electrode structure being of at least 40 wt.% of natural flake graphite, having an L_a -value of at least 300 nm and/or an L_c -value in the range 50–150 nm and an L_a - L_c -ratio of at least 2, and the electrolyte having at least 10 wt.% of propylene carbonate based on the weight of the solvent and salts of the electrolyte system. Natural flake graphite is compatible with propylene carbonate containing electrolytes, thereby forming stable battery configurations.

6267943

LITHIUM MANGANESE OXIDE SPINEL COMPOUND AND METHOD OF PREPARING SAME

Vesselin Manev; Titus Faulkner; D. Wayne Barnette; USA assigned to FMC Corporation

The present invention includes lithium manganese oxide spinel compounds having a low porosity, a high tap density and a high pellet density, and methods of preparing these compounds. In particular, the method comprises preparing a lithium manganese oxide with a spinel structure and having the formula, wherein $M_{m_1, \dots, m_k}^k O_{4+Z} M^1, M^2, \dots, M^k$ are cations different than lithium or manganese selected from the group consisting of alkaline earth metals, transition metals, B, Al, Si, Ga and Ge; $X, Y, m_1, m_2, \dots, m_k$, each have a value between 0 and 0.2; Z has a value between -0.1 and 0.2 ; and $X, Y, m_1, m_2, \dots, m_k$ are selected to satisfy the equation.

6268085

COMPOSITE MANGANESE OXIDE CATHODES FOR RECHARGEABLE LITHIUM BATTERIES

Arumugam Manthiram; Jaekook Kim; USA assigned to Board of Regents, The University of Texas System

A composite electrode and process of making. The composite includes a mixture of nanometer size particles of the lithium spinel oxide, $Li_{1+x}Mn_{2-x}O_{4+\delta}$, and Na_yMnO_2 , where $0 \leq x \leq 0.33$ and $0 \leq \delta \leq 0.5$ and $0 \leq y \leq 1$.

6268087

METHOD OF PREPARING LITHIUM-ION POLYMER BATTERY

Dong-Won Kim; Young-Roak Kim; Yang-Kook Sun; Boo-Keun Oh; Chang-Woo Baek; South Korea assigned to Samsung Display Device Company Ltd.

The present invention relates to a method of preparing a lithium-ion polymer battery which has a high capacity and a

good cyclability as well as no exudation of liquid electrolyte. The lithium-ion polymer battery according to the present invention is prepared by the steps of forming electrode films, laminating the electrode films on both surfaces of a grid or extended metal so as to improve the interfacial adhesion between the electrode films, forming a polymer electrolyte film composed of a polymer, an electrolyte solution, and a filler, and laminating the composite anode, the polymer electrolyte and the composite cathode. The activated composite anode/polymer electrolyte film/activated composite cathode is laminated to obtain a lithium-ion polymer battery structure. The lithium-ion polymer battery is vacuum-packaged using a vacuum packaging apparatus.

6270916

COMPLETE DISCHARGE DEVICE FOR LITHIUM BATTERY

Michael S. Sink; Glen V. Bowling; USA assigned to Alcatel

A method and apparatus for completely discharging a LiSO_2 battery which is not prone to self-activation and which does not require special tools for activation. In the present invention, a switch is formed of a switch contact (e.g. a spring contact) biased toward a contact pad. When the contact and contact pad meet, the discharge circuit of the complete discharge device (CDD) is activated. Under normal conditions, an elongated insulative strip projects between the switch contact and the contact pad and extends through the casing of the battery. The extension allows the strip to be pulled out from the exterior of the casing. Also under normal conditions, the portion of the strip extending through the casing is folded over and covered with a peel-off label. When it is desired to activate the CDD, the peel-off label is removed to expose the end of the strip, and the strip can be withdrawn from the casing. This then allows the contact and the contact pad to touch and activate the CDD.

6270924

LITHIUM SECONDARY BATTERY

Yasuhisa Yamashita; Koji Hattori; Japan assigned to Murata Manufacturing Company Ltd.

