



Available online at www.sciencedirect.com

SCIENCE @ DIRECT®

Journal of Power Sources 114 (2003) 374–382

JOURNAL OF
**POWER
SOURCES**

www.elsevier.com/locate/jpowsour

Patents ALERT

This section contains abstracts of recently issued patents in the United States and published patent applications filed from over 90 countries under the Patent Cooperation Treaty and compiled in accordance with interest profiles developed by the Editors.

Further information about complete patents can be obtained from:

REEDFAX Document Delivery System
275 Gibraltar Road, Horsham, PA 19044, USA

Phone: +1 215 441-4768
Fax: +1 215 441-5463
WWW: www.reedfax.com

Journal of Power Sources

*LEAD ACID***6458489****LEAD ACID BATTERY WITH IMPROVED PERFORMANCE**

Jean Alzieu; Jack Robert; France assigned to Centre National de la Recherche Scientifique

In a lead acid battery with stress applied perpendicular to the plane of the electrodes, at least one of the elements chosen from among the positive electrode, the negative electrode and the electrolyte has been modified so that the quantity of sulfuric acid in the positive electrode and/or negative electrode represents at least 0.20 mol of H₂SO₄ per mole of active material in the charged state.

6461758**BATTERY WITH VENT CAP ASSEMBLY**

Matthias Geibl; Thomas J. Dougherty; Gerald D. Slayton; Mark S. Inkmann; Guy L. Pfeifer; Gerald A. Cummins; Edward C. Frelka; Edward N. Mrotek; Helmuth Faust; Arch A. Pope; David J. Novak; William J. Ross; Bradley R. Niemuth; Ronald F. Kirby; USA assigned to Johnson Controls Technology Company

An improved vent cap system for use in an electrochemical battery is provided which includes a ring flange for forming a ring seal between the vent cap assembly and the fill tube. When the vent cap assembly is positioned in the battery housing, the ring flange and the fill tube deform to create a seal therebetween to provide a fluid tight seal.

6455191**CONNECTING PART FOR CONNECTING INTERNAL COMPONENTS OF LEAD ACID BATTERY**

Takao Omae; Hiroyuki Ishiguro; Japan assigned to Japan Storage Battery Company Ltd.

The use of the Pb–Sn alloy containing Ag and Se of the present invention as a connecting part for connecting internal components makes it possible to improve the resistance of straps, poles and cell connectors to general corrosion and grain boundary corrosion, inhibit the occurrence of the stress corrosion cracking and enhance the alloy strength, thus providing a lead acid battery having an excellent reliability.

*BATTERY MATERIALS***6455196****NON-SINTERED POSITIVE ELECTRODE FOR ALKALINE STORAGE BATTERY AND ALKALINE STORAGE BATTERY USING THE SAME**

Fumio Kato; Tatsuhiko Suzuki; Futoshi Tanigawa; Yoshitaka Dansui; Kohji Yuasa; Japan assigned to Matsushita Electric Industrial Company Ltd.

The present invention provides alkaline storage batteries high in energy density and excellent in overdischarge resistance, and, besides, less in decrease of capacity even if charging and discharging cycle is repeated at high-temperatures. There is used a positive electrode comprising a foamed nickel substrate having the number of pores of 80–160 pores/in. (PPI2D) and a thickness of skeleton of 30–60 μm in which spherical nickel hydroxide solid solution particles having an average particle size of 5–20 μm and a cobalt oxide conductive agent having an average particle size of 1 μm or less and mainly composed of gamma-cobalt oxyhydroxide having a cobalt valence of higher than 3.0 are held and the total occupying ratio of the spherical nickel hydroxide solid solution particles and the cobalt oxide conductive agent based on the whole electrode plate is in the range of 75–85 vol.%.

*FUEL CELL***6458478****THERMOELECTRIC REFORMER FUEL CELL PROCESS AND SYSTEM**

Chi S. Wang; J. Daniel Lyons; USA

An integrated process and system for producing electricity for stationary purposes or for electric-powered vehicle using any of multiple hydrocarbon input fuels, a fuel cell, and a thermoelectric reformer that allows quick response to transient loads. Optional high-temperature and low-temperature water-gas shift reactors are used to convert carbon monoxide to carbon dioxide in the reformat stream; a hydrogen separator is used to remove carbon dioxide, carbon monoxide, and trace hydrocarbons; and a condenser is used to remove moisture from the reformat stream. Hydrogen gas not consumed in the fuel cell is stored or recycled for subsequent input to the fuel cell. H₂O produced in the fuel cell is recycled for use in the reformer and water-gas shift reactors and is heated with waste heat from the fuel cell and carbon dioxide, carbon monoxide, and hydrocarbons from the hydrogen separator. A mixer is used to vaporize the input fuel prior to entering the thermoelectric reformer. Some of the electricity produced in the fuel cell is used for powering the thermoelectric reformer and is also stored for subsequent startup and peak load purposes.

