Advanced Lithium Ion Batteries For Automotive Applications

Recognizing the pretension ways to acquire this book **Advanced Lithium Ion Batteries For Automotive Applications** is additionally useful. You have remained in right site to start getting this info. acquire the Advanced Lithium Ion Batteries For Automotive Applications link that we pay for here and check out the link.

You could buy lead Advanced Lithium Ion Batteries For Automotive Applications or acquire it as soon as feasible. You could quickly download this Advanced Lithium Ion Batteries For Automotive Applications after getting deal. So, subsequent to you require the book swiftly, you can straight acquire it. Its in view of that entirely easy and for that reason fats, isnt it? You have to favor to in this sky

MARQUES

OSBORN

Progress in

Materials and Component Developmen

t for Advanced Lithium-Ion Cells for Nasa's Exploration Missions The Electrochemical Society The number of electric vehicles (cars, buses, e-bikes, electric scooters and electric motorcycles) sold in the Nordic countries is currently increasing quickly. That means that more electricity is used for driving, and also that more of some important metals are being used than earlier. This report regards the fate of the lithium-ion batteries used in vehicles in the Nordic countries. Currently the "Battery Directive" (EC, 2006) which is a producer's responsibility directive, is under revision and this study is a knowledge base intended for use by the Nordic Environmental Protection Agencies for their referral response in the revision process. This report focuses on the aspect of metal resources, but it does not elaborate on a broader range of environmental impacts, as these were outside the scope of this study.

Electrospun Titanium Dioxide and Silicon Composite Nanofibers for Advanced Lithium Ion Batteries CRC Press This book covers both the fundamental and applied aspects of advanced Na-ion batteries

(NIB) which have proven to be a potential challenger to Li-ion batteries. Both the chemistry and design of positive and negative electrode materials are examined. In NIB, the electrolyte is also a crucial part of the batteries and the recent research, showing a possible alternative to classical electrolytes – with the development of ionic liquid-based electrolytes – is also explored. Cycling performance in NIB is also strongly associated with the quality of the electrode-electrolyte interface, where electrolyte degradation takes place; thus, Na-ion Batteries details the recent achievements in furthering knowledge of this interface. Finally, as the ultimate goal is commercialization of this new electrical storage technology, the last chapters are dedicated to the industrial point of view, given by two startup companies, who developed two different NIB chemistries for complementary applications and markets.
Multiscale Approaches Toward Advanced Lithium-ion Battery
Elsevier
To address the future performance and safety requirements for the electrical energy storage technologies

that will enhance and enable future NASA manned aerospace missions, advanced rechargeable, lithium ion battery technology development is being pursued within the scope of the NASA Exploration Technology Development Program's (ETDP) Energy Storage Project. A critical cell-level component of a lithium-ion battery which significantly impacts both overall electrochemical performance and safety is the porous separator that is sandwiched between the two active cell electrodes. To support the selection of the optimal cell separator material(s) for the advanced battery technology and chemistries under development, laboratory characterization and screening procedures were established to assess and compare separator material-level attributes and associated separator performance characteristics.

Graphene and Carbon Nanotubes for Advanced Lithium Ion Batteries

Independently Published

In the decade since the introduction of the first commercial lithium-ion battery research and development on virtually every aspect of the chemistry and engineering of these systems has proceeded at unprecedented levels. This book is a snapshot of the state-of-the-art and where the work is going in the near future. The book is intended not only for researchers, but also for engineers and users of lithium-ion batteries which are found in virtually every type of portable electronic product. Lithium-Ion Batteries BiblioGov Vehicles and stand-alone power systems that enable the next generation of human missions to the moon will require energy storage systems that are safer, lighter, and more compact than current state-of-the-art (SOA) aerospace quality lithium-ion (Li-ion) batteries. NASA is developing advanced Li-ion cells to enable or enhance future human missions to Near Earth Objects, such as asteroids, planets, moons, libration points, and orbiting structures. Advanced, high-performing materials are required to provide component-level performance that can offer the required gains at the integrated cell level. Although there is still a significant amount of work yet to be done, the present state of development activities has resulted in the synthesis of promising materials that approach the ultimate performance goals. This paper on interim progress of the development efforts will present performance of materials and cell components and will elaborate on the challenges of the development activities and proposed strategies to overcome technical issues.