The invention provides a lithium secondary battery, comprising a cathode having a spinel-structured lithium-manganese complex oxide as the active-material, which is characterized in that the particles of said spinel-structured lithium-manganese complex oxide are hollow, spherical secondary particles formed by sintering of primary particles, and said secondary particles have a mean particle size of from ~ 1 to $5 \mu\text{m}$ and a specific surface area of from ~ 2 to $10 \text{m}^2/\text{g}$. The lithium secondary battery has a high capacity and excellent charge-discharge cycle characteristics.

6270925

LITHIUM BATTERY

Kazunori Takada; Shigeo Kondo; Ryoji Kanno; Tatsuya Nakamura; Mikio Takano; Japan assigned to Toda Kogyo Corporation, Matsushita Electric Industrial Company Ltd.

The present invention related to a lithium battery comprising a pair of electrodes disposed by means of a separator in the presence of a lithium-ion-conductive electrolyte, wherein at least one of said electrodes comprises a lithium iron oxide having a corrugated layer crystal structure and represented by the formula (I), wherein M represents at least one element selected from the group consisting of Co, Ni, Mn and Al, $0 < x < 2$, and y is 0.005–0.1, which has improved battery characteristics, an excellent cycle life and a higher electric current operated.

6270926

LITHIUM SECONDARY BATTERY

Yasuhisa Yamashita; Koji Hattori; Japan assigned to Murata Manufacturing Company Ltd.

A lithium secondary battery includes an anode, a cathode and a separator containing non-aqueous electrolytic solution or solid-state electrolyte, interposed between the anode and the cathode. The anode comprises, as an active-material, lithium metal, lithium alloy or a material capable of absorbing and desorbing lithium-ions. The cathode comprises spinel-structured lithium-manganese complex oxide as an active-material. The spinel-structured lithium-manganese complex oxide is in the form of hollow spherical particles formed by sintering single crystal particles.

6270927

LITHIUM SECONDARY BATTERY AND CATHODE ACTIVE-MATERIAL FOR USE IN LITHIUM SECONDARY BATTERY

Kenji Nakane; Yasunori Nishida; Takeshi Miyai; Tomoari Satoh; Japan assigned to Sumitomo Chemical Company Ltd.

Provided is a lithium secondary battery of a high energy density using a cathode active-material having an excellent cycle characteristic in charging-discharging at a high capacity and a small irreversible capacity. The lithium secondary battery comprising: a cathode including a material that can be doped/undoped with lithium-ions as an active-material; an anode including a lithium metal, a lithium alloy, or a material that can be doped/undoped with lithium-ions as an active-material; and a liquid or solid-electrolyte, wherein lithiated nickel dioxide containing tin is used as the cathode active-material, and said lithiated nickel dioxide has a peak near $2\theta = 34.4^\circ$ and does not have a peak near $2\theta = 22.5^\circ$ in the X-ray diffraction pattern by Cu $K\alpha$ rays, or the intensity ratio of the peak near $2\theta = 22.5^\circ$ to the peak near $2\theta = 34.4^\circ$ is 1.2 or less.

6274271

NON-AQUEOUS ELECTROLYTE LITHIUM SECONDARY BATTERY

Nobuharu Koshiba; Emi Asaka; Koichi Chikayama; Yoko Sano; Japan assigned to Matsushita Electric Industrial Company Ltd.

A non-aqueous electrolyte lithium secondary battery comprising a negative-electrode of spinel-type lithium-titanium oxide with improved overcharge and overdischarge characteristics is disclosed. In this battery, the rechargeable electric capacity of the negative-electrode is adjusted to be smaller than that of the positive-electrode. In a preferable mode, the negative-electrode may further comprise a material which has more negative potential than that of the lithium-titanium oxide, and shows electrochemical reversibility. An electrolyte comprising ethylene carbonate and $\text{LiN}(\text{CF}_3\text{SO}_2)_2$ or $\text{LiN}(\text{C}_2\text{F}_5\text{SO}_2)_2$ is preferable.

6274272

ACTIVE CATHODE MATERIAL FOR A LITHIUM RECHARGEABLE CELL

Jean-Paul Peres; Philippe Biensan; Andre Lecerf; France assigned to Alcatel

An active cathode material for a lithium rechargeable cell is in the form of lithium-containing nickel oxide substituted by three elements including at least cobalt and aluminum. The material has a monoclinic crystal structure and the following general formula, where $0.05 \leq L \leq 1.03$, $0.05 \leq C \leq 0.20$, $0.11 \leq A \leq 0.20$, $0.01 \leq M \leq 0.05$ and $C/A \geq 0.60$.