6458479**AIR BREATHING DIRECT METHANOL FUEL CELL**

Xiaoming Ren; Shimshon Gottesfeld; USA assigned to the Regents of the University of California

An air breathing direct methanol fuel cell is provided with a membrane electrode assembly, a conductive anode assembly that is permeable to air and directly open to atmospheric air, and a conductive cathode assembly that is permeable to methanol and directly contacting a liquid methanol source. Water loss from the cell is minimized by making the

conductive cathode assembly hydrophobic and the conductive anode assembly hydrophilic.

6461751

**METHOD AND APPARATUS FOR OPERATING
A FUEL CELL**

Gustav Boehm; David P. Wilkinson; Shanna Knights; Reinhold Schamm; Nicholas J. Fletcher; Germany assigned to Ballard Power Systems Inc.

The present invention relates to improving the overall efficiency of a fuel cell system by reducing parasitic power consumption. A controller is programmed to decrease oxidant stoichiometry until oxidant starvation is detected or until oxidant stoichiometry is about one. When oxidant starvation is detected, the oxidant stoichiometry is increased until oxidant starvation is no longer detected. The fuel cell system employs a sensor for detecting an operational characteristic such as voltage output, or oxygen or hydrogen concentration in the cathode exhaust stream. The controller uses the operational characteristic to calculate oxidant stoichiometry or to determine when there is oxidant starvation at the cathode.

6461753

**FUEL CELL WITH A DIRECT ANTIFREEZE
IMPERMEABLE COOLER PLATE**

Richard D. Breault; Margaret M. Steinbugler; David A. Condit; USA assigned to UTC Fuel Cells, LLC

A fuel cell with a direct antifreeze impermeable cooler plate is disclosed for producing electrical energy from reducing fluid and process oxidant reactant streams. The fuel cell includes an electrolyte secured between an anode catalyst and a cathode catalyst; an anode flow field secured adjacent the anode catalyst for directing the reducing fluid to pass adjacent the anode catalyst; a cathode flow field secured adjacent the cathode catalyst for directing the process oxidant stream to pass adjacent the cathode catalyst; a direct antifreeze impermeable cooler plate secured in heat exchange relationship with the cathode flow field; and a direct antifreeze solution passing through the cooler plate for controlling temperature within the fuel cell. The direct antifreeze solution is an organic antifreeze solution that is not volatile at cell operating temperatures. A preferred direct antifreeze solution is an alkanetriol selected from the group consisting of glycerol, butanetriol, and pentanetriol having favorable low volatility and high surface tension characteristics. The direct antifreeze impermeable cooler plate may be constructed of any material that is impermeable to liquid and compatible with a fuel cell operating environment such as plated metals, or in a preferred embodiment, the cooler plate may be a fine pore commercial graphite material.

6461754

**SOLID POLYMER ELECTROLYTE FUEL CELL
HAVING A COOLANT CIRCULATION CIRCUIT**

Yixin Zeng; Japan assigned to Aisin Seiki Kabushiki Kaisha

A solid polymer electrolyte fuel cell having a coolant circulation circuit is made up of a coolant flow field plate having a surface opposed to a cell surface, an open faced coolant flow channel formed in a major region of the surface of the coolant flow field plate, the open-faced coolant flow channel being divided into a plurality of divisional passages in regional fashion, a coolant inlet port at one end of each of the divisional passages, and a coolant outlet port at the other end of each of the divisional passages. Thus, the major region is divided into the corresponding plurality of divisional regions which can be differentiated in temperature gradient, with the result that the coolant temperature gradient may be made non-linear, excessive local wetting and/or drying at electrodes can be restricted, and the inner resistance of the cell and the current density at the cell surface can be made uniform.

6461755

**ELECTROCONDUCTIVE RESIN COMPOSITION,
FUEL CELL SEPARATOR MADE OF SAID
ELECTROCONDUCTIVE RESIN COMPOSITION,
PROCESS FOR PRODUCTION OF SAID
FUEL CELL SEPARATOR, AND SOLID
POLYMER TYPE FUEL CELL USING SAID
FUEL CELL SEPARATOR**

Kazuo Saito; Atsushi Hagiwara; Fumio Tanno; Yasuo Imashiro; Naofumi Horie; Tsutomu Uehara; Japan assigned to Nisshinbo Industries Inc.