A Study on Advanced Lithium-Based Battery Cell Springer Science & Business Media

Vehicles and stand-alone power systems that enable the next generation of human missions to the Moon will require energy storage systems that are safer, lighter, and more compact than current state-of-the-art (SOA) aerospace quality lithium-ion (Li-ion) batteries. NASA is developing advanced Li-ion cells to enable or enhance the power systems for the Altair Lunar Lander, Extravehicular Activities spacesuit, and rovers and portable utility pallets for Lunar Surface Systems. Advanced, high-performing materials are required to provide component-level performance that can offer the required gains at the integrated cell level. Although there is still a significant amount of work yet to be done, the present state of development activities has resulted in the synthesis of promising materials that approach the ultimate performance goals. This report on interim progress of the development efforts will elaborate on the challenges of the development activities, proposed strategies to overcome technical issues, and present performance of materials and cell components. *Lithium-Ion Batteries* Springer Science & Business Media Carbon nanotubes and graphene are promising and widely explored materials for the development of high performance lithium ion batteries that can operate at a wide range of temperatures. This book deals with carbon nanotube and graphene composite materials for both electrodes and electrolytes in lithium ion battery applications. Rechargeable Lithium-Ion Batteries Wiley-VCH Currently, automotive batteries use intercalation cathodes such as lithium iron phosphate ($LiFePO4$) which provide high levels of safety while sacrificing cell voltage and therefore energy density. Lithium transition metal oxide ($LiMO2$) batteries achieve higher cell voltages at the risk of releasing oxygen gas during charging, which can lead to ignition of the liquid electrolyte. To achieve both safety and high energy density, oxide cathodes must be well characterized under operating conditions. In any intercalation cathode material, the loss of positive lithium ions during charge must be balanced by the loss of negative electrons from the host material. Ideally, the TM ions oxidize to compensate this charge. Alarmingly, the stoichiometry of the latest LiMO2 cathode materials includes more lithium ions than the TM ions can compensate for. Inevitably, peroxide ions or dioxygen gas must form. The former mechanism is vital for lithium-air batteries, while the latter must be avoided. Battery researchers have long sought to completely characterize the intercalation reaction in working batteries. However, the volatile electrolytes employed in batteries are not compatible with vacuum-based characterization techniques, nor are the packaging materials required to contain the liquid. For the first time, a solid state battery (using exposed particles of Li1.17Ni0.25Mn0.58O2) was charged while using soft X-ray absorption spectroscopy to observe the redox trends in nickel, manganese and oxygen. This was combined with innovative hard X-ray absorption spectroscopic studies on the same material to create the most complete picture yet possible of charge compensation. *Recent Trends and Perspectives* John Wiley & Sons Lithium-ion batteries are the most promising among the secondary battery technologies, for providing high energy and high power required for hybrid electric vehicles (HEV) and electric vehicles (EV). Lithium-ion batteries consist of conventional graphite or lithium titanate as anode and lithium transition metal-oxides as cathode. A lithium salt dissolved in an aprotic solvent such as ethylene carbonate and diethylene carbonate is used as electrolyte. This rechargeable battery operates based on the principle of electrochemical lithium insertion/re-insertion or intercalation/de-intercalation during charging/discharging of the battery. It is essential that both electrodes have layered structure which should accept and release the