Available online at www.sciencedirect.com
SCIENCE DIRECT®
Journal of Power Sources 124 (2003) 360–368
JOURNAL OF POWER SOURCES
www.elsevier.com/locate/jpowsour

# PatentsALERT

This section contains abstracts of recently issued patents in the United States and published patent applications filed from over 100 countries under the Patent Cooperation Treaty and compiled in accordance with interest profiles developed by the Editors.

## *Journal of Power Sources*

0378-7753/03/$ – see front matter
doi:10.1016/S0378-7753(03)00630-X

*LEAD–ACID*

**6506521**
**BATTERY SEPARATOR CONTAINING EFFICIENCY IMPROVING ADDITIVES FOR A LEAD–ACID BATTERY**
Thomas J. Clough; Frank X. McGaruey; USA assigned to Ensci Inc.

A battery element of a lead–acid battery including a negative plate, a positive plate and a separator having a metal inhibiting additive that reduces the detrimental effects of at least one impurity on the negative plate.

**6506522**
**BATTERY SEPARATOR ELEMENT CONTAINING EFFICIENCY IMPROVING ADDITIVES**
Thomas J. Clough; USA assigned to Ensci Inc.

A recombinant battery element of a lead–acid battery including a negative plate, a positive plate and a separator having an additive associated with the separator that improves the overall efficiency of the lead–acid battery.

**6509118**
**VALVE-REGULATED LEAD–ACID CELLS AND BATTERIES AND SEPARATORS USED IN SUCH CELLS AND BATTERIES**
Detchko Pavlov; Stefan Ivanov Ruevski; Veselin Bozhidarov Naidenov; Vera Vladimirova Mircheva; Galia Angelova Petkova; Mitko Kolev Dimitrov; Temelaki Vasilev Rogachev; Mariana Hristova Cherneva-Vasileva; Bulgaria

A valve-regulated lead–acid cell utilizes an absorptive glass mat separator having a glass fiber surface which is modified by treatment with at least one particular polymer, as by treatment with a polymer emulsion to coat at least part of the glass fiber surface and then sintering to dry the coating, the polymers including polyolefins, polytetrafluoroethylene, polyvinylchlorides, polyacrylonitriles, polyesters, amphiphilic block and graft copolymers, hydrophilic and amphiphilic nitrogen-containing polymers and polyorgano-silica compounds such as polysilanes and polysiloxanes.

**6509121**
**SEPARATOR CONTAINING METAL INHIBITING ADDITIVES FOR A LEAD–ACID BATTERY**
Thomas J. Clough; USA assigned to Ensci Inc.

A battery element of a lead–acid battery including a negative plate, a positive plate and a separator having a metal inhibiting additive having a plurality of chemically different functional groups, associated with the separator that reduces the detrimental effects of at least one impurity on the negative plate.

**6511771**
**NEGATIVE PLATE ELEMENT FOR A LEAD–ACID BATTERY**
Thomas J. Clough; USA assigned to Ensci Inc.

A battery element of a lead–acid battery including a negative plate, a positive and a separator having a metal inhibiting additive having a plurality of chemically different functional groups and an expander component associated with the negative plate that reduces the detrimental effects of at least one impurity on the negative plate.

**6511775**
**SEPARATOR CONTAINING EFFICIENCY IMPROVING ADDITIVES FOR A LEAD–ACID BATTERIES**
Thomas J. Clough; USA assigned to Ensci Inc.

A battery element of a lead–acid battery including a negative plate, a positive plate and a separator having a metal inhibiting additive associated with a plate that reduces the detrimental effects of at least one impurity on the negative plate.

*BATTERY MATERIALS*

**6503378**
**POLYMER ELECTROLYTE MEMBRANE AND METHOD OF FABRICATION**
Allison M. Fisher; USA assigned to Motorola Inc.

A polymer electrolyte membrane comprised of a hydrophobic hydrocarbon region, a hydrophilic region containing covalently bound acid functional groups and protic functional groups. The hydrophobic hydrocarbon region and the hydrophilic region are covalently bound to form a single polymer molecule.