The present invention provides: an electroconductive resin composition comprising: (A) a liquid crystal polyester resin capable of forming an anisotropic melt phase, in an amount of 100 parts by weight, (B) a carbodiimide compound in an amount of 0.01–30 parts by weight, (C) an electroconductive carbon powder in an amount of 50–3000 parts by weight, and (D) a filler in an amount of 0–10,000 parts by weight; a fuel cell separator made of the above electroconductive resin composition; a process for producing the above fuel cell separator; and a solid polymer type fuel cell using the above fuel cell separator. The electroconductive resin composition alleviates the problems of the prior art, can be mass-produced, and is superior in high-temperature resistance and hydrolysis resistance.

6461756

**RETENTION SYSTEM FOR FUEL CELL
STACK MANIFOLDS**

Scott Blanchet; Michael Cramer; Richard F. Zepko; USA assigned to FuelCell Energy Inc.

A fuel cell stack manifold retention system in which a number of flexible spring loaded belt members adapted to expand, contract and slide are used to hold the manifolds of a fuel cell stack in place against the faces of the stack.

6458477

FUEL CELL STACKS FOR ULTRA-HIGH EFFICIENCY POWER SYSTEMS

Michael S. Hsu; USA assigned to Ztek Corporation

A system and method for producing electricity with a fuel cell power system. The power system includes an assembly of fuel cell stacks that operate at different temperatures, which vary between two or more of the fuel cell stacks. The fuel cell stack can have multiple temperature regions formed axially along the stack, or a plurality of spatially separated fuel cell stacks can be employed to heat a reactant from an input temperature to a desired temperature. The fuel cell stacks have operating temperatures in the range between about 20 °C and about 2000 °C.

6462095

POLYMER-STABILIZED METAL COLLOID SOLUTIONS, METHOD FOR PRODUCING SAID SOLUTIONS AND USE OF THE SAME AS CATALYSTS FOR FUEL CELL

Harald Bonsel; Gregor Deckers; Georg Frank; Hans Millauer; Thomas Soczka-Guth; Germany assigned to Axiva GmbH

Polymer-stabilized metal colloid solutions, process for preparing them and their use as catalysts for fuel cells. Process for preparing metal colloid solutions by reacting a platinum compound and, if desired, one or more compounds of Rh, Ru, Ir or Pd with a reducing agent. At least one cation-exchange polymer is used for stabilizing the metal colloid solution.

LITHIUM BATTERIES

6451472

LITHIUM BATTERY AND MANUFACTURING METHOD THEREOF

Youn-han Chang; Jung-ho Kim; South Korea assigned to Samsung SDI Company Ltd.

A lithium polymer battery having a positive electrode including a positive electrode current collector and positive electrode sheets on at least one surface of the positive electrode current collector, the positive electrode sheets having a positive electrode active material layer as a main component, a negative electrode including a negative electrode current collector and negative electrode sheets on at least one surface of the negative electrode current collector, the negative electrode sheets having a negative electrode active material layer as a main component, and a separator interposed between the positive electrode and the negative electrode, for insulating the electrodes from each other. The positive electrode and the negative electrode of the lithium polymer battery each include a plate and are wound with the separator interposed therebetween.

6451480

POLYIMIDE-BASED LITHIUM-ION BATTERY

Scott D. Gustafson; Loel R. Nelson; Joseph T. Antonucci; USA

A polyimide-based lithium-ion battery is presented. The battery comprises at least one anode and at least one ionically conductive and electrochemically active cathode; or at least one ionically conductive and electrochemically active anode and a cathode; or at least one ionically conductive and electrochemically active anode and at least one ionically conductive and electrochemically active cathode. The source of the ionic conductivity and electronic activity. In either the anode, the cathode (or both) lies in a solid electrolyte polyimide binder comprising a lithium salt and a pre-imidized soluble, amorphous, thermoplastic polyimide powder. The batteries of the present invention do not require adhesives or interlayer bonding which may fail and they have at least one ionically conductive and electrochemically active electrode, enhancing the overall performance of the battery.

6451481

LITHIUM POLYMER BATTERY

Jong-min Lee; Sung-won Lee; South Korea assigned to Samsung SDI Company Ltd.

A lithium secondary battery having a bi-cell type battery cell consisting of an anode plate, a separator fixed to both surfaces of the anode plate and a cathode plate fixed to either outer surface of the separator, wherein the cathode plate includes a cathode current collector, a front cathode sheet fixed to one surface of the cathode current collector, which is adjacent to the anode plate, and a rear cathode sheet fixed to the other surface of the cathode current collector and having a thickness different from that of the front cathode sheet.

6451482

NON-AQUEOUS ELECTROLYTE SECONDARY BATTERIES

Shoichiro Watanabe; Noriko Tanaka; Toshitada Sato; Takuyuki Shirane; Shigeo Kobayashi; Japan assigned to Matsushita Electric Industrial Company Ltd.