lithium-ion. In advanced lithium-ion battery technologies, other than layered anodes are also considered. High cell voltage, high capacity as well as energy density, high Columbic efficiency, long cycle life, and convenient to fabricate any size or shape of the battery, are the vital features of this battery technology. Lithium-ion batteries are already being used widely in most of the consumer electronics such as mobile phones, laptops, PDAs etc. and are in early stages of application in HEV and EV, which will have far and wide implications and benefits to society. The book contains ten chapters, each focusing on a specific topic pertaining to the application of lithium-ion batteries in Electric Vehicles. Basic principles, electrode materials, electrolytes, high voltage cathodes, recycling spent Li-ion batteries and battery charge controller are addressed. This book is unique among the countable books focusing on the lithium-ion battery technologies for vehicular applications. It provides fundamentals and practical knowledge on the lithium-ion battery for vehicular application. Students, scholars, academicians, and battery and automobile industries will find this volume useful. A Review of State-Of-The-Art Separator Materials for Advanced Lithium-Based Batteries for Future Aerospace Missions Advanced Lithium-Ion BatteriesRecent Trends and Perspectives Electrochemical energy storage has played important roles in energy storage technologies for portable electronics and electric vehicle applications. During the past thirty years, great progress has been made in research and development of various batteries, in term of energy density increase and cost reduction. However, the energy density has to be further increased to achieve long endurance time. In this book, recent research and development in advanced electrode materials for electrochemical energy storage devices are presented, including lithium ion batteries, lithium-sulfur batteries and metal-air batteries, sodium ion batteries and supercapacitors. The materials involve transition metal oxides, sulfides, Si-based material as well as graphene and graphene composites. John Wiley & Sons Explains the current state of the science and points the wayto technological advances First developed in the late 1980s, lithium-ion batteries nowpower everything from tablet computers to power tools to electriccars. Despite tremendous progress in the last two decades in theengineering and manufacturing of lithium-ion batteries, they arecurrently unable to meet the energy and power demands of many newand emerging devices. This book sets the stage for the developmentof a new generation of higher-energy density, rechargeablelithium-ion batteries by advancing battery chemistry andidentifying new electrode and electrolyte materials. The first chapter of Lithium Batteries sets thefoundation for the rest of the book with a brief account of thehistory of lithium-ion battery development. Next, the book coverssuch topics as: Advanced organic and ionic liquid electrolytes for batteryapplications Advanced cathode materials for lithium-ion batteries Metal fluorosulphates capable of doubling the energy density oflithium-ion batteries Efforts to develop lithium-air batteries Alternative anode rechargeable batteries such as magnesium andsodium anode systems Each of the sixteen chapters has been contributed by one or moreleading experts in electrochemistry and lithium battery technology.Their contributions are based on the latest published findings aswell as their own firsthand laboratory experience. Figuresthroughout the book help readers understand the concepts underlyingthe latest efforts to advance the science of batteries and developnew materials. Readers will also find a bibliography at the end ofeach chapter to facilitate further research into individualtopics. Lithium Batteries provides electrochemistry students andresearchers with a snapshot of current efforts to improve batteryperformance as well as the tools needed to advance their ownresearch efforts.

