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Journal of Power Sources

LEAD-ACID**6284411****VALVE REGULATED TYPE BATTERY AND PRODUCING METHOD THEREOF**

Masaaki Shiomi; Yuuichi Okada; Akiyoshi Kimura; Masaji Adachi; Ken Sawai; JAPAN assigned to Japan Storage Battery Company Ltd.

In a valve regulated type lead-acid battery, a positive plate includes a positive grid made of Pb–Ca alloy and a positive active material containing Sb in the range of 0.005–1.0% both inclusive per weight of the positive active material; wherein a density of the positive active material is not lower than 3.75 g/cc after formation.

6291104**STORAGE BATTERY**

Yasuyuki Yoshihara; Kazuyoshi Yonezu; Go Kashio; Fumiaki Seta; JAPAN assigned to Matsushita Electric Industrial Company Ltd.

A lead-acid storage battery uses as a current collector an expanded grid produced by processing a belt shaped material formed of lead or lead alloys. Strand of a grid for negative electrodes have a twist. The extent of the negative electrode's grid is larger than that of the positive electrode's grid. Accordingly, degradation of output characteristics in the domain deep in the depth of discharge is prevented and further high rate discharge life cycle characteristics are improved.

BATTERY MATERIALS**6280877****METHOD FOR PRODUCING AN ELECTRODE CONTAINING ELECTROLYTE-ABSORBED POLYMER PARTICLES**

Lewis Frederick Urry; USA assigned to Eveready Battery Company Inc.

A method for producing a gelled anode for alkaline galvanic cells, specifically alkaline zinc–manganese dioxide cells, in which cross-linked electrolyte-absorbed polymer particles are distributed throughout the anode and the gelled anode so made.

6284409**PASTED HYDROGEN-ABSORBING ALLOY ELECTRODE FOR ALKALINE STORAGE BATTERY**

Nobuyuki Higashiyama; Kikuko Kato; Teruhiko Imoto; Masutaka Ouchi; Mamoru Kimoto; Yasuhiko Itoh; Koji Nishio; JAPAN assigned to Sanyo Electric Company Ltd.

In a pasted hydrogen-absorbing alloy electrode of this invention, an active material layer made from a mixture of a hydrogen-absorbing alloy powder, a composite particle

powder including carbon particles and a rare earth compound for partially coating surfaces of the carbon particles, and a binder is formed on a current collector. When this pasted hydrogen-absorbing alloy electrode is used in an alkaline storage battery, the alkaline storage battery can attain small increase of the internal pressure during charge, large discharge capacity in high rate discharge and good charge–discharge cycle performance.

6287432**SOLID MULTI-COMPONENT MEMBRANES, ELECTROCHEMICAL REACTOR COMPONENTS, ELECTROCHEMICAL REACTORS AND USE OF MEMBRANES, REACTOR COMPONENTS, AND REACTOR FOR OXIDATION REACTIONS**

Terry J. Mazanec; Thomas L. Cable; John G. Frye Jr.; Wayne R. Klierer; USA assigned to The Standard Oil Company

Solid membranes comprising an intimate, gas-impervious, multi-phase mixture of an electronically-conductive material and an oxygen ion-conductive material and/or a mixed metal oxide of a perovskite structure are described. Electrochemical reactor components, such as reactor cells, and electrochemical reactors are also described. The reactor cells generally comprise first and second zones separated by an element having a first surface capable of reducing oxygen to oxygen ions, a second surface capable of reacting oxygen ions with an oxygen-consuming gas, an electron-conductive path between the first and second surfaces and an oxygen ion-conductive path between the first and second surfaces.

6287729**GRAPHITE MATERIALS FOR NEGATIVE ELECTRODE USED IN LITHIUM SECONDARY BATTERY**

Toshio Tamaki; Kazunori Ishigami; JAPAN assigned to Petoca Ltd.

There are disclosed graphite materials for a negative electrode used in a lithium secondary battery which graphite materials have an average specific surface area of 1.5–5 m²/g and comprise (A) milled graphite fibers which are produced by milling and graphitizing mesophase pitch-based carbon fibers, and which have an interplanar spacing of the graphite layer (d_{002}) of at most 0.337 nm and a specific surface area of 0.8–1.3 m²/g; and (B) graphite materials which have an interplanar spacing of the graphite layer (d_{002}) of at most 0.336 nm, a degree of graphitization (P_{101}/P_{100}) of at least 2.0 and a specific surface area of 2–15 m²/g, wherein the components (A) and (B) are mixed at a ratio (A)/(B) by weight of 90/10–50/50. The above graphite materials comprising the components (A) and (B), when used for a negative electrode in a lithium secondary battery, can enhance the performance of the battery and charge/discharge capacity thereof especially in a high load discharge.

6290878**SOLID POLYMER ELECTROLYTE BASED ON
POLYACRYLONITRILE**

Michel Hilaire; Carole Moneuse; FRANCE assigned to Alcatel

The invention provides a solid polymer electrolyte comprising a polymer which is a polyacrylonitrile, a plasticizer made up of a lithium salt in solution in a liquid organic solvent, and a reinforcing agent which is an organic compound constituted by porous grains of a polymer having polyamide structural units.