A non-aqueous secondary battery comprising a positive electrode comprising a lithium-containing metal oxide, and a negative electrode comprising a carbon material as the active material is disclosed. The electrodes are separated by either a separator impregnated with organic electrolyte solution or by a solid electrolyte layer. The negative electrode comprises a mixture of the carbon material and at least one metal oxide selected from TiO₂, Cr₂O₃, MnO₂, Fe₃O₄, CoO, Co₂O₃, Co₃O₄, NiO, Ni₂O₃, Ag₂O, PbO, Sb₂O₃, Bi₂O₃, SeO₂, and TeO₂.

6451483**ENHANCED CAPACITY LI/CFX
ELECTROCHEMICAL CELL**

Joseph Probst; Esther S. Takeuchi; Sally Ann Smesko; USA assigned to Wilson Greatbatch Ltd.

An alkali metal/solid cathode electrochemical cell, particularly a Li/CF_x cell, having an electrolyte-to-cathode (E/C) weight ratio of about 0.938 to about 0.73, and an anode-to-cathode (A/C) capacity ratio of about 1.03, is described. This provides the cell with an improvement in terms of delivered capacity of about 6 to about 15% under a 1 kΩ discharge load, and of about 2 to about 5% under a 2 kΩ load in comparison to prior art Li/CF_x cells. Fabricating the cathode electrode at such high pressures was not previously thought possible.

6451484**LITHIUM SECONDARY BATTERY AND
MANUFACTURING METHOD THEREOF**

Se-jong Han; Ki-ho Kim; Yun-seok Choi; Jin-soo Lee; Yong-Beom Lee; Hyung-gon Noh; South Korea assigned to Samsung SDI Company Ltd.

A lithium secondary battery and a method of manufacturing the battery. In the lithium secondary battery including a positive electrode plate having a positive electrode current collector and a positive electrode sheet having a positive electrode active material fixed to at least one surface of the positive electrode current collector, a negative electrode plate having a negative electrode current collector and a negative electrode sheet having a negative electrode active material fixed to at least one surface of the negative electrode current collector, a separator is interposed between the positive electrode plate and the negative electrode plate, and a coating of a polymer material having a high elongation ratio is present on at least each one outer surface of the positive and negative electrode plates to improve battery safety.

6455194**LITHIUM-ION BATTERY ELECTRODE
COMPOSITION**

Hossein Maleki; Guoping Deng; Anaba Anani; Inna Kerzhner-Haller; USA assigned to Motorola Inc.

A lithium-ion battery having at least an anode that includes phenol formaldehyde in a range of 0.1–10% by weight as a binder material. The phenol formaldehyde, or a mixture of phenol formaldehyde with polyvinylidene fluoride (PVDF), is used as a binding material in a Li-ion battery negative electrode to decrease the exothermic reaction of the battery during charging and discharging, which accordingly lessens the risk of thermal runaway and rupture of the battery.

6455198**LITHIUM SECONDARY BATTERY WITH A
LITHIUM MANGANESE OXIDE POSITIVE
ELECTRODE**

Kenshin Kitoh; Japan assigned to NGK Insulators Ltd.

A lithium secondary battery is provided in which even if the depth of discharge becomes deep, lowering of an power is small, and charging and discharging characteristics are excellent, and which is suitably used particularly as a battery for driving a motor of an electric vehicle or the like. In the lithium secondary battery, an internal electrode body formed by winding a lithium manganese positive electrode and a graphite negative electrode through a separator made of porous polymer is contained in a battery case, and an organic electrolyte is used. An power at a depth of discharge of 80% is not smaller than 60% of an power at a depth of discharge of 0%.

6455200**FLAME-RETARDANT ADDITIVE FOR
Li-ION BATTERIES**

Jai Prakash; Chang Woo Lee; Khalil Amine; USA assigned to Illinois Institute of Technology

A lithium-ion battery having an anode electrode, a cathode electrode and a non-aqueous solvent lithium electrolyte. At least one cyclophosphazene is added to the non-aqueous solvent lithium electrolyte, which cyclophosphazene acts as a flame-retardant material. The non-aqueous solvent lithium electrolyte is preferably a carbonate-based electrolyte and the preferred cyclophosphazene is hexamethoxycyclotriphosphazene.