Trends and Progress in Electric Vehicles

Wiley-VCH This timely book addresses the different components that make up a lithium battery while also providing up-to-date information on advanced characterization techniques, safety issues, and applications. Richly illustrated as an aid to understanding, the book is edited by a team of researchers from both academia and industry, and each chapter is written by a pertinent leading expert in the field. Beginners and students will benefit from the coverage of such fundamentals as electrochemistry, thermodynamics, transport, and storage. At the same time, those involved in R&D of lithium batteries will find this an invaluable source of information on computational modeling, cathodes, anodes, electrolytes, the electrode/electrolyte interface, cell design, and solid-state batteries. Finally, those working in the lithium-ion battery industry will use this monograph to track development in achieving higher storage capability, rate performances, and reliability.

Advanced Technologies and Applications

CRC Press

The distribution and concentration of lithium in Li-ion battery cathodes at different stages of cycling is a pivotal factor in determining battery performance. Non-uniform distribution of the transition metal cations has been shown to affect cathode performance; however, the Li is notoriously challenging to characterize with typical high-spatial-resolution imaging techniques. Here, for the first time, laser-assisted atom probe tomography is applied to two advanced Li-ion battery oxide cathode materials--layered $Li_{1.2}Ni_{0.2}Mn_{0.6}O_2$ and spinel $LiNi_{0.5}Mn_{1.5}O_4$--to unambiguously map the three dimensional (3D) distribution of Li at sub-nanometer spatial resolution and correlate it with the distribution of the transition metal cations (M) and the oxygen. The as-fabricated layered $Li_{1.2}Ni_{0.2}Mn_{0.6}O_2$ is shown to have Li-rich Li_2MO_3 phase regions and Li-depleted $Li(Ni_{0.5}Mn_{0.5})O_2$ regions while in the cycled layered $Li_{1.2}Ni_{0.2}Mn_{0.6}O_2$ an overall loss of Li and presence of Ni rich regions, Mn rich regions and Li rich regions are shown in addition to providing the first direct evidence for Li loss on cycling of layered LNMO cathodes. The spinel $LiNi_{0.5}Mn_{1.5}O_4$ cathode is shown to have a uniform distribution of all cations. These results were additionally validated by correlating with energy dispersive spectroscopy mapping of these nanoparticles in a scanning transmission electron microscope. Thus, we have opened the door for probing the nanoscale compositional fluctuations in crucial Li-ion battery cathode materials at an unprecedented spatial resolution of sub-nanometer scale in 3D which can provide critical information for understanding capacity decay mechanisms in these advanced cathode materials. *Trends and Progress in Electric Vehicles* Springer Science & Business Media High-performance secondary batteries, also called rechargeable or storage batteries, are a key component of electric automobiles, power storage for renewable energies, load levellers of electric power lines, base stations for mobile phones, and emergency power supply in hospitals, in addition to having application in energy security and realization of a low-carbon and resilient society. A detailed understanding of the physics and chemistry that occur in secondary batteries is required for developing next-generation secondary batteries with improved performance. Among various types of secondary batteries, lithium-ion batteries are most widely used because of their high energy density, small memory effect, and low self-discharge rate. This book introduces lithium-ion batteries, with an emphasis on their overview, roadmaps, and simulations. It also provides extensive descriptions of ion beam analysis and prospects for in situ diagnostics of lithium-ion batteries. The chapters are written by specialists in cutting-edge research on lithium-ion batteries and related subjects. The book will be a great reference for advanced undergraduate- and graduate-level students, researchers, and engineers in electrochemistry, nanotechnology, and diagnostic methods and instruments. *Fullerene-like Polyoxometalates as Anode Materials for Advanced Lithium-Ion Batteries* CRC Press Author's abstract: A unique electrospinning method was implemented to fabricate composite nanofibers for lithium ion battery applications. The composite nanofibers were made of amorphous carbon, rutile phase TiO_2, and cubic phase Si nanoparticles. Sulfur was utilized as a template to form void structures within the TiO_2 nanofiber matrix. This provides the desired space for the Si expansion during the lithiation process. Phase, structure, composition, and morphology of the nanofibers were characterized using Raman spectroscopy, SEM, EDS, TGA, and powder XRD. Carbonized TiO_2 nanofibers showed a low but stable specific capacity. Si Nanoparticles demonstrated an initially high but fast degrading capacity. In contrast, silicon in SiNP/C/TiO2 nanofibers with sulfur as a template exhibits an impressive high specific capacity of ~3459 mAh g-1 initially, 54% of which can be maintained after 180 cycles.

Novel in Operando Characterization Methods for Advanced Lithium-ion Batteries The Electrochemical Society Lithium-ion batteries are the most promising among the secondary battery technologies, for providing high energy and high power required for hybrid electric vehicles (HEV) and electric vehicles (EV). Lithium-ion batteries consist of conventional graphite or lithium titanate as anode and lithium transition metal-oxides as cathode. A lithium salt dissolved in an aprotic solvent such as ethylene carbonate and diethylene carbonate is used as electrolyte. This rechargeable battery operates based on the principle of electrochemical lithium insertion/re-insertion or intercalation/de-intercalation during charging/discharging of the battery. It is essential that both electrodes have layered structure which should accept and release the lithium-ion. In advanced lithium-ion battery technologies, other than layered anodes are also considered. High cell voltage, high capacity as well as energy density, high Columbic efficiency, long cycle life, and convenient to fabricate any size or shape of the battery, are the vital features of this battery technology. Lithium-ion batteries are already being used widely in most of the consumer electronics such as mobile phones, laptops, PDAs etc. and are in early stages of application in HEV and EV, which will have far and wide implications and benefits to society. The book contains ten chapters, each focusing on a specific topic pertaining to the application of lithium-ion batteries in Electric Vehicles. Basic principles, electrode materials, electrolytes, high voltage cathodes, recycling spent Li-ion batteries and battery charge controller are addressed. This book is unique among the countable books focusing on the lithium-ion battery technologies for vehicular applications. It provides fundamentals and practical knowledge on the lithium-ion battery for vehicular application. Students, scholars, academicians, and battery and automobile industries will find this volume useful.