6274273

POSITIVE ACTIVE-MATERIAL FOR RECHARGEABLE LITHIUM BATTERY AND METHOD OF PREPARING SAME

Jae-Phil Cho; Geun-Bae Kim; Yong-Chul Park; South Korea assigned to Samsung SDI Company Ltd.

Disclosed is a positive active-material for a rechargeable lithium battery having a higher concentration of Co in the surface portion than in the central portion. The surface portion is a region from the outermost surface to a depth of 10 μm . The positive active-material is represented $\text{Li}_{1+x}\text{Mn}_{2-y}\text{Co}_y\text{O}_4$ wherein $-0.1 < x < 0.1$ and $0 < y < 0.1$. The positive active-material is produced by obtaining a sol or gel cobalt material by mixing lithium salts, cobalt salts, an alcohol and chelating agents and heating the mixture, mixing the sol or gel cobalt material with LiMn_2O_4 , and heat-treating the resulting mixture.

6274278

GALLIUM DOPED LITHIUM MANGANESE OXIDE SPINELS ($\text{LiGa}_x\text{Mn}_{2-x}\text{O}_4$) AS CATHODE MATERIAL FOR LITHIUM OR LITHIUM-ION**RECHARGEABLE BATTERIES WITH IMPROVED CYCLING PERFORMANCE**

Gianfranco Pistoia; Carlo Bellitto; Alessandra Antonini; Italy assigned to Consiglio Nazionale Delle Ricerche

An improved process for preparing a spinel-type lithium manganese composite oxide represented by the general formula (I): $\text{Li}_x\text{Mn}_{2-y}\text{M}_{y_1}\text{B}_{y_2}\text{O}_4$ wherein M represents at least one member selected from among Al, Cr, Fe, Ni, Co, Ga, and Mg; $0.9 \leq x \leq 1.1$; and $y = y_1 + y_2$, wherein $0.002 \leq y \leq 0.5$, $0 \leq y_1 \leq 0.5$, and $0.002 \leq y_2 \leq 0.1$ or represented by the general formula (Ia) $\text{Li}_x\text{Mn}_{2-y}\text{M}_y\text{O}_4$, which is the same as the general formula (I) except that y_2 is 0. In formula (Ia) M and x are each as defined above and $0.002 \leq y \leq 0.5$; and a cathode active-material for a lithium-ion rechargeable battery comprising the spinel-type lithium manganese composite oxide having improved charge-discharge characteristics produce by the above method. The composite oxide, thus, produce is a novel one improved in cycle characterized, particularly in charge-discharge cycle characterized in a high-temperature (50 °C or above) environment, and hence, is very useful from the viewpoint of industry.

6277520

THIN LITHIUM BATTERY WITH SLURRY CATHODE

George W. Moutsios; Xuekun Xing; Jay Nardi; Frough K. Shokoohi; Wanjun Fang; USA assigned to NTK Powerdex Inc.

A cathode slurry for use in a lithium battery, comprised of ~60–70 wt.% electrolytic manganese dioxide; ~5–10 wt.% carbon; and ~25–35 wt.% of an electrolyte, said electrolyte comprised of ~10–40 wt.% ethylene carbonate, ~60–90 wt.% propylene carbonate, and ~0.5–1.5 mol of triflate salt.

6277521

LITHIUM METAL OXIDE CONTAINING MULTIPLE DOPANTS AND METHOD OF PREPARING SAME

Yuan Gao; Marina Yakovleva; USA assigned to FMC Corporation

The present invention provides a multiple-doped lithium metal oxide and a method of preparing same for use in the positive-electrodes of lithium and lithium-ion batteries. The intercalation compound of the invention has the formula $\text{LiNi}_{1-x}\text{Co}_y\text{M}_a\text{M}'_b\text{O}_2$, wherein M is selected from the group consisting of Ti, Zr, and combinations thereof, and M' is selected from the group consisting of Mg, Ca, Sr, Ba, and combinations thereof. The elements in the compounds are present such that $x = y + a + b$, x is from >0 to ~0.5, y is from >0 to ~0.5, a is from >0 to ~0.15, and b is from >0 to ~0.15.