6291100**ELECTRODE COMPOSITION COMPRISING
DOPED TUNGSTEN OXIDES AND
ELECTROCHEMICAL CELL
COMPRISING SAME**

Narayan Doddapaneni; Zhendong Hu; Shigenobu Denzumi; USA assigned to IRMA America Inc.

Provided is a novel electrode composition suitable for use in an electrochemical cell. The composition includes a polymeric binder material and a doped tungsten (IV) oxide active material. The active material includes a tungsten (IV) oxide host material and a metal dopant in the host material effective to increase the charge-discharge capacity per unit weight of the active material when used in an electrochemical cell. Also provided is a method for forming the electrode composition and an electrochemical cell comprising the composition. The invention results in an electrochemical cell having improved charge-discharge capacity per unit weight of the electrode active material, and is additionally chemically and electrochemically stable.

6291105**BATTERY SEPARATOR AND METHOD FOR
MANUFACTURING THE SAME AND BATTERY**

Hiroyuki Yamamoto; Toyohiko Sano; Shuuji Hori; Tomofumi Tanaka; Tatsunori Kida; JAPAN assigned to Daiwabo Company Ltd.

A battery separator and a method for manufacturing the same and a battery using the same. The battery separator is excellent in alkaline retaining property, initial alkaline absorption and durable alkaline absorption while maintaining tensile strength and air permeability, by forming functional groups or bonds of $-\text{CHO}$ or $-\text{C}^+\text{H}-\text{O}^-$, $-\text{CO}-$, and $-\text{COO}-$ or $-\text{COO}^-$ on the surface of the non-woven fabric. The battery shows great wettability with an alkaline electrolyte when incorporated into a battery, and thus, improves the battery life. The battery separator is provided by mixing and wet laid processing 15–75 wt.% of splittable conjugated staple fibers comprising polyolefin polymer (component A) and ethylene vinyl alcohol copolymer

(component B) arranged adjacent to each other when viewed in fiber cross section, 20–60 wt.% of thermal bonding staple fibers, and 0–50 wt.% of synthetic fibers that have greater fineness than that of ultra fine fibers formed by splitting the splittable bi-component fibers and have the same or smaller fineness than that of the thermal bonding fibers; treating the wet laid type non-woven fabric with high-pressure water flow to split the splittable bi-component fibers and to form the ultra fine fibers while entangling the fibers; treating both surfaces of the non-woven fabric with corona surface discharge, and calendering by heated rollers.

*FUEL CELL***6280864****CONTROL SYSTEM FOR PROVIDING HYDROGEN
FOR USE WITH FUEL CELLS**

Gavin P. Towler; Kishore J. Doshi; Kurt M. Vanden Bussche; John J. Senetar; USA assigned to UOP LLC

Hydrogen generation and fuel cell operation are integrated through the use of a low-cost hydrogen generation zone which comprises a pre-reforming zone, a partial oxidation zone, a reforming zone, and a water gas shift zone. Anode waste gas from the fuel cell is burned to provide heat to pre-reform the feed to the hydrogen generation zone while the burner exit temperature and the reforming zone exit temperatures are controlled using a simplified control system to eliminate thermal cycling in the hydrogenation zone. This simplified control of the hot side temperatures in the hydrogen generation zone below about 700 °C combined with use of the pre-reforming zone, surprisingly permits the use of carbon steel and/or stainless steel for construction of the hydrogenation zone while providing an efficient system which does not require external fuel and offers a high degree of feedstock flexibility at low cost.

6280865**FUEL CELL SYSTEM WITH HYDROGEN
PURIFICATION SUBSYSTEM**

Glenn Eisman; James F. Mc Elroy; Norman Peschke; USA assigned to Plug Power Inc.

The invention relates to a fuel cell system with a hydrogen purification subsystem. The hydrogen purification subsystem can concentrate hydrogen from the fuel exhaust for recirculation or storage. The hydrogen purification subsystem can also concentrate hydrogen from a fuel supply for input into a fuel cell or for storage. The hydrogen purification subsystem can also concentrate hydrogen for quantitative comparison with a second stream containing hydrogen. The hydrogen purification subsystem can also charge a hydrogen storage device for system use such as meeting transient fuel cell load increases.

6287716

SOLID OXIDE FUEL CELL HAVING COMPOSITION GRADIENT BETWEEN ELECTRODE AND ELECTROLYTE

Ikiko Hashimoto; Norikazu Komada; Kazunori Adachi; JAPAN assigned to Mitsubishi Materials Corporation

A solid oxide fuel cell and method of making same is disclosed. An electrolyte layer of an oxide ion conductor material that may be specified by $\text{La}_{1-a}\text{A}_a\text{Ga}_{1-(b+c)}\text{B}_b\text{Co}_c\text{O}_3$ and an air electrode layer of an electron conductor material that may be specified by $\text{La}_{1-d}\text{A}_d\text{CoO}_3$ are laminated, preferably with an intermediate layer of an electron and ion mixed conductor material that may be specified by $\text{La}_{1-e}\text{A}_e\text{Ga}_{1-(f+g)}\text{B}_f\text{Co}_g\text{O}_3$ interposed therebetween. The laminate may be sintered to integrate the layers, and may then be subjected to a heat treatment to cause elements to diffuse through an interface between adjoining layers. The composition in each interface is thus continuously changed. Here, A may be at least one element selected from the group consisting of Sr and Ca, B may be at least one element selected from the group consisting of Mg, Al, and In, and $0.05 \leq a \leq 0.3$, $0 \leq b, e \leq 0.3$, $0 \leq c \leq 0.15$, $b + c \leq 0.3$, $0 \leq d \leq 0.5$, $0 \leq f \leq 0.15$, $0.15 < g \leq 0.3$, and $f + g \leq 0.3$. The cell is free from cracks distortion, delamination, and the increase in interface resistance under thermal stress during sintering is reduced. In addition, an increase in the reaction area in an air electrode results in an improved cell efficiency.