**6506516**
**LITHIUM BISOXALATOBORATE, THE PRODUCTION THEREOF AND ITS USE AS A CONDUCTING SALT**
Ulrich Wietelmann; Uwe Lischka; Marion Wegner; Germany assigned to Metallgesellschaft Aktiengesellschaft

The invention relates to the novel lithium bisoxalatoborate compound, and to a method for producing this compound, on the basis of a lithium compound, an oxalic acid or an oxalate, and a boron compound. The invention also relates to another production method on the basis of lithium boron hydride and oxalic acid, and to the use of lithium bisoxalatoborate as a conducting salt in lithium-ion batteries.

### 6506519 NON-AQUEOUS SECONDARY BATTERY, METHOD FOR MAKING NEGATIVE ELECTRODE COMPONENT THEREFORE, AND APPARATUS FOR EVALUATING AND MAKING GRAPHITE MATERIAL FOR NEGATIVE ELECTRODE COMPONENT

Otaro Satori; Akinori Kita; Atsuo Omaru; Japan assigned to Sony Corporation

A negative electrode of a non-aqueous secondary battery is formed of a carbonaceous material. The ratio RG = Gs/Gb of the degree of graphitization Gs of the carbonaceous material, determined by a surface-enhanced Raman spectrum, to the degree of graphitization Gb, determined by a Raman spectrum measured using argon laser light, is at least 4.5. Alternatively, the carbonaceous material has a peak in a wavelength range above 1360 $cm^{-1}$ in a surface-enhanced Raman spectrum which is measured by the same surface-enhanced Raman spectrum. The deterioration of the non-aqueous secondary battery is suppressed during use in high-temperature environments and high capacity is maintained for long periods.

### 6509116 SECONDARY BATTERY AND CAPACITOR USING INDOLE POLYMERIC COMPOUND

Shinako Kaneko; Toshihiko Nishiyama; Masaki Fujiwara; Gaku Harada; Masato Kurosaki; Japan assigned to NEC Tokin Corporation

Secondary batteries and capacitors have a high electromotive force together with a high cyclic property and are capable of fast charging and discharging, using a polymeric compound having a high stability and high reactivity in an acidic ambient, as an electrode active material. The secondary batteries and capacitors include an indole polymeric compound as an electrode active material. The polymeric compound uses a proton as a charge carrier and has a constituent represented by general formula (1); wherein each R denotes a hydrogen atom, a halogen atom, a hydroxyl group, a carboxyl group, a sulfonic group, a sulfuric acid group, a nitro group, a cyano group, an alkyl group, an aryl group, an alkoxyl group, an amino group, an alkylthio group and an arylthio group, which may be the same or different from each other, and at least one R is a substituent other than a hydrogen atom.

### 6509123 GEL ELECTROLYTE AND GEL ELECTROLYTE CELL

Mashio Shibuya; Tsuyonobu Hatazawa; Tomitaro Hara; Goro Shibamoto; Shuji Goto; Japan assigned to Sony Corporation

The present invention provides a gel electrolyte cell including a non-aqueous electrolytic solution containing lithium-containing electrolyte salt solved in a non-aqueous solvent and made into a gel state by a matrix polymer, and the gel electrolyte contains vinylene carbonate or derivative thereof in the amount not less than 0.05 wt.% and not greater than 5 wt.%. This gel electrolyte exhibits an excellent chemical stability with the negative electrode, strength, and liquid-retention characteristic. This gel electrolyte enables to obtain a gel electrolyte cell satisfying the cell capacity, cycle characteristic, load characteristic, and low-temperature characteristic.

### 6511768 ELECTRODE SUBSTRATE FOR ELECTROCHEMICAL CELLS BASED ON LOW-COST MANUFACTURING PROCESSES

Victor Trapp; Peter Wilde; Heiko Leinfelder; Germany assigned to SGL Carbon AG

This invention relates to electrode substrates for electrochemical cells, particularly low-temperature fuel cells, and processes for their production. Graphitized fiber web structures are used that have a preferred non-planar fiber alignment resulting in high through-plane conductivity. These structures are further impregnated and processed to adjust the final product properties.