6458483**LITHIUM-ION SECONDARY BATTERY**

Kouji Hamano; Osamu Hiroi; Yasuhiro Yoshida; Shoji Yoshioka; Hisashi Shiota; Makiko Kise; Shigeru Aihara; Daigo Takemura; Jun Aragane; Hiroaki Urushibata; Sei Tsunoda; Japan assigned to Mitsubishi Denki Kabushiki Kaisha

A lithium-ion secondary battery having an electrode body including a positive electrode made of a positive electrode active material layer joined to a current collector, a negative electrode made of a negative electrode active material layer joined to a current collector, a separator which is disposed between the positive electrode and the negative electrode and retains an electrolytic solution containing lithium-ions, and a porous adhesive resin layer which retains the electrolytic solution and joins the separator to at least one of the positive electrode active material layer and to the negative electrode active material layer, the electrode body being sealed into a packaging bag, wherein an adhesive resin film capable of absorbing the electrolytic solution and gelling adheres the electrode body to the packaging bag.

6461770

**LITHIUM BATTERY COMPRISING
A POSITIVE ELECTRODE MATERIAL
OF LITHIUM-MANGANESE COMPLEX OXIDE
CONTAINING BORON AND PHOSPHORUS**

Seiji Yoshimura; Taeko Ota; Shin Fujitani; Nobuhiro Nishiguchi; Japan assigned to Sanyo Electric Company Ltd.

A lithium battery comprising a positive electrode, a negative electrode and a non-aqueous electrolyte containing a solute and a solvent, wherein the positive electrode comprises a positive-electrode active material of lithium-manganese complex oxide containing boron and phosphorus.

the invention proposes the manufacture of an electrode system for nicad batteries under at least partial utilization of fiber-structure electrodes, for which purpose positive and negative lamellar electrodes are produced and, with separator material interlayered, stacked in alternating fashion in a defined number to form an electrode assembly. The respective equidirectional electrodes are mutually connected by means of connecting straps; the electrode assembly is pressed and positionally locked between mechanical clamping elements into a unitized, coplanar, undeformable block, under simultaneous compression of the separator material interlayered between the electrodes.

NICKEL HYDRIDE BATTERIES

6455195

**HYDROGEN ABSORBING ALLOY ELECTRODES
AND NICKEL-METAL HYDRIDE BATTERIES
USING THE SAME**

Yoshinori Matsuura; Reizo Maeda; Katsuhiko Shinyama; Tadayoshi Tanaka; Toshiyuki Nohma; Ikuro Yonezu; Japan assigned to Sanyo Electric Company Ltd.

A hydrogen absorbing alloy electrode is prepared by adding a binder to a hydrogen absorbing alloy powder and forming the mixture to a shape of an electrode, and the binder is partly or entirely made of poly *N*-vinyl acetamide, whereby higher high-rate discharge characteristics are obtained than conventionally.

6461767

**NICKEL-METAL HYDRIDE SECONDARY
BATTERY COMPRISING A COMPOUND SILICATE**
Yoshitaka Dansui; Tatsuhiko Suzuki; Hideki Kasahara; Takeshi Yao; Japan assigned to Matsushita Electric Industrial Company Ltd.

A nickel-metal hydride secondary battery includes positive electrodes including nickel hydroxide, negative electrodes including a hydrogen-absorbing alloy, separators and an alkaline electrolyte. The positive electrode includes a compound silicate. By employing the above construction, the compound silicate reacts with Mn or Al which dissolves out from the negative electrode to inhibit deterioration of electrochemical characteristics of the battery, and thus the life of the battery can be prolonged.

6455197

**POSITIVE ACTIVE MATERIAL FOR ALKALINE
ELECTROLYTE STORAGE BATTERY
NICKEL ELECTRODES**

Patrick Bernard; Michelle Baudry; France assigned to Alcatel Alsthom Compagnie Generale d'Electricite

A positive active material for nickel electrodes of alkaline storage batteries consists of particles of hydroxide containing mainly nickel and covered with a layer of a hydroxide phase based on nickel and yttrium. The proportion of the hydroxide phase is in the range 0.15–3% by weight of yttrium expressed as yttrium hydroxide relative to the total weight of particles.

COMPONENTS AND/OR CHARGES

6459236

**CELL BALANCE ADJUSTING CIRCUIT,
ABNORMAL CELL VOLTAGE DETECTING
CIRCUIT, METHOD OF ADJUSTING CELL
BALANCE, AND METHOD OF DETECTING
ABNORMAL CELL VOLTAGE**

Shingo Kawashima; Japan assigned to NEC Corporation

A cell balance adjusting circuit includes a series connection of basic cells; and a voltage holder connected through a switching circuit to individual terminals of the basic cells, wherein the switching circuit shows a switching operation to provide a parallel connection between an intermediate point between adjacent two of the basic cells and the voltage holder, and the switching circuit shows a unidirectional sequential scanning of the switching operation to all of the basic cells, and the switching circuit repeats the unidirectional sequential scanning.