6290928

GAMMA LITHIUM ALUMINATE PRODUCT AND PROCESS OF MAKING

Hitose Takahashi; Nobuyuki Yamazaki; Takenori Watanabe; Katsumi Suzuki; JAPAN assigned to Nippon Chemicals Industrial Company

Gamma-type lithium aluminate, a particle of which has a BET specific surface area in a range of from 1 to 15 m^2/g and a synthesized degree (P) of not less than 80% is disclosed. The synthesized degree (P) is defined by the equation, $(I_2/I_1) \times 100$, wherein I_1 and I_2 represent diffraction intensity in the X-ray diffraction spectral analysis of gamma-type lithium aluminate and I_1 represents the height of a (1 0 1) peak, I_2 represents the height of a (2 0 0) peak. The gamma-type lithium aluminate of the present invention exhibits excellent heat stability and chemical stability in a molten carbonate when used for an electrolyte-retainer plate of MCFC.

6291089

RADIAL PLANAR FUEL CELL STACK CONSTRUCTION FOR SOLID ELECTROLYTES

James Piascik; Daniel Dalfonzo; Jean Yamanis; Liang A. Xue; Gregory Lear; James Powers; USA assigned to Allied-Signal Inc.

A radial planar fuel cell stack comprises an internal manifold having a first interior cavity and a second interior cavity. A plurality of single cells having an anode layer, a cathode layer, and an electrolyte layer therebetween are disposed about the manifold. A manifold bracket operatively fixes the manifold to at least one of the single cells. The manifold bracket describes a channel in communication with at least one of the first and second interior cavities. A porous element is disposed in the channel and ensures uniform distribution of gases over 360° .

6291091

CONTINUOUS METHOD FOR MANUFACTURING A LAMINATED ELECTROLYTE AND ELECTRODE ASSEMBLY

Christine Preischl; Peter Hedrich; Alfred Hahn; GERMANY assigned to Ballard Power Systems Inc.

A continuous method manufactures a laminated electrolyte and electrode assembly "laminated assembly" comprising at least one pre-formed electrode layer, at least one catalyst layer and at least one electrolyte layer for an electrochemical cell. The method comprises forming at least one of the catalyst or electrolyte layers in situ and using it as a laminating medium. The method produces a laminated assembly in a continuous sheet, which may be later cut to size and shape for use in electrochemical cells. The method may comprise co-extruding granular catalyst and/or electrolyte materials. In one embodiment, the catalyst and electrolyte layers are co-extruded. The co-extruded tri-layer extrusion is laminated with immediately adjacent pre-formed electrode layers. In another embodiment the catalyst layer is extruded and the catalyst layer acts as the laminating medium between immediately adjacent pre-formed electrode and electrolyte layers. In a further embodiment the catalyst layers are applied to two separate pre-formed electrode layers, and the catalyst coated electrode layers are laminated with an electrolyte layer formed in situ which serves as the laminating medium.

6294149

PROCESS FOR OPERATING A WATER VAPOR REFORMING SYSTEM, A REFORMING SYSTEM OPERABLE THEREBY AND A FUEL CELL SYSTEM OPERATING PROCESS

Rainer Autenrieth; Stefan Boneberg; Thomas Poschmann; Martin Schuebler; Steffen Wieland; GERMANY assigned to Xcellsis GmbH

The invention relates to a process for operating a system for the water vapor reforming of a hydrocarbon. The system includes a reactor which is suitable for POX operation as well as for a reforming operation, an evaporator, a hydrogen separating stage, and a catalytic burner device. A first part of the catalytic burner device is in thermal contact with the reforming reactor, and a second part of the burner device is

in thermal contact with the evaporator. An air/hydrocarbon intermediate feeding pipe for the reactor and a pressure maintaining valve are provided for changing the reactor between the POX operation and the reforming operation. According to the process, during cold start of the system, a heating operation is carried out during which the reactor is first used in the POX operation at a lower pressure and subsequently is used for the reforming operation and simultaneously the pressure is increased to the normal operating pressure. The invention is particularly useful for the water vapor reforming of methanol for obtaining hydrogen for a fuel-cell-operated motor vehicle.

6294277

FUEL CELL SYSTEM

Masataka Ueno; Kenji Kato; Munehisa Horiguchi; Noriyuki Takada; JAPAN assigned to Kabushikikaisha Equos Research

A fuel cell power generating apparatus includes a stack of a plurality of fuel cell units each having a cathode and an anode disposed on opposite sides of an electrolyte membrane. A fuel gas supply system supplies fuel gas to the anode, an air supply system supplies air to the cathode and a water supply system supplies liquid water to the cathode. A control unit ensures that, when the apparatus starts up, the cathode is first supplied with air, followed by supply of the liquid water. In a preferred embodiment, the water supply system intermittently sprays the liquid water onto the cathode when the temperature of the fuel cell stack monitored by a temperature sensor falls below a predetermined temperature.