### 6511774 SEPARATOR FOR NON-AQUEOUS ELECTROLYTE BATTERIES, NON-AQUEOUS ELECTROLYTE BATTERY USING IT, AND METHOD FOR MANUFACTURING SEPARATOR FOR NON-AQUEOUS ELECTROLYTE BATTERIES

Takahiro Tsukuda; Haruyoshi Funae; Japan assigned to Mitsubishi Paper Mills Limited

The present invention provides a separator for non-aqueous electrolyte batteries which neither breaks nor slips off at the time of fabrication of battery, gives excellent battery fabricability, causes no internal short-circuit caused by contact between electrodes even if the electrodes are externally short-circuited, can inhibit ignition of battery and produces high energy density and excellent cycle life, and further provides a non-aqueous electrolyte battery using the separator and a method for manufacturing the separator. That is, the present invention relates to a separator for non-aqueous electrolyte batteries which comprises a porous base containing at least one member selected from a porous film, a woven fabric or non-woven fabric containing an organic fiber and a paper and an organometallic compound applied to the porous base; a method for the manufacture of the separator for non-aqueous electrolyte batteries which comprises allowing said porous base to contact with a solution of organometallic compound by impregnation, coating or spraying, followed by drying or curing with heating to apply the organometallic compound to the porous base; and a non-aqueous electrolyte battery using the separator.

**6511776**
**POLYMER ELECTROLYTE BATTERY AND POLYMER ELECTROLYTE**
Ryuji Ohshita; Toshikazu Yoshida; Koji Nishio; Yoshinori Kida; Toshiyuki Nohma; Tadashi Teranishi; Japan assigned to Sanyo Electric Company Ltd.

In a polymer electrolyte battery provided with a positive electrode, a negative electrode, and a polymer electrolyte containing a non-aqueous electrolyte solution, a solvent in said non-aqueous electrolyte solution contains vinylene carbonate in a concentration of 0.1–90 vol.% so that the non-aqueous electrolyte solution contained in the polymer electrolyte is restrained from reacting with the positive electrode and negative electrode.

*FUEL CELLS*

**6503653**
**STAMPED BIPOLAR PLATE FOR PEM FUEL CELL STACK**
Jeffrey A. Rock; USA assigned to General Motors Corporation

A bipolar plate assembly for a PEM fuel cell having a serpentine flow field formed on one side and an interdigitated flow field formed on the opposite side such that a single plate member is usable as an anode current collector and a cathode current collector of adjacent fuel cells. The bipolar plate assembly further includes a staggered seal arrangement to direct gaseous reactant flow through the fuel cell such that the seal thickness is maximized while the repeat distance between adjacent fuel cells is minimized.

**6506228**
**METHOD OF PREPARING PLATINUM ALLOY ELECTRODE CATALYST FOR DIRECT METHANOL FUEL CELL USING ANHYDROUS METAL CHLORIDE**
Seol Ah Lee; Kyung Won Park; Boo Kil Kwon; Yung Eun Sung; South Korea assigned to Kwangju Institute of Science and Technology

A method for preparing a platinum alloy electrode catalyst for DMFC using anhydrous metal chlorides. The method includes reducing platinum chloride and non-aqueous second metal chloride with boron lithium hydride ($LiBH_4$) in a water-incompatible organic solvent in a nitrogen atmosphere to form nano-sized particles of colloidal platinum alloy, and drying the platinum alloy particles without any heat treatment. The method of preparing a platinum alloy catalyst according to the present invention makes it possible to prepare platinum alloy particles having a narrow range of size distribution and an average particle size of less than 2 nm with ease, relative to the conventional methods. The platinum alloy particles thus obtained can be used as an electrode catalyst for DMFC to enhance methanol oxidation performance.

**6506510**
**HYDROGEN GENERATION VIA METHANE CRACKING FOR INTEGRATED HEAT AND ELECTRICITY PRODUCTION USING A FUEL CELL**
Daniel R. Sioui; Gavin P. Towler; Anil R. Oroskar; Lubo Zhou; Stephen R. Dunne; Santi Kulprathipanja; Leonid B. Galperin; Frank S. Modica; Timur V. Voskoboinikov; USA assigned to UOP LLC

A novel integrated system for the co-production of heat and electricity for residences or commercial buildings is based on the cracking of hydrocarbons to generate hydrogen for a fuel cell. Compared to prior art reforming methods for hydrogen production, the cracking reaction provides an input stream to the fuel cell that is essentially free of CO, a known poison to the anode catalyst in many fuel cell designs, such as PEM fuel cells. The cracking reaction is coupled with an air or steam regeneration cycle to reactivate that cracking catalyst for further use. This regeneration can provide a valuable source of heat or furnace fuel to the system. A novel control method for system adjusts the durations of the cracking and regeneration cycles to optimize the recovery of reaction heat.