6458484

**FIBER-STRUCTURE ELECTRODE SYSTEM FOR
NICKEL-CADMIUM BATTERIES AND
PROCEDURE FOR ITS MANUFACTURE**

Detlef Ohms; Willi Kitzhofer; Uwe Schaffrath; Gabor Benzur-Urmossy; Germany assigned to Hoppecke Batterie Systeme GmbH

In order to be able to produce prismatic, unsealed nickel-cadmium batteries without limiting the amount of electrolyte,

6459238

**METHOD FOR CHARGING A BATTERY PACK
INCLUDING A PLURALITY OF BATTERY UNITS**
Keiichi Minamiura; Toshiaki Nakanishi; Kiwamu Inui; Yoshiaki Kikuchi; Japan assigned to Matsushita Electric Industrial Company Ltd., Toyota Jidosha Kabushiki Kaisha

A method for charging a battery pack including a plurality of battery units includes: a first step of charging the battery units with a first electric current at a first rate until an internal pressure of at least one of the plurality of battery units begins to increase; and a second step of charging/discharging the battery units with a second electric current which is lower than the first electric current at a second rate which is lower than the first rate after the internal pressure of the at least one of the plurality of battery units has begun to increase.

6459239

METHOD AND APPARATUS FOR RECHARGING BATTERIES IN THE PRESENCE OF A LOAD CURRENT

David L. Price; USA assigned to Agere Systems Inc.

A method and apparatus are disclosed for recharging a battery in the presence of a load. The present invention utilizes the battery itself as an averaging element to maintain the battery at the desired threshold voltage, V_T (on average) as the current charging source is selectively turned on and off. Generally, the present invention measures the battery voltage at the end of each interval just before the current source is turned on or off. A calculation is performed for each charging cycle (current on and off) to determine the duty cycle for the subsequent cycle. The calculated duty cycle is the percentage of time that the current source should be applied for the next cycle. The calculated duty cycle is based on the difference between the actual battery voltage and the desired voltage. In this manner, the on and off times are modulated by the present invention such that the average battery voltage, V_{bat} , is the desired threshold voltage, V_T .

6459243

MULTIPLE PLATEAU BATTERY CHARGING METHOD AND SYSTEM TO FULLY CHARGE THE FIRST PLATEAU

Michael Cheiky; Te-Chien F. Yang; USA assigned to Zinc Matrix Power Inc.

A battery charging method and system, the battery charging method comprising: charging at least one battery at a first voltage for a first time duration; determining state-of-charge of the batteries at the end of the first time duration; if the batteries are substantially fully charged at the end of the first time duration, charging the batteries at the first voltage for a second time duration, and charging the batteries at a second voltage for a third duration of time; if the batteries are substantially fully depleted at the end of the first time duration, charging the batteries at the first voltage for an alternate second time duration, and charging the batteries at the second voltage for an alternate third duration of time. The battery charging system comprises: a current source; a cutoff voltage controller and timer; at least one battery; and respective ones of voltage and current regulators, which regulate voltages applied to each of the respective ones of the

batteries and current supplied to the respective batteries, the cutoff voltage controller and timer controlling the voltages and controlling time durations of the voltages applied to each of the respective ones of the batteries therethrough control of the voltage and current regulators.

6462514

BATTERY UNIT WITH AN INTEGRAL CHARGE CONTROLLER

Serge Maloizel; France assigned to Alcatel

The battery unit includes a storage battery (ac) with an integral charge control circuit (CC). The charge control circuit (CC) includes a switch (S) adapted to prevent or allow charging current (I_c) to flow into the storage battery (ac), said switch (S) being controlled by a measuring system for measuring at least one physical parameter (T_1 , T_n , V_b) representative of the state of the storage battery (ac) in order to command successive opening and closing of the switch (S) to chop said charging current (I_c) if said measured physical parameter crosses a predetermined threshold. The end of charging of the storage battery is then optimized by the battery unit itself, so that a simple constant current generator is sufficient to charge the storage battery satisfactorily.

6456042

METHOD AND APPARATUS FOR CHARGING BATTERIES AT REDUCED OVERCHARGE LEVELS

Wellington Y. Kwok; USA assigned to Delphi Technologies Inc.

Battery charging methods and associated chargers which are capable of rapidly charging a battery while subjecting it to reduced levels of overcharging. The methods described are capable of being utilized within numerous battery charging systems for batteries spanning a range of chemistries, such as lead acid, nickel-based, and lithium-based batteries. Upon detection of the onset-of-overcharge during the charge process, a variable voltage lid is imposed ($V_{LID} = v(\phi) + \beta \log \phi + \kappa f$) which reduces the maximum voltage that may be applied to the battery as a function of charge acceptance which is typically estimated by a calculation based on state-of-charge. Additionally, the voltage lid can be approximated with step-wise voltage lids which are responsive to the level of charge acceptance within the battery.