6294279

SOLID-ELECTROLYTE FUEL CELL AND METHOD FOR MANUFACTURING THE SAME

Hiroaki Taira; JAPAN assigned to Murata Manufacturing Company Ltd.

A solid-electrolyte fuel cell has a three-layered film in which an air electrode is arranged on one surface of a solid-electrolyte film and a fuel electrode is arranged on the other surface, a support layer is bonded to an electrode of the three-layered film, and a collecting layer is bonded with another surface of the support layer and the fuel electrode and the collecting layer, or the air electrode and the collecting layer are electrically connected to each other through holes formed in the thickness direction of the main surface of the support layer.

6294281

BIOLOGICAL FUEL CELL AND METHOD

Adam Heller; USA assigned to TheraSense Inc.

A fuel cell has an anode and a cathode with anode enzyme disposed on the anode and cathode enzyme is disposed on the cathode. The anode is configured and arranged to

electrooxidize an anode reductant in the presence of the anode enzyme. Likewise, the cathode is configured and arranged to electroreduce a cathode oxidant in the presence of the cathode enzyme. In addition, anode redox hydrogel may be disposed on the anode to transduce a current between the anode and the anode enzyme and cathode redox hydrogel may be disposed on the cathode to transduce a current between the cathode and the cathode enzyme.

LITHIUM BATTERIES

6280484

METHOD FOR THE MANUFACTURE OF A LITHIUM BATTERY

Erik M. Kelder; Michiel J. Jak; Johannes Schooman; THE NETHERLANDS assigned to Stichting voor de Technische Wetenschappen, Stichting Scheikundig Onderzoek Nederland

The invention relates to a method for the economic manufacture of lithium batteries by means of dynamic compaction. To this end cathode, electrolyte and/or anode material is taken up in a carrier. The carrier, according to a preferred embodiment, is a plastic. This facilitates the handling of the material, while in addition thin layers can be made. According to a preferred embodiment the plastic material is a lithium ion-conductive plastic.

6280873

WOUND BATTERY AND METHOD FOR MAKING IT

Hisashi Tsukamoto; USA assigned to Quallion LLC

A lithium battery made with a bipolar polyimide membrane with metal layers on each side, including one embodiment where the polyimide has a gold layer on each side. Different formulations for the positive electrode active material are used. The positive electrode active materials are essentially three substances: first, a lithium compound selected from the group consisting of LiCoO_2 , LiNiO_2 , and LiMn_2O_4 ; second, a powder selected from the group consisting of acetylene black powder (AB) and graphite; and third, polyvinylidene fluoride (PVDF). The negative electrode active material consists essentially of two substances: the first is graphite powder; the second is PVDF (polyvinylidene fluoride). The positive electrode metals include gold and aluminum. The negative electrode materials include gold, copper, nickel, titanium and iron. A separator layer of polyethylene is used so the battery layers can be wound. Because of the strength of the polyimide, the battery can be tightly wound. The energy density of the battery is about 300 Wh/cm^3 .

6280878

ELECTRODE AND LITHIUM SECONDARY BATTERY USING THIS ELECTRODE

Satoshi Maruyama; Masato Kurihara; Akira Kakinuma; JAPAN assigned to TDK Corporation

An electrode comprising a porous metal member in sheet form having a three-dimensional skeleton structure and a solid polymer electrolyte is used to construct a lithium secondary battery and an electric double-layer capacitor. Owing to the increased retaining force of the gel electrolyte component to a current collector, the gel electrolyte component can be directly applied to the current collector, contributing to mass scale productivity and cost reduction.

6280881

LITHIUM SECONDARY BATTERY

Asa Wendsjo; Steen Yde-Andersen; DENMARK assigned to Danionics A/S

A lithium secondary battery with an electrolyte containing one or more alkali metal salts, one or more non-aqueous solvents and immobilized by a polymer selected from cellulose acetates, cellulose acetate butyrates, cellulose acetate propionates, polyvinylidene fluoride-hexafluoropropylenes and polyvinylpyrrolidone-vinyl acetates, the polymer preferably being used in an amount of at most 15% by weight based on the weight of the salts, solvents and polymer of the electrolyte system, with the provision that in the case of polyvinylidene fluoride-hexafluoropropylenes, the polymer is present in an amount of at most 12% by weight based on the weight of the salts, solvents and polymer of the electrolyte system. The immobilized electrolyte does not cause problems with respect to leakage from the cell compartment and the electrolyte also high conductivity implying a capacity utilization more closely approaching the utilization observed for batteries using liquid electrolyte. The electrolyte is also electrochemically stable.

6287448

ELECTROCHEMICAL PRODUCTION OF LITHIUM USING A LITHIUM AMALGAM ANODE

Kerstin Schierle-Arndt; Hermann Putter; Gunther Huber; Dieter Schlafer; Josef Guth; GERMANY assigned to BASF Aktiengesellschaft

A process for producing metallic lithium starting from an aqueous solution of at least one lithium salt comprises the following steps: (I) production of a lithium amalgam from an aqueous solution of at least one lithium salt; and (II) electrolysis using an anode comprising the lithium amalgam, a solid electrolyte which conducts lithium ions, and liquid lithium as cathode, wherein the lithium amalgam as anode is kept in motion.