6277524

LITHIUM-ION-CONDUCTIVE SOLID-ELECTROLYTE AND SOLID-ELECTROLYTE LITHIUM BATTERY

Ryoji Kanno; Japan assigned to Toyota Jidosha Kabushiki Kaisha, Genesis Research Institute Inc.

A lithium-ion-conductive solid-electrolyte includes a lithium-ion-conductive substance expressed by a general formula $\text{Li}_2\text{S}-\text{GeS}_2-\text{X}$, wherein "X" is at least one member selected from the group consisting of Ga_2S_3 and ZnS , or $\text{Li}_2\text{S}-\text{SiS}_2-\text{P}_2\text{S}_5$. It is superb in terms of stability and safety at elevated temperatures, since it is a crystalline solid of high ion-conductivity. It can be applied to a solid-electrolyte for lithium batteries.

NICKEL HYDRIDE BATTERIES

6261720

POSITIVE-ELECTRODE ACTIVE-MATERIAL FOR ALKALINE STORAGE BATTERIES

Hirokazu Kimiya; Yoichi Izumi; Hiroyuki Sakamoto; Hidekatsu Izumi; Isao Matsumoto; Japan assigned to Matsushita Electric Industrial Company Ltd.

Disclosed is a high capacity positive active-material for an alkaline storage battery comprising a nickel based multi-metals oxide, wherein the charge characteristic at high-temperature is improved. This oxide has a large number of micropores in at least a surface layer. An average composition of the surface layer is different from that of the interior in that at least one element selected from the group consisting of Ca, Ti, Zn, Sr, Ba, Y, Cd, Co, Cr, Bi and lanthanoids, in addition to Ni, is contained in the surface layer, or in that the at least one element is contained at a concentration higher than that of the interior.

6265112

METHOD OF MAKING A NICKEL FIBER ELECTRODE FOR A NICKEL BASED BATTERY SYSTEM

Doris L. Britton; USA assigned to The United States of America as represented by the Administrator of the, National Aeronautics and Space Administration

The general purpose of the invention is to develop a high specific energy nickel electrode for a nickel based battery system. The invention discloses a method of producing a lightweight nickel electrode which can be cycled to deep depths of discharge (i.e. 40% or greater of electrode capacity). These deep depths of discharge can be accomplished by depositing the required amount of nickel hydroxide active-material into a lightweight nickel fiber substrate.

6268082

PRODUCTION METHOD OF ACTIVE-MATERIAL FOR POSITIVE-ELECTRODE OF ALKALINE SECONDARY BATTERY, POSITIVE-ELECTRODE

USING THE ACTIVE-MATERIAL AND PRODUCTION METHOD OF ALKALINE SECONDARY BATTERY USING THE POSITIVE-ELECTRODE

Masayoshi Hiruma; Naomi Bando; Kunihiko Miyamoto; Makoto Wakabayashi; Japan assigned to Toshiba Battery Company Ltd.

The present invention is to provide a production method of an active-material for an alkaline secondary battery comprising: a step of mixing particles comprising particles mainly containing nickel hydroxide and particles of a metal cobalt or a cobalt compound in a mixer with a sealed structure comprising a heating means in the presence of oxygen and an alkaline aqueous solution while heating. An active-material produced by the method allows a high utilization. And a battery assembled with a positive-electrode using the active-material has an excellent high ratio discharge characteristic, and hardly causes the capacity decline even at the time of recharging after leaving in the over discharge state for a long time.

6270535

METHOD OF FORMING CoOOH AND NiOOH IN A NiMH ELECTROCHEMICAL CELL AND AN ELECTROCHEMICAL CELL FORMED THEREBY

Deepika B. Singh; USA assigned to Moltech Power Systems Inc.