OTHER BATTERIES

6451473

NON-AQUEOUS ELECTROLYTE SECONDARY BATTERY AND METHOD OF MANUFACTURING THE SAME

Susumu Saito; Takayuki Inoi; Japan assigned to NEC Tokin Corporation

In a non-aqueous electrolyte secondary battery in which a battery element which is constructed by forming an anode active material layer and a cathode active material layer on an anode collecting body and a cathode collecting body, respectively, and laminating and winding them together with two separators, is housed in a battery can. An electrical connecting member for electrical connection between an inner electrode lead and an external terminal is designed to have spring property so that a winding core is pressurized and fixed to the center of the battery can, and the battery is structured such that connection between the inner lead and the connecting member can be made on an end face of the winding core inside of the battery can.

6455187

RECOMBINATOR FOR THE RE-ACIDIFICATION OF AN ELECTROLYTE STREAM IN A FLOWING ELECTROLYTE ZINC-BROMINE BATTERY

Gerd Tomazic; Austria assigned to Premium Power Acquisition Corporation

A recombinator device and associated method for re-acidification of an electrolyte in a flowing electrolyte zinc-bromine battery. The recombinator device receives hydrogen, formed as a result of electrolysis within cell stacks of the zinc-bromine battery, as well as aqueous bromine from the zinc-bromine battery. Upon receipt, the hydrogen and bromine are introduced into a reaction chamber in the recombinator device so as to form hydrobromic acid. The hydrobromic acid is then reintroduced back into the electrolyte of the zinc-bromine battery for re-acidification of same.

6455199

NON-AQUEOUS ELECTROLYTE SECONDARY BATTERY AND METHOD FOR MANUFACTURING NEGATIVE ELECTRODE OF THE SAME

Masaki Kitagawa; Yoshihiro Kashihara; Hizuru Koshina; Toyoji Sugimoto; Kunio Tsuruta; Shuji Ito; Hajime Nishino; Kojiro Ishikawa; Hisanori Sugimoto; Kaoru Tsukamoto; Japan assigned to Matsushita Electric Industrial Company Ltd.

Graphite powder for a negative electrode in prior arts, which allows lithium-ions to repeat intercalation and de-intercalation reversibly by charge and discharge, has failed to attain a specific capacity close to the theoretical capacity of 372 mAh per 1 g. Also, there was a problem in storage property at a high-temperature when it is attempted to improve the high rate charge and discharge characteristics. An object of the present invention is to solve these problems. In the process of pulverizing flaky graphite particles of which plane interval (d_{002}) of (0 0 2) plane is 3.350–3.360 angstroms, and crystallite size (L_c) in the C -axis direction is at least 1000 Å or more, the graphite particles are chamfered into disk- or tablet-like form, which are then

sifted, so as to obtain a graphite powder, of which mean particle size is defined within the range of 10–30 μm, mean thickness of thinnest portion is defined to be 3–9 μm, and X-ray diffraction peak intensity ratio of (1 1 0)/(0 0 4) by a wide angle X-ray diffraction method is defined to be 0.015 or more. By using this powder, the conventional problems are solved in a favorable balance, and, while achieving high energy density, the high rate discharge performance and reliability when left at a high-temperature can be enhanced.

6458485

NON-AQUEOUS ELECTROLYTE SECONDARY CELL

Atsushi Yanai; Kazunari Ohkita; Katsunori Yanagida; Takeshi Maeda; Atsuhiko Funahashi; Yoshito Chikano; Toshiyuki Nohma; Ikuo Yonezu; Koji Nishio; Japan assigned to Sanyo Electric Company Ltd.

A non-aqueous electrolyte secondary cell having a rolled-up electrode unit housed in a cell can and comprising a positive electrode and a negative electrode each formed by coating a surface of a strip-like current collector with an electrode material. According to a first embodiment, the current collector of at least one of the positive electrode and the negative electrode comprises a plurality of current collector pieces 42 arranged along one direction and a PTC element five interconnecting each pair of adjacent current collector pieces 42. Alternatively with a second embodiment, at least one of the positive electrode and the negative electrode comprises a PTC element held between opposed faces of an uncoated portion of the current collector thereof and a base end portion of a current collector tab. The PTC element serves to prevent continuous occurrence of a current in excess of a predetermined value and realizes a high energy density.

6461495

PROCESS FOR THE REMOVAL OF SULFATE IONS FROM AN ELECTROLYTE

Patrick John Morrissey; Philip John Mitchell; Stewart Ernest Male; Great Britain assigned to Regenesis Technologies Ltd.