6287721

PROCESS FOR MANUFACTURING ELECTRO-CHEMICAL CELLS

Like Xie, Thomas J. Roberts, Steve Kaganovich, Zhiwei Zang; Mohammed Alamgir; USA assigned to Thomas and Betts International Inc.

A manifold bi-cell assembly for electrochemical cells such as a polymer lithium ion battery is provided along with a method of manufacture thereof. The disclosed electrochemical cell includes an elongate planar separator or substrate formed of an elastic material. A plurality of discrete anodes with laterally offset leads is positioned in longitudinally spaced apart relationship to one another and positioned between a pair of substrates to create a sandwich assembly wherein adjacent anodes have a substrate interface therebetween. A plurality of cathodes with laterally offset leads corresponding in size, shape and number to the plurality of anodes is also positioned in longitudinal spaced apart relationship on an opposed side of said substrate and overlying the anodes. The substrate is folded along its interfaces to create a manifold assembly wherein the anodes and cathodes are superimposed in a stacked configuration with the leads of the cathodes being offset from the leads of the anodes.

6287727

MANGANESE-LITHIUM ION ELECTROLYTIC CELL

Hideaki Horie; Mikio Kawai; Takaaki Abe; Toyooki Nakagawa; Yuuji Tanjo; Ken Iwai; JAPAN assigned to Nissan Motor Company Ltd.

There is provided a positive electrode comprising positive electrode active material granules which each are composed of lithium manganate; and a first surface layer which is formed on each of the positive electrode active material granules and is to transmit lithium (Li) ion but not manganese (Mn) ion therethrough.

6291097

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., Delphi Technologies 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.

6291101

LITHIUM SECONDARY BATTERY

Koji Kita; Hiroshi Watanabe; Toshiyuki Nohma; Koji Nishio; JAPAN assigned to Sanyo Electric Company Ltd.

The present invention provides a lithium secondary battery using, as a lithium ion occluding agent for a negative electrode, a substantially amorphous oxide powder in which a product $V \times d$ of a total volume V in cm^3/g of pores with a diameter of 100 nm or less and a true density d in g/cm^3 measured by a helium displacement method is 0.1 through 0.5. Thus, the lithium secondary battery can attain an excellent charge-discharge cycle characteristic.

6291102

LITHIUM ION SECONDARY BATTERY

Yasuhiro Yoshida; Kouji Hamano; Hisashi Shoita; Shigeru Aihara; Takayuki Inuzuka; Michio Murai; Sho Shiraga; JAPAN assigned to Mitsubishi Denki Kabushiki Kaisha

An object is to provide a lithium ion secondary battery which maintains the electrical connections between each active material layer and a separator without using a firm housing, can have an increased energy density, can take an arbitrary shape, such as a thin shape, exhibits excellent charge and discharge characteristics, and has a large battery capacity. Positive and negative electrode active material particles are bonded to their respective current collectors to form a positive electrode and a negative electrode. The positive and the negative electrode active material layers are joined to a separator with a binder resin so that the joint strength between the separator and the positive and the negative electrode active material layers may be equal to or greater than the joint strength between the positive and the negative electrode active material layers and the respective current collectors to prepare a tabular laminated battery body having a plurality of electrode laminates. An electrolytic solution containing lithium ions is held in the voids possessed by the positive and the negative electrode active material layers and the separator to make an electrical connection between electrodes.

6291103

POSITIVE ACTIVE MATERIAL FOR RECHARGEABLE LITHIUM BATTERY

Yong-Chul Park; Geun-Bae Kim; Jae-Phil Cho; Hyun-Sook Jung; SOUTH KOREA assigned to Samsung SDI Company Ltd.

A positive active material for a rechargeable lithium battery is provided. The positive active material is characterized by formulas 1 or 2. The positive active material exhibits good cycle life characteristics and high capacity. (Where $0.95 \leq a \leq 1.05$, $0.01 \leq x + y \leq 0.5$, $0 < y \leq 0.1$, $0 \leq z \leq 0.05$, $1.7 \leq b \leq 2.3$, M is at least one metal selected from the group consisting of La and Ce, and N is at least one metal selected from the group consisting of Mg and Sr.) (Where $0.95 \leq a + b \leq 1.05$, $0 \leq b \leq 0.5$, $0.01 \leq x + y \leq 0.5$, $0 < z \leq 0.1$, $1.7 \leq z \leq 2.3$, M is at least one metal selected from the group consisting of La and Ce, and N is Mg.)

6291106

ELECTROLYTIC-SOLUTION-SUPPORTING POLYMER FILM AND SECONDARY BATTERY

Takahiro Daido; Takeyuki Kawaguchi; JAPAN assigned to Teijin Limited

A high-strength, heat-resistant and high-safety electrolytic-solution-supporting polymer film which can be applied to secondary batteries typified by lithium and lithium ion secondary batteries and which has an ionic conductivity of at least 5×10^{-4} S/cm at 25 °C, a puncture strength of at least 300 g and a mechanical heat resistance of at least 300 °C.