A formation procedure for a NiMH electrochemical cell is disclosed that significantly shortens the time required to fully form such a cell. The formation procedure includes a first step during which the cell is charged at a constant voltage of preferably 1 V for approximately 3 h. A second charging step is performed by applying either a constant charge current at a predetermined rate of $C/3$ for 5 h or applying a constant voltage of 1.45–1.5 V for 5–9 h. A third step may optionally be used whereby the cell is charged at a constant current of $C/10$ for ~ 2 h. NiMH cells subjected to this formation procedure have a much greater percentage of the starting cobalt material in the positive-electrode converted to CoOOH , thereby, improving the conductive matrix formed about the $\text{Ni}(\text{OH})_2/\text{NiOOH}$ particles, which constitute the active-material of the positive-electrode. The disclosed inventive formation procedures result in higher utilization, higher cell capacities following long-term storage, or storage at high-temperatures as well as improved capacity recovery following deep discharge.

6270719

MODIFIED ELECTROCHEMICAL HYDROGEN STORAGE ALLOY HAVING INCREASED CAPACITY, RATE CAPABILITY AND CATALYTIC ACTIVITY

Michael A. Fetcenko; Kwo Young; Stanford R. Ovshinsky; Benjamin Reichman; John Koch; William Mays; USA assigned to Ovonic Battery Company Inc.

A modified Ti–V–Zr–Ni–Mn–Cr electrochemical hydrogen storage alloy which has at least one of the following characteristics: (1) an increased charge–discharge rate capability over that the base Ti–V–Zr–Ni–Mn–Cr electrochemical hydrogen storage alloy; (2) a formation cycling requirement which is reduced to one tenth that of the base Ti–V–Zr–Ni–Mn–Cr electrochemical hydrogen storage alloy; or (3) an oxide surface layer having a higher electrochemical hydrogen storage catalytic activity than the base Ti–V–Zr–Ni–Mn–Cr electrochemical hydrogen storage alloy.

6274270

NON-SINTERED NICKEL ELECTRODE FOR AN ALKALINE ELECTROLYTE SECONDARY ELECTROCHEMICAL CELL

Claudette Audry; Michelle Baudry; Patrick Bernard; Olivier Jan; France assigned to Alcatel

A non-sintered nickel electrode for alkaline electrolyte storage cells including a current collector and a paste containing an active-material based on nickel hydroxide and a conductive material, wherein said conductive material is a lithium-containing cobalt and nickel oxide whose degree of oxidation obtained after electrochemical conditioning is stable after prolonged storage in the alkaline electrolyte.

COMPONENTS AND/OR CHARGES

6232748

BATTERY CONTROL APPARATUS FOR HYBRID VEHICLE

Naoki Kinoshita; Japan assigned to Honda Giken Kogyo Kabushiki Kaisha

The present invention relates a battery control apparatus controls charge–discharge processes of a battery installed in a hybrid vehicle, according to the battery temperature so as to prevent degradation of the battery performance. The vehicle has a combustion engine for providing a driving force, an electric motor for generating a drive-assist force for assisting the output of the engine, wherein the battery supplies electrical power to the motor, and, when the drive-assist force is not required by the engine, the motor is used as a generator to charged the battery, the apparatus is comprised by: a residual battery charge computation device for computing a level of residual battery charge in the battery; a battery temperature measuring device for measuring a temperature of the battery; and a charge–discharge controller that operates in such a way that, when a battery temperature measured by the battery temperature measuring device exceeds a threshold temperature, the charge–discharge controller permits only discharging until the residual battery charge is lowered to a level defined by a first specified value.

6239578

SYSTEM AND METHOD FOR PRESERVATION OF BATTERY POWER DURING RECONDITIONING

Arnold Thomas Schnell; Shawn Joel Dube; USA assigned to Dell Products L.P., a Texas Ltd. Partnership

A battery reconditioning circuit for a computer system is disclosed. The battery reconditioning circuit comprises a battery charger, a battery reconditioner and at least two sets of batteries. While one set of batteries is being reconditioned by the battery charger and the battery reconditioner, at least one set of batteries remains connected to the load. Therefore, even if the computer system suffers power loss while one set of batteries is being reconditioned, there is at least one battery available to provide backup power.