A method for the removal of sulfate ions from an electrolyte of an electrochemical reduction-oxidation system wherein said electrolyte comprises a halogen and in which the sulfate ions are a contaminant or interferant, which method comprises the steps of: (i) increasing the halide concentration in the electrolyte by electrochemical reduction of the halogen, (ii) crystallizing a sulfate salt out of the electrolyte, and (iii) separation of the electrolyte from the crystallized sulfate salt. An electrochemical process for energy storage and/or power delivery comprising the step of removal of sulfate ions from the electrolyte according to the above cited method is also disclosed.

6461757**NON-AQUEOUS BATTERY OF
A THIN CONFIGURATION**

Masa-aki Sasayama; Takashi Minakata; Kouichi Yasukata;
Japan assigned to Asahi Kasei Kogyo Kabushiki Kaisha

A non-aqueous battery is provided in a pouchy casing comprising opposing sheets of at least three-layer laminates, each laminate comprising (1) an inner thermoplastic resin layer, (2) a middle metal foil layer, and (3) an outer electrically insulating material layer, wherein the pouchy casing has an elongated, hermetic adhesion area along a periphery of the pouchy casing, and the middle metal foil layer has a peripheral elongated region in the elongated, hermetic adhesion area of the pouchy casing, and at least a pair of terminals electrically connected to the cathode and anode of the battery extends through and protrudes from the terminal-withdrawal sites in the elongated, hermetic adhesion area toward the outside of the pouchy casing, and the battery has at least one of the following features: (i) the peripheral elongated region of the middle metal foil layer has cut-out portions around the terminal-withdrawal sites and (ii) the surface of the peripheral edge of the pouchy casing is provided with electric insulation at least at portions around the terminal-withdrawal sites.

6461760**NON-AQUEOUS ELECTROLYTE SECONDARY
BATTERY HAVING A ROLLED BODY THEREIN**

Takayuki Inoi; Japan assigned to NEC Tokin Corporation

A non-aqueous electrolyte secondary battery comprising: a case comprising a bottom and a sidewall; a rolled body comprising: a positive electrode comprising a first electric plate and a positive electrode active material applied on the first electric plate; a negative electrode comprising a second electric plate and a negative electrode active material applied on the second electric plate; and a separator inserted between the positive electrode and the negative electrode; wherein the rolled body is formed by laminating and rolling the positive electrode, the negative electrode, and the separator; and wherein the rolled body is enclosed in the body; non-aqueous electrolyte enclosed in the case; a header used for sealing the case; a plurality of positive electrode leads connecting the positive electrode and the header; a plurality of negative electrode leads connecting the negative electrode and a bottom of the case; and holding means for holding the

rolled body so that the rolled body does not relatively move with respect to the case while keeping a gap between a lower terminal of the rolled body and the bottom of the case and a gap between an upper terminal of the rolled body and the header.

6461761**AIR DEPOLARIZED ELECTROCHEMICAL CELLS**

Gregory Scott Moy; John Edward Oltman; Robert Brian Dopp; Joseph Lynn Passaniti; Michael Andrew Ward; USA assigned to Rayovac Corporation

An elongate, generally tubular, air depolarized electrochemical cell comprising a cathode, including an air cathode assembly, extending about the tubular circumference, and along the tubular length, of the cell, an anode, a separator between the anode and the cathode, electrolyte, a top closure member, and a bottom closure member. The cathode assembly is fixedly held, by a friction fit, in a slot at the bottom of the cell. The slot can be developed, for example, by inner and outer walls of a cathode can, by inner and outer walls of a bottom closure member, or by an outer wall of a cathode can and an opposing outer wall of a plug on the interior of the cell. Preferably, bottom closure structure of the cell and receives a bottom edge portion of the cathode current collector, and makes electrical contact with the bottom edge portion, preferably at an inner surface of the cathode current collector. A diffusion member of the cathode assembly is preferably compressed as a seal, at the bottom of the cell, between an outer side wall of the cell and the remainder of the cathode assembly. The diffusion member is also used at least as an assist in sealing the cell against electrolyte leakage from the anode cavity and past the cathode assembly. An embodiment may provide a stop ledge in grommet facing a stop groove in a cathode can. The cathode assembly can extend into a slot at an outer edge of the grommet. A top grommet can have an upwardly extending leg overlain by a top closure member. The air diffusion member may control the rate of entry of air to the reaction surface, depending on density of the air diffusion member, whereby the air diffusion member controls the limiting current of the cell. The air cell can be free from adhesive bonding the separator to the cathode assembly. The bottom of the cathode current collector may be in a bottom slot, in a path of flow of current between a reaction surface and a positive electrode terminal. A method of fabricating cells can including crimping a top washer and an outer leg of a top grommet at the same time, including closing a slot.