6291107

NON-AQUEOUS ELECTROLYTE BATTERY

Ryuichi Shimizu; JAPAN assigned to NEC Moli Energy Corporation

The invention provides a non-aqueous electrolyte battery using a carbonaceous material capable of doping or dedoping lithium for an anode, a composite oxide comprising lithium and a transition metal for a cathode, and a non-aqueous electrolyte obtained by dissolving a carrier salt in a non-aqueous solvent as an electrolyte. The non-aqueous electrolyte comprises at least one monomer selected from the group consisting of isoprene, styrene, 2-vinylpyridine, 1-vinylimidazole, butyl acrylate, ethyl acrylate, methyl methacrylate, *N*-vinylpyrrolidone, ethyl cinnamate, methyl cinnamate, ionone, and myrcene, which, upon charging, forms a film on the surface of the anode.

6291108

NON-AQUEOUS ELECTROLYTE CELL

Masatoshi Takahashi; Seiji Yoshimura; Nobuhiro Furukawa; JAPAN assigned to Sanyo Electric Company Ltd.

A non-aqueous electrolyte cell includes a positive electrode, a negative electrode, and an electrolyte consisting of a solute and an organic solvent. The solvent is a solvent mixture of a cyclic carbonate and a non-cyclic carbonate.

6294290

ELECTRODE BINDER FOR A LITHIUM-ION SECONDARY BATTERY AND METHOD FOR MANUFACTURING ACTIVE MATERIAL SLURRY USING THE SAME

You-Mee Kim; SOUTH KOREA assigned to Samsung SDI Company Ltd.

The present invention provides an electrode binder of a lithium-ion secondary battery. The binder includes at least two materials selected from a polyvinylidene fluoride polymer. The materials have the same chemical component as each other but different physical characteristic from each other. The materials are a homopolymer and a copolymer of

the polyvinylidene fluoride polymer. The binder also includes at least two materials selected from a rubber polymer binder and a polyvinylidene fluoride polymer. The materials have the different chemical component as each other. A mixture ratio of the homopolymer and the copolymer are selected within a range of 50:50–95:5 wt.%. It is preferable that the polyvinylidene fluoride and rubber polymer binder are mixed within a rate of 20:80–80:20 wt.%.

NICKEL METAL HYDRIDE BATTERIES

6284215

MANUFACTURING METHOD OF ACTIVE MATERIALS FOR THE POSITIVE ELECTRODE IN ALKALINE STORAGE BATTERIES

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

A process for producing positive electrode active material includes feeding an aqueous nickel salt solution, aqueous solutions of different kinds of metals, aqueous solution containing ammonium ions and aqueous alkali solution each independently and simultaneously into a reaction vessel such that the amount of alkali metal is 1.9–2.3 moles relative to 1 mole of the total amount of nickel and different kinds of metals and the amount of ammonium ions is 2 mole or more relative to 1 mole of the total amount of nickel and different kinds of metals, the pH in the vessel is 11–13, the temperature in the vessel is 30–60 °C and the average residence time is 20–50 h. Further, in the process step of continuously growing the complex metal oxide particles from the salts of a plurality of metal elements through a plurality of successive reaction-deposition stages, the compositions and/or the kinds of the salts of metal element groups used for forming the oxide in the reaction-deposition stages adjacent to each other are made to be different from each other.

6287725

SINTERED HYDROGEN STORAGE ALLOY ELECTRODE AND NICKEL–HYDROGEN STORAGE BATTERY

Reizo Maeda; Syuuichi Suzuki; Hiroshi Nakamura; Mitsuzo Nogami; Ikuo Yonezu; Koji Nishio; JAPAN assigned to Sanyo Electric Company Ltd.

The present electrode is fabricated by coating a conductive substrate with a paste including a hydrogen-absorbing alloy, a binder and a carbon material and sintering the conductive substrate coated with the paste under vacuum or in an atmosphere of a non-oxidizing gas. In this electrode, the carbon material works as a reducing agent so as to suppress oxidation of the hydrogen-absorbing alloy during the sintering, and therefore, the electrode exhibits large

oxygen absorbing power in over-charge. Furthermore, the present battery uses, as a negative electrode, the sintered hydrogen-absorbing alloy electrode exhibiting large oxygen absorbing power in over-charge, and hence attains high reliability because increase of the pressure within the battery is minimal.

6287726

METHOD FOR PRODUCING NICKEL POSITIVE ELECTRODE FOR ALKALINE STORAGE BATTERIES

Kazuhiro Ohta; Yukihiro Okada; Hiromu Matsuda; Yoshi-nori Toyoguchi; JAPAN assigned to Matsushita Electric Industrial Company Ltd.

Disclosed is a nickel positive electrode for alkaline storage batteries with superb utilization of nickel hydroxide in an atmosphere from room temperature to high temperature. The positive electrode comprises a nickel hydroxide particle or a nickel hydroxide particle with one or more elements other than Ni incorporated therein, a coating layer which comprises a compound of cobalt having a mean valence over 2 and which coats the nickel hydroxide particle, and a compound of at least one element selected from the group consisting of Ca, Sr, Ba, Cu, Ag, Cd, Y, Yb, Ce, Sm, Gd and Er.