From Synthesis to Structure-reactivity-performance-relationship to Mechanistic and Safety Aspects

Nordic Council of Ministers

Advanced Fluoride-Based Materials for Energy Conversion provides thorough and applied information on new fluorinated materials for chemical energy devices, exploring the electrochemical properties and behavior of fluorinated materials in lithium ion and sodium ion batteries, fluoropolymers in fuel cells, and fluorinated carbon in capacitors, while also exploring synthesis applications, and both safety and stability issues. As electronic devices, from cell phones to hybrid and electric vehicles, are increasingly common and prevalent in modern lives and require dependable, stable chemical energy devices with high-level functions are becoming increasingly important. As research and development in this area progresses rapidly, fluorine compounds play a critical role in this rapid progression. Fluorine, with its small size and the highest electronegativity, yields stable compounds under various conditions for utilization as electrodes, electrolytes, and membranes in energy devices. The book is an ideal reference for the chemist, researcher, technician, or academic, presenting valuable, current insights into the synthesis of fluorine compounds and fluorination reactions using fluorinating agents. Provides thorough and applied information on new fluorinated materials for chemical energy devices Describes the emerging role of stable energy devices with high-level functions and the research surrounding the technology Ideal for the chemist, research, technician, or academic seeking current insights into the synthesis of fluorine compounds and fluorination reactions using fluorinating agents

Design of Nanostructured Materials for Advanced Lithium Ion Batteries

Royal Society of Chemistry As NASA embarks on a renewed human presence in space, safe, human-rated, electrical energy storage and power generation technologies, which will be capable of demonstrating reliable performance in a variety of unique mission environments, will be required. To address the future performance and safety requirements for the energy storage technologies that will enhance and enable future NASA Constellation Program elements and other future aerospace missions, advanced rechargeable, lithium-ion battery technology development is being pursued with an emphasis on addressing performance technology gaps between state-of-the-art capabilities and critical future mission requirements. The material attributes and related performance of a lithium-ion cell's internal separator component are critical for achieving overall optimal performance, safety and reliability. This review provides an overview of the general types, material properties and the performance and safety characteristics of current separator materials employed in lithium-ion batteries, such as those materials that are being assessed and developed for future aerospace missions. Bladwin, Richard S. Glenn Research Center NASA/TM-2009-215590, E-16879 *Nano-engineered Electrode Materials for Advanced Lithium-ion Batteries* John Wiley & Sons

Lithium ion batteries are currently the energy source of choice for small mobile devise like cell phones, laptops, owning to their balance of energy density with power density compared to other energy storage devices, like nickel cadmium batteries. At present there is great urgent need to replace gasoline with environmental healthy electricity. Li-ion batteries became a great alternative as an energy carrier for electric and hybrid electric vehicles. The ever increased power density and the life time of the battery are highly desirable in the application. So there is a great space for the improvement of lithium ion batteries. Thus the focus of the study is put on increasing the power density and cycle life of batteries. Performance of batteries could be improved by means of synthesizing composites, reduce interface resistance, building two dimensional and three dimensional architecture, etc. High performance anode materials such as two dimensional MoO_2/graphite oxide composite, three dimensional anode material Co_3O_4 on nickel foam as well were successfully developed and showed excellent performance.

The composites show better performance than each component due to the synergistic effects between the components. By taking advantage of the two-dimensional and three-dimensional structure, the electrodes exhibited stable output and high power density, as been discussed in chapter 4 and chapter 5. Meanwhile, cathode materials with high stability and high rate capability were synthesized, such as LiMn2O4, V2O5. By doping cations into cathodes, conductivity and structural stability could be improved. Also the electronic structure could also been changed due to the introduction of the cations with different valance. The cathodes were proved to be both stable and fast response to current, as been discussed in chapter 6 and chapter 7. Another way of increase power density is to increase the potential of battery. This is achieved by increase the potential of cathode amterials. Also by modify the surface the high potential electrode, we successfully alleiviate the problem of surface consumption of electrolyte. Nickel doped LiMn2O4 (LiMn1.6Ni0.4 O4) is shown to have both high power density and stability. By having higher concentration of Mn3+ ions at surface, we have solve the problem of surface oxidation of electrolyte. Also taking advantage of carbon coating, the dissolution of Mn2+ into electrolyte is also prohibited while the electronic conductivity is increase, as been discussed in chapter 8.1. A new concept of bat-capacitor was brought out too by taking advantage of fast charge nd discharge of capacitor. By combining battery and capacitor, capacitor can serve as lithium ions buffer and reservoir before they can diffuse into battery. Just by simply annealing amorphous materials and forming a partially crystallized electrode, which can be treated as complicated system of nanobatteries and nanocapacitors, as been discussed in chapter 9.

Advances and Applications CRC Press With the development of potent x-ray sources, Compton scattering has become a standard tool for studying electron densities in materials. This text looks at the Compton scattering method, leading to a fundamental understanding of the electrical and magnetic properties of solid materials, both elements and compounds.