**6506511**
**MULTI-ELEMENT FUEL CELL SYSTEM**
John B. Lakeman; Ranulf Slee; Kevin J. Green; John M. Cruickshank; Great Britain assigned to Qinetiq Limited

A multi-element fuel cell system comprises a substantially cylindrical former, a rechargeable hydrogen fuel source and a plurality of fuel cell elements. The former comprises a series of interconnecting modules each perforated to allow passage of fuel to the fuel cell elements. Each fuel cell element is positioned radially outwardly of the former and is provided with channels, arranged to receive and direct fuel gas, an anode current collector, a gasket, a first diffusion backing layer, a membrane electrode assembly, a second diffusion backing layer and a cathode current collector. The cathode current collector applies even compression to the fuel cell element, such that good electrical contact is maintained within each fuel cell element. The fuel cell elements are electrically connect in series via respective anode and cathode current collectors and then capped at each end of the former for connection to equipment. The former and current collectors have substantially the same coefficient of thermal expansion and the fuel source is coupled to the fuel cell elements. The system is suitable for man-portable applications.

**6508925**
**AUTOMATED BRUSH PLATING PROCESS FOR SOLID OXIDE FUEL CELLS**
Jeffrey William Long; USA assigned to Siemens Westinghouse Power Corporation

A method of depositing a metal coating on the interconnect of a tubular, hollow fuel cell contains the steps of providing the fuel cell having an exposed interconnect surface; contacting the inside of the fuel cell with a cathode without use of any liquid materials; passing electrical current through a contacting applicator which contains a metal electrolyte solution; passing the current from the applicator to the cathode and contacting the interconnect with the applicator and coating all of the exposed interconnect surface.

### 6509113
### FLUID DISTRIBUTION SURFACE FOR SOLID OXIDE FUEL CELLS

Kevin R. Keegan; USA assigned to Delphi Technologies Inc.

The drawbacks and disadvantages of the prior art are overcome by an electrode fluid distributor. The electrode fluid distributor comprises a fluid passageway having a first end with an inlet and a second end with an outlet. A baffle is included that diagonally traverses the fluid passageway from the first end to the second end, and from a base of the fluid passageway toward an at least partially open side of the fluid passageway. The baffle defines at least a portion of a first reservoir and at least a portion of a second reservoir, with the inlet defining at least a portion of one end of the first reservoir and the outlet defining at least a portion of one end of the second reservoir. The inlet is in fluid communication with the outlet over the baffle. The first reservoir has a width proximate the open side which is smaller proximate the inlet than proximate the outlet.

### 6511521
### PURIFIER OF HYDROGEN FROM REFORMER FOR FUEL CELL

Iraj Parchamazad; USA

Contaminated hydrogen gas from a catalytic steam reformer is purified by passing it through a membrane assembly having a metallic membrane sealed between two tubular stainless steel members having perforations (or being formed as screen or mesh) and having an encapsulating chamber around it. Pressure regulating valve means in recycle path of residual gas flowing out of the membrane assembly maintains a constant pressure of contaminated hydrogen gas in the membrane assembly. The purified hydrogen gas may be further purified, if needed, by directing the purified hydrogen gas out of a side tube of the chamber through a second encapsulated membrane assembly that is a replica of the first encapsulated membrane assembly. A directional valve may be selectively set to recycle residual gas out of the first membrane assembly until it is virtually free of hydrogen. Residual gas out of the second membrane assembly approaches being 100% free of hydrogen and may always be exhausted to a burner.

### 6511765
### FUEL CELL SYSTEM

Masataka Ueno; Kenji Kato; Munehisa Horiguchi; Noriyuki Takada; Japan assigned to Kabusikikaisha 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.