COMPONENTS AND/OR CHARGES

6281661

METHOD OF CHARGING A PLURALITY OF BATTERIES

Osamu Kaite; Tomoya Fukuda; JAPAN assigned to Sanyo Electric Company Ltd.

The method of charging a plurality of batteries uses a charging power supply to pulse charge a plurality of batteries to full charge by time-division switching of the battery being charged. Further, this charging method moves timing intervals forward to begin charging the next battery when charging of a fully charged battery is stopped.

6285163

MEANS FOR ESTIMATING CHARGED STATE OF BATTERY AND METHOD FOR ESTIMATING DEGRADED STATE OF BATTERY

Nobuo Watanabe; Yukio Kuroda; Yoshiaki Kikuchi; JAPAN assigned to Toyota Jidosha Kabushiki Kaisha

Means for estimating the charged state of a battery, capable of accurately estimating an SOC even though the battery repeats charging/discharging in short cycles. The charging/discharging current I_b measured by current sensing means is integrated, and pseudo-SOC estimating means estimates a pseudo-SOC. Electromotive force estimating means estimates the open voltage V_{oc} from the pseudo-SOC. Voltage

change estimating means estimates the voltage change V_r due to the internal resistance from the charging/discharging current I_b . Dynamic voltage change estimating means estimates the voltage change V_{dyn} due to the change of the charging/discharging current. An adder adds the V_{oc} , V_r , and V_{dyn} to calculate an estimated voltage V_{est} of the battery. SOC correction calculating means calculates the correction of the SOC for equalizing the estimated voltage V_{est} to the measured voltage V_{mes} measured by voltage sensing means, and an adder adds the correction to the pseudo-SOC to estimate the SOC of the battery.

6291966

METHOD AND AN APPARATUS FOR STORING AND COMMUNICATING BATTERY INFORMATION

Heino Wendelrup; Michael Kellerman; Johan Mercke; Kristoffer Ptasiniski; Jan Rubbmark; Jonas Bengtsson; Charles Forsberg; SWEDEN assigned to Telefonaktiebolaget LM Ericsson

A battery system and method are disclosed. The battery system and method include battery means for supplying operating power during battery operation of a battery power receiving device (e.g. a mobile phone). The battery system and method further includes a battery information circuit carried as a unit together with the battery means (e.g. in the form of a so-called battery pack for a mobile phone) for assembly with the battery power receiving device. The battery information circuit includes memory cells and is capable of communicating information with the battery power receiving device. The memory cells include bits encoded to represent an index for a table including battery information, and the battery power receiving device includes a memory capable of storing the table.

6291971

METHOD AND APPARATUS FOR DETERMINING THE CHARGE BALANCE OF A STORAGE BATTERY FOR AN OPERATING SYSTEM HAVING A PLURALITY OF ELECTRICAL CONSUMERS

Wolf Boll; Bernd Falkenmayer; Matthias Schorpp; GERMANY assigned to DaimlerChrysler AG

In a method for detecting the charge balance of a storage battery for an electric drive vehicle by measuring and summing the charge and discharge currents over time, a plurality of current measuring arrangements are provided. Individual electrical power consumers are each assigned to one of these current measuring arrangements, and the currents detected by the current measuring arrangements are added over time. The consumers are assigned mainly on the basis of their power draws. It is also possible to replace one or more current measuring arrangements by a pulse generator. The power draw of the corresponding consumer is then multiplied by its operating time, determined with a

given factor. The current draw of the electric drive is measured in any case.

6294897

METHOD AND APPARATUS FOR ELECTRONICALLY EVALUATING THE INTERNAL TEMPERATURE OF AN ELECTROCHEMICAL CELL OR BATTERY

Keith S. Champlin; USA

A testing device applies time-varying electrical excitation to a cell or battery and senses the resulting time-varying electrical response. Computation circuitry within the device uses voltage and current signals derived from the excitation and response signals as inputs and computes values of elements of an equivalent circuit representation of the cell or battery. The internal temperature of the cell or battery is calculated from the value of the time constant of a particular parallel G-C subcircuit of the equivalent circuit. The battery's internal temperature is then either displayed to the user, used to apply appropriate temperature corrections to other computed quantities, used to detect thermal runaway, and/or used to control an external process such as charging of the battery.

OTHER BATTERIES

6280875

RECHARGEABLE BATTERY STRUCTURE WITH METAL SUBSTRATE

B. Leo Kwak; Robert A. Clarke; Richard F. David; USA assigned to Teledyne Technologies Incorporated

A thin-film rechargeable battery and its method of manufacture having a substrate over which may be formed layered battery components. The layered components include, in series, a first electrode layer, and an electrolyte layer. The layered arrangement reduces reactivity between the layered components and provides improved battery performance.

6284405

NONAQUEOUS ELECTROLYTE BATTERY, ELECTRODE PLATE FOR NONAQUEOUS ELECTROLYTE BATTERY, AND METHOD FOR MANUFACTURING ELECTRODE PLATE FOR NONAQUEOUS ELECTROLYTE BATTERY

Hideki Kaido; Kouichi Matsumoto; Minoru Hashimoto; Mitsuru Furuichi; JAPAN assigned to Toshiba Battery Company Ltd.