6239579

DEVICE FOR MANAGING BATTERY PACKS BY SELECTIVELY MONITORING AND ASSESSING THE OPERATIVE CAPACITY OF THE BATTERY MODULES IN THE PACK

James H. Dunn; Julio C. de Oliveira; David H. Gerwing; Canada assigned to Estco Battery Management Inc.

The invention relates to a device for managing battery packs by measuring and monitoring the operating capacity of individual battery modules in a battery pack. A programmable logic controller directs the selective closing of relays to allow individual battery modules to be load-tested using a variable discharge load unit, without compromising useful battery pack capacity. A battery module whose useful capacity falls below a predefined threshold may be connected to a battery charger for replenishment and then electrically realigned with the remaining modules in the pack for continued operation. Alternatively, an alarm may be triggered which alerts the user that the module is due for replacement. This sequence of events is performed on all cells in the pack at a predetermined interval.

6246216

BATTERY CHARGE CONTROL DEVICE HAVING FUNCTION TO DECIDE GASSING WITHOUT TEMPERATURE SENSOR

Syuji Satake; Hisashi Takemoto; Japan assigned to Yazaki Corporation

A battery charge control device is capable of detecting a gassing state in a battery without using a temperature sensor. Under condition of charging the battery 5 with a charging current, when a terminal voltage V_i of the battery 5 monitored by the device exceeds a threshold value, a temporary-gassing detecting unit 23 informs a voltage regulation calculating unit 24 that the battery 5 is in course of reaching its gassing state. The voltage regulation calculating unit 24 calculates a changing rate of terminal voltage V_i of the battery 5 while it is in course of reaching the gassing state.

When the calculated changing rate exceeds a preset decision value, a gassing detecting unit 25 judges that the battery 5 has just reached the gassing state. A decision value renewing unit 27 changes the decision value corresponding to the charging current.

6262563

METHOD AND APPARATUS FOR MEASURING COMPLEX ADMITTANCE OF CELLS AND BATTERIES

Keith S. Champlin; USA

A periodic time-varying current with smallest period $1/f_1$ excites a cell/battery and provides a timing reference. Linear circuitry produces two signals, one proportional to the excitation current, the other proportional to the responding time-varying voltage. These signals are processed with identical frequency-limiting filter characteristics to attenuate higher-order harmonics and noise. Using the timing reference for synchronization, a microprocessor/microcontroller commands analog to digital converters to sample the frequency-limited current and voltage signals at equally-spaced times over a period and accepts the digitized samples as inputs. The digital samples are averaged over multiple periods and employed to calculate averaged Fourier coefficients of in-phase and quadrature components of frequency-limited current and voltage at frequency f_1 . By numerically combining these Fourier coefficients, the microprocessor/microcontroller determines real and imaginary parts of the cell/battery's complex admittance at frequency f_1 .

OTHER BATTERIES

6265105

SEALED, ALKALINE-ZINC STORAGE BATTERY

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

A sealed alkaline-zinc storage battery includes a battery can, a hollow positive-electrode disposed within the battery can in electrical contact therewith and containing a positive active-material including nickel hydroxide, a negative-electrode disposed inwardly of the positive-electrode and containing a negative active-material including zinc, a separator disposed between the positive and negative-electrodes, a negative current collector inserted into the negative-electrode, and an alkaline electrolyte filled in the battery can and impregnated into the positive-electrode, negative-electrode and separator. The positive-electrode, negative-electrode, separator, negative current collector and electrolyte together account for at least 75% of an internal volume of the battery can. The alkaline electrolyte is in the 30–45 mass% concentration range and has a total water content in the range of 0.5–0.9 g for each theoretical capacity of the negative-electrode expressed as 1 Ah (Ah).

6265109

MAGNESIUM ALLOY BATTERY

Osamu Yamamoto; Teruhisa Kanbara; Shuji Ito; Japan assigned to Matsushita Electric Industrial Company Ltd.

A battery having a high capacity and a high negative-electrode utilization rate is disclosed. It comprises a negative-electrode active-material including fine particles of magnesium or a magnesium alloy and, preferably, of such a magnesium alloy that contains at least one member selected from the group consisting of In, Ga, Sn, Pb, Cd, Mn, Co, Zn and Ti.