### 6511766
### LOW COST MOLDED PLASTIC FUEL CELL SEPARATOR PLATE WITH CONDUCTIVE ELEMENTS

Raouf O. Loutfy; Mathias Hecht; USA assigned to Materials and Electrochemical Research (MER) Corporation

A bipolar or unipolar separator plate for an electrochemical fuel cell is formed of an insulating slab of plastic material such as a polymer matrix having a plurality of electrically conductive elements embedded therein for conducting electricity from an adjacent electrode of the cell to an electrical conductor on the opposite side of the slab for deriving electricity from the cell. The conducting elements are preferably formed of aligned carbon fiber composite cylinders and the insulating slab is formed of a plastic such as epoxy, polyamide, polystyrene, polyphenylene oxide or polyphenylene sulfide molded around the conductive elements.

## *LITHIUM BATTERIES*

### 6503660
### LITHIUM-ION BATTERY CONTAINING AN ANODE COMPRISED OF GRAPHITIC CARBON NANOFIBERS

R. Terry K. Baker; Nelly M. Rodriguez; USA

A lithium-ion secondary battery having an anode comprised of substantially crystalline graphitic carbon nanofibers composed of graphite sheets. The graphite sheets are preferably substantially perpendicular or parallel to the longitudinal axis of the carbon nanofiber. This invention also relates to the above-mentioned electrode for use in lithium-ion secondary batteries.

### 6503661
### LITHIUM SECONDARY BATTERY

Chi-kyun Park; Archana Kakirde; Peikang Liu; Venkatesan Manivannan; Chul Chai; Dong-joon Ihm; Jon-ha Lee; South Korea assigned to SKC Company Ltd.

A composition for forming polymer electrolyte and a lithium secondary battery employing the polymer electrolyte prepared using the composition are provided. The composition for forming polymer solid electrolyte having a polymer resin, a plasticizer, a filler and a solvent, wherein the filler is synthetic zeolite having an affinity for an organic solvent or moisture. Therefore, the mechanical strength and ionic conductivity can be improved by adding synthetic zeolite as a filler when forming polymer electrolyte. Also, use of such polymer electrolyte makes it possible to prepare lithium secondary batteries having good high-current discharge characteristics and excellent discharge capacity characteristics even under repeated charge/discharge conditions.

### 6503662
### NON-AQUEOUS ELECTROLYTE AND LITHIUM SECONDARY BATTERY USING THE SAME

Toshikazu Hamamoto; Koji Abe; Yasuo Matsumori; Japan assigned to UBE Industries Ltd.

A non-aqueous electrolyte containing a non-aqueous solvent, an electrolyte salt dissolved therein and a *tert*-butylbenzene derivative having the formula (I); wherein R1, R2, R3, R4 and R5 independently represent a hydrogen atom or C1–C12 hydrocarbon group and a lithium secondary battery using the same.

### 6503663
### ORGANIC ELECTROLYTE AND LITHIUM SECONDARY BATTERY

Eui-hwan Song; Won-il Jung; Duck-chul Hwang; South Korea assigned to Samsung SDI Company Ltd.

An organic electrolyte containing an organic solvent mixture and a lithium salt, wherein the organic solvent mixture includes 20–60% by volume of ethylene carbonate, 5–30% by volume of polypropylene carbonate, and 20–70% by volume of chain carbonate. The organic electrolyte improves charge/discharge cycle characteristics while maintaining high discharge capacity and low-temperature discharge characteristics.

### 6506515
### LITHIUM SECONDARY BATTERY

Kenshin Kitoh; Hiroshi Nemoto; Japan assigned to NGK Insulators Ltd.

A lithium secondary battery including an internal electrode body contained in a battery case including a positive electrode, a negative electrode and a separator made of porous polymer, the positive electrode and the negative electrode are wound or laminated. A working volume ratio of the positive active material and the negative active material obtained by the positive active material weight being divided by the negative active material weight is within the range from 40 to 90% of the theoretical working volume ratio. The lithium secondary battery has high safety as well as high energy density by controlling the working volume of an electrode active material and the dispersion of the distribution of the working volume and in particular is preferably used for a drive motor of an electric vehicle.