A method for manufacturing an electrode plate of a non-aqueous electrolyte battery comprises the steps of running a sheet conductive base material in a first direction; and injecting an electrode material composition containing an electrolyte from a die nozzle onto a first surface of the running sheet conductive base material to form uncoated

areas at predetermined intervals on the first surface along the first direction. The electrode material composition may be applied in different amounts per unit area between first and second areas of the sheet conductive base material. Preferably, the coated amount is continuously increased or decreased along the first direction.

6287715

METAL-AIR FUEL CELL BATTERY SYSTEM HAVING MEANS FOR CONTROLLING DISCHARGING AND RECHARGING PARAMETERS FOR IMPROVED OPERATING EFFICIENCY

Sadeg M. Faris; Tsepin Tsai; USA assigned to Reveo Inc.

Disclosed are various types of metal-air FCB-based systems comprising a metal-fuel transport subsystem, a metal-fuel discharging subsystem, and a metal-fuel recharging subsystem. The function of the metal-fuel transport subsystem is to transport metal-fuel material, in the form of tape, cards, sheets, cylinders and the like, to the metal-fuel discharge subsystem, or the metal-fuel recharge subsystem, depending on the mode of the system selected. When transported to or through the metal-fuel discharge subsystem, the metal-fuel is discharged by, (i.e. electro-chemically reaction with) one or more discharging heads in order produce electrical power across an electrical load connected to the subsystem while H₂O and O₂ are consumed at the cathode-electrolyte interface during the electrochemical reaction. When transported to or through the metal-fuel recharging subsystem, discharged metal-fuel is recharged by one or more recharging heads in order to convert the oxidized metal-fuel material into its source metal material suitable for reuse in power discharging operations, while O₂ is released at the cathode-electrolyte interface during the electro-chemical reaction. In the illustrative embodiments, discharge and recharge parameters are detected and processed in order to generate control data signals that are used to control discharging and recharging parameters so that discharging and recharging operations and metal-fuel/metal-oxide management operations are carried out in an efficient manner.

6287720

NONAQUEOUS BATTERY HAVING POROUS SEPARATOR AND PRODUCTION METHOD THEREOF

Masaya Yamashita; Shunsuke Oki; JAPAN assigned to Asahi Kasei Kabushiki Kaisha

Disclosed is a battery comprising a positive electrode comprising a cathode active material layer, a negative electrode comprising an anode active material layer, and a sole porous separator disposed between the positive electrode and the negative electrode, wherein the positive electrode, the negative electrode and the separator are disposed in a casing containing an electrolyte, and wherein the porous separator comprises at least one layer of an aggregate form of particles

of at least one insulating substance, the layer of the aggregate form of particles having a three-dimensional network of voids which function as pores of the porous separator and which are capable of passing ions therethrough.

6287723

ALKALINE SECONDARY BATTERY HAVING AN ANODE COMPRISING A NON IONIC POLYMER BINDER

Koichiro Maeda; Toshihiro Inuoe; Kenji Wada; Hidekazu Haneda; Haruhisa Yamamoto; JAPAN assigned to Nippon Zeon Company Ltd.

An alkaline secondary battery comprising an electrolyte such as aqueous solution of potassium hydroxide, at least one cathode electrode, at least one anode electrode having an anode active material layer, and a separator such as non-woven fabric between the anode electrode and the cathode electrode, in which the anode active material layer containing an anode active material such as a hydridable alloy or a cadmium alloy, and an anode binder which includes a nonionic polymer produced by emulsion polymerization of a nonionic monomer in the presence of a nonionic surfactant, and in which the electrolyte essentially surrounds the cathode electrode and the anode electrode.

6287728

NONAQUEOUS ELECTROLYTE SECONDARY BATTERY

Yoshio Kajjura; Tetsuya Kusakabe; Nobuyuki Isshiki; JAPAN assigned to Kao Corporation

By using a porous material formed by calcining an active material as an electrode of a non-aqueous solvent secondary battery, the volume of a dead space in the electrode contained in a container of the constituted battery is reduced, thereby, to increase an electric capacity per unit volume. By using the porous material as the electrode material, rather a powder material, the active material is sufficiently brought into contact with an electrolyte solution, electrically. Furthermore, the amount of a metal foil as a current collecting material and a conductive material are reduced or use of them is made unnecessary, and an electric capacity per unit weight is increased in comparison with the prior art. When the porous sintered material has a plate-like shape, the thickness is from 100 μm to 2 mm. The porous sintered material contains pores of an average diameter of 0.1–100 μm in the proportion of 15–60% based on the total volume, and an average wall thickness between the pores is not more than 40 μm.

6294291

SECONDARY BATTERY OR CELL WITH A NON-AQUEOUS ELECTROLYTE

Yoshiyuki Ozaki; Nobuo Eda; Akiyoshi Morita; JAPAN assigned to Matsushita Electric Industrial Company Ltd.

A secondary battery with non-aqueous electrolyte having a high voltage and energy density and a superior cycle property, characterized in that a cathode comprises composite oxides containing lithium and an anode comprises compo-

site carbon materials containing graphite spherical particles and carbon fibers. The carbon fiber improves the stiffness of the anode depolarizing mix to prevent the body made thereof from swelling and decomposing.