6268079

NON-AQUEOUS ELECTROLYTE BATTERY

Takefumi Inoue; Shinya Kitano; Japan assigned to Japan Storage Battery Company Ltd.

A metallic ring is insulatedly sealed around each of the positive-electrode terminal and negative-electrode terminal, previously, by the glass hermetic seal and ceramic hermetic seal in such a manner that it is sealed into the opening hole of the cover plate of a battery case. In this case, in order to prevent the corrosion of a metallic brazer which may occur in the ceramic hermetic seal and improve the workability, the ceramic material is brazed around the negative-electrode terminal through a Au–Cu brazer or P–Cu brazer.

6274261

CYLINDRICAL METAL–AIR BATTERY WITH A CYLINDRICAL PERIPHERAL AIR CATHODE

Lawrence A. Timker; R. Dennis Bentz; USA assigned to AER Energy Resources Inc.

A cylindrical metal–air cell has a cylindrical housing, an axially extending cylindrical air cathode adjacent an interior surface of the housing, and a plurality of elongate plenums defined between the oxygen electrode and the interior surface of the housing. Isolating passageway are positioned between the ambient environment and each of the plenums, and an air moving device is operable to force air through the isolating passageways and into at least one of the plenums. The air moving device may be a micromachined blower controlled by a circuit integrated into the housing of the blower.

6274268

POLYMER SECONDARY BATTERY AND METHOD OF MAKING SAME

Masaki Fujiwara; Gaku Harada; Shinako Okada; Toshihiko Nishiyama; Japan assigned to NEC Corporation

A polymer secondary battery uses, for at least one of the active-material of positive-electrode and the active-material of negative-electrode, a polymer–carbon composite material including powdered carbon having its surfaces coated with an organic compound polymer capable of adsorbing and

desorbing protons electrochemically. The polymer secondary battery has a high rate of appearance of capacity and excellent cycle characteristics.

6274269

**METHOD FOR REDUCING VOLTAGE DELAY IN
ALKALI METAL ELECTROCHEMICAL
CELLS ACTIVATED WITH A NON-AQUEOUS
ELECTROLYTE HAVING A PHOSPHATE
ADDITIVE**

Hong Gan; Esther S. Takeuchi; USA assigned to Wilson Greatbatch Ltd.

An alkali metal, solid cathode, non-aqueous 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.

6274277

ORGANIC ELECTROLYTE BATTERY

Tatsuo Mori; Tadayoshi Takahashi; Shinichi Waki; Nobuharu Koshiba; Takashi Akiyama; Japan assigned to Matsushita Electric Industrial Company Ltd.

The present invention relates to an organic electrolyte battery configured by sealing power generating elements comprising an organic electrolyte by a positive can, a negative can and a gasket, wherein said organic electrolyte includes a lithium salt containing a sulfonic acid group as a

solute and at least one selected from a group consisting of sulfolane, 3-methyl sulfolane and tetraglyme as a solvent. The aim of the invention is to provide an organic electrolyte battery having an excellent discharge performance in a low temperature environment and a superior reliability during long-term storage, as well as a high-temperature resistance which enables the battery to be mounted onto a substrate according to the Reflow method.

6277515

**SOLID-ELECTROLYTE BATTERY WITH CHARGE-
ACCUMULATING PORTIONS SURROUNDING A
BATTERY STRUCTURE PORTION**

Sachio Akahira; Japan assigned to Sony Corporation

A solid-electrolyte battery is provided which is able to satisfactorily perform discharge of a large electric current in a short time and large electric current pulse even in a low temperature environment. A solid-electrolyte battery incorporates: a battery structure portion constituted by forming a positive-electrode active-material layer in a portion of the surface of a positive-electrode collector and a negative-electrode active-material layer in a portion of the surface of a negative-electrode collector to be opposite to each other through a polymer electrolyte. The solid-electrolyte battery incorporates a first charge-accumulating portion constituted by disposing, through a dielectric-material layer, the positive-electrode collector to be opposite to a portion of the negative-electrode collector in which the negative-electrode active-material layer is formed; and a second charge-accumulating portion constituted by disposing, through a dielectric layer, the negative-electrode collector to be opposite to a portion of the positive-electrode collector in which the positive-electrode active-material layer is formed.