### 6509120
### LITHIUM BATTERY WITH BORON-CONTAINING LITHIUM–MANGANESE COMPLEX OXIDE CATHODE MATERIAL

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

A lithium battery comprising a positive electrode comprising a positive-electrode active material of boron-containing lithium–manganese complex oxide, a negative electrode and a non-aqueous electrolyte containing a solute and a solvent, the positive-electrode active material is the boron-containing lithium–manganese complex oxide having a boron-to-manganese atomic ratio (B/Mn) in the range of 0.01–0.20 and a predischarge mean manganese valence of not less than 3.80

### 6509122
### POLYMER ELECTROLYTE

Noboru Oyama; Japan

A polymer electrolyte for lithium secondary batteries in which growth of lithium dendrites is suppressed is disclosed, batteries exhibiting excellent discharge characteristics in low to high temperature, comprising a polymer gel holding a non-aqueous solvent containing an electrolyte, wherein the polymer gel comprises (I) a unit derived from at least one monomer having one copolymerizable vinyl group and (II) a unit derived from at least one compound selected from the group consisting of (II-a) a compound having two acryloyl groups and a (poly)oxyethylene group, (II-b) a compound having one acryloyl group and a (poly)oxyethylene group, and (II-c) a glycidyl ether compound, particularly the polymer gel comprises monomer (I), compound (II-a), and a copolymerizable plasticizing compound are disclosed.

### 6511516
### METHOD AND APPARATUS FOR PRODUCING LITHIUM BASED CATHODES

Lonnie G. Johnson; Richard Breitkopf; John Baxley; USA assigned to Johnson Research and Development Company Inc.

A method of producing a layer of lithiated material is provided wherein a mixture of Li(acac) and $Co(acac)_3$ is dis-

solved in an aqueous solvent to produce a solution. The solution is deposited upon a substrate by atomizing the solution, passing the atomized solution into a heated gas stream so as to vaporize the solution, and directing the vaporized solution onto a substrate.

### 6511639
### PROCESS FOR RECYCLING NEGATIVE-ELECTRODE MATERIALS FROM SPENT LITHIUM BATTERIES

Michael Schmidt; Reinhard P. Hemmer; Margret Wohlfahrt-Mehrens; Giesela Arnold; Christian Vogler; Germany assigned to Merck Patent Gesellschaft mit beschrankter Haftung

A process for recycling electrode materials from spent lithium batteries in which negative-electrode materials from the lithium/transition-metal mixed oxide class of compounds from discharged, spent lithium batteries can, after comminution of the electrode constituents, be re-synthesized into chemically identical products as employed for the production of the batteries comprising mechanical and extractive processing of these constituents with the aim of removing positive-electrode constituents and other secondary constituents, such as binders and other processing auxiliaries, followed by controlled high-temperature treatment without leaving thermal decomposition products behind.

### 6511769
### ELECTROLYTE FOR RECHARGEABLE LITHIUM BATTERY

Wong-Il Jung; Duck-Chul Hwang; Eui-Hwan Song; South Korea assigned to Samsung SDI Company Ltd.

An electrolyte for rechargeable lithium battery including a lithium salt, an organic solvent and a thermosetting organic compound is provided.

### 6511772
### ELECTROCHEMICAL CELL HAVING AN ELECTRODE WITH A PHOSPHATE ADDITIVE IN THE ELECTRODE ACTIVE MIXTURE

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

An electrochemical cell of either a primary or a secondary chemistry, is described. In either case, the cell has a negative electrode of lithium or of an anode material which is capable of intercalating and de-intercalating lithium coupled with a positive electrode of a cathode active material. A phosphate compound is mixed with either the anode material or the cathode active material prior to contact with its current collector. The resulting electrode couple is activated by a non-aqueous electrolyte. The electrolyte flows into and throughout the electrodes causing the phosphate compound to dissolve in the electrolyte. The phosphate solute is then able to contact the lithium to provide an electrically insulating and ionically conducting passivation layer thereon.

### 6511773
### LITHIUM RECHARGEABLE INORGANIC ELECTROLYTE CELL

Frederick W. Dampier; USA assigned to Lithium Energy Associates Inc.

A rechargeable cell with an alkali or alkaline earth metal electrode with a coulombic capacity about the same as a metal halide electrode such as $CuCl_2$, $CuBr_2$, and the like, or a metal oxide positive electrode such as $LiCoO_2$, $MnO_2$ and the like or a carbonaceous positive electrode and a sulfur dioxide electrolyte solvent containing a salt that produces a halogen and/or a Lewis acid on overcharge is disclosed. On most discharges, the active metal of the negative electrode is anodically dissolved and any dendrites are anodically dissolved or electrically isolated and scavenged. About every 4–50 cycles, the cell is overdischarged in reversal to reduce the state of charge of the positive electrode relative to the negative electrode and compensate for undercharging of the negative electrode during recycling.

## *COMPONENTS AND/OR CHARGERS*

### 6504341
### METHOD AND APPARATUS FOR IDENTIFYING AND CHARGING BATTERIES

Daniele C. Brotto; USA assigned to Black and Decker Inc.

A method for charging a rechargeable battery pack includes identifying battery capacity, determining sampling interval length according to the battery capacity, and implementing the determined sampling interval length. Also disclosed herein is a method for charging batteries comprising identifying battery capacity, determining current-on period length in duty cycle according to the battery capacity, and implementing the determined current-on period length. Further, disclosed herein is a battery charging apparatus comprising a charger for charging first and second batteries, where the first battery comprises a microprocessor. The charger further comprises at least one terminal for receiving a battery identification signal, so that the charger can distinguish between the first and second batteries. Also disclosed herein is a battery/charger combination comprising a battery comprising first, second and third terminals, at least one cell disposed between the first and second terminals and a microprocessor disposed within the battery between the first and third terminals, a charger connected to the battery via the first, second and third terminals, wherein the microprocessor controls charging of the battery by sending instructions to the charger.

*OTHER BATTERIES*

**6503646**
**HIGH RATE BATTERIES**

Dania I. Ghantous; Benjamin Chaloner-Gill; Shivkumar Chiruvolo; Devendra R. Banfol; William E. McGovern; Ronald M. Cornell; Khanh Hoang; Allison A. Pinoli; USA assigned to NanoGram Corporation

Improved high rate batteries based on silver vanadium oxide yield improved pulsed performance. In particular, batteries comprise an electrolyte having lithium-ions and a cathode comprising silver vanadium oxide. Improved batteries have a pulsed specific energy of at least about 575 mWh/g when pulsed in groups of four-10 s pulses at a current density of 25 mA/cm$^2$ spaced by 15 s between pulses and with 30 min between pulse groups down to a discharge voltage of 1.5 V. In addition, improved batteries can achieve high maximum specific powers, high current densities and no voltage delay in pulsed operation. The batteries are particularly suitable for use in implantable medical devices, such as, defibrillators, pacemakers or combinations thereof. Improved processing approaches are described.

**6503657**
**NON-AQUEOUS ELECTROLYTE SECONDARY BATTERY**

Norio Takami; Hiroyuki Hasebe; Takahisa Ohsaki; Motoya Kanda; Japan assigned to Kabushiki Kaisha Toshiba

The present invention provides a non-aqueous electrolyte secondary battery, comprising an electrode group including a positive electrode, a negative electrode including a material for absorbing–desorbing lithium-ions, and a separator arranged between the positive electrode and the negative electrode, a non-aqueous electrolyte impregnated in the electrode group and including a non-aqueous solvent and a lithium salt dissolved in the non-aqueous solvent, and a jacket for housing the electrode group and having a thickness of 0.3 mm or less, wherein the non-aqueous solvent ?-butyrolactone in an amount larger than 50% by volume and not larger than 95% by volume based on the total amount of the non-aqueous solvent.

**6506514**
**NON-AQUEOUS ELECTROLYTE SECONDARY BATTERY**

Takayuki Endo; Hiroshi Watanuki; Japan assigned to NEC Mobile Energy Corporation

The present invention provides a non-aqueous electrolyte secondary battery, comprising a battery element produced by laminating and winding up a positive electrode and a negative electrode with a separator interposed there between. A separator is not provided on the outermost periphery of the battery element. A current collector surface of one of the positive electrode or the negative electrode is exposed to the ambient environment. A separation-preventive tape is attached on the battery element except a portion of one of the longer sides on the outermost periphery. This battery increases battery capacity of the thin-walled type non-aqueous electrolyte secondary battery.

**6506520**
**NON-AQUEOUS ELECTROLYTE SECONDARY BATTERY**

Kaoru Inoue; Hiroshi Yoshizawa; Hizuru Koshina; Harunari Shimamura; Yoshiaki Nitta; Japan assigned to Matsushita Electric Industrial Company Ltd., H01M 1024

A negative electrode is characterized by its composite particles constructed in such a manner that at least part of the surrounding surface of nuclear particles containing at least one of tin, silicon and zinc as a constituent element, is coated with a solid solution or an inter-metallic compound, which is composed of, the element included in the nuclear particles, and at least one other element except the elements included in the nuclear particles selected from a group comprising group 2 elements, transition elements, group 12 elements, group 13 elements and group 14 elements except carbon of the periodic table. The present invention is characterized that the lithium content of the nuclear particles of the composite particles is 40–95 at.% of the theoretical limit of lithium content of each constituent element of the nuclear particles. Further, the batteries are first charged at a constant current and upon reaching the predetermined voltage, are charged at a constant voltage. The current density during charging are set at not more than 5 mA/cm$^2$ as a in the area where the positive and negative electrodes face each other.

**6506523**
**SOLID ELECTROLYTE SECONDARY BATTERY**

Tsuyonobu Hatazawa; Takayuki Kondo; Yukiko Iijima; Japan assigned to Sony Corporation

A solid-electrolyte secondary battery is provided which comprises a positive electrode, negative electrode and a solid electrolyte provided between the electrodes. The solid electrolyte contains as a matrix polymer a vinylidene fluoride/hexafluoropropylene block copolymer. The film of the block copolymer has a high mechanical toughness and solvent retaining capability. Use of this block copolymer film as the matrix polymer of the solid electrolyte greatly improves the adhesive strength, load characteristic and low-temperature performance. In the block copolymer, the proportion of hexafluoropropylene should preferably be 3–7.5% by weight. The molecular weight should preferably be of over 550,000. A block copolymer of over 300,000 in Mw and under 550,000 in Mw is used in combination with the above one.

**6506524**

## ELECTROLYTE COMPRISING FLUORO-ETHYLENE CARBONATE AND PROPYLENE CARBONATE, FOR ALKALI METAL-ION SECONDARY BATTERY

Roderick S. McMillan; Denis James Worsfold; John J. Murray; Isobel Davidson; Zhi Xin Shu; Canada assigned to National Research Council of Canada

The invention disclosed is an alkali metal-ion secondary cell having a carbonaceous anode and an electrolyte, comprising an alkali metal salt dissolved in an organic electrolyte solvent. Intercalation and de-intercalation during repeated charge/discharge cycle of the secondary cell using a conventional electrolyte solvent causes continual exposure of bare surfaces of the carbonaceous material to the electrolyte, resulting in continual consumption of electrolyte in the formation of new passivation films on the bared or partially covered surfaces, adversely affecting the performance and capacity of the cell. An improvement on the conventional electrolyte involves the addition of fluorinated organic solvent to the conventional electrolyte and results in a more stable passivation film, much less consumption of electrolyte and better performance and cell capacity. The cell efficiency of the secondary cell is improved substantially and high capacity retained by the replacement of the chlorinated organic solvent with fluorinated organic solvent.

**6509117**

## BATTERY COMPRISING MANGANESE DIOXIDE HAVING A HIGH POWER COEFFICIENT

William Bowden; Klaus Brandt; James J. Cervera; Hyoun Sook Choe; Rimma A. Sirotina; Joseph Sunstrom; USA assigned to The Gillette Company

A battery, a primary alkaline battery, has a cathode including manganese dioxide, carbon, and a binder. The manganese dioxide is selected to have a high power coefficient to provide the battery capable of high current discharge.

**6509714**

## SECONDARY BATTERY WITH TERMINALS AND CAPACITOR WITH TERMINALS

Koji Tomitsuka; Kenji Ogata; Taisuke Takiguchi; Shunji Watanabe; Japan assigned to SII Micro Parts Ltd.

A secondary battery or capacitor fitted with terminals and occupies less area on a packaging substrate. Either one of the positive and negative terminals is mounted within the outer surface of the secondary battery or capacitor. This reduces the area occupied by the secondary battery or capacitor fitted with terminals on the substrate. At least one step is formed on the terminal positioned opposite to the substrate. This prevents electrical shorting between the positive electrode can and the negative terminal.