

Lindens Handbook Of Batteries 4th Edition

As the world’s demand for electrical energy increases, it will be the ingenuity and skill of brilliant electrochemists that enable us to utilize the planet’s mineral reserves responsibly. This biographical dictionary profiles 95 electrochemists from 19 nations who during the past 270 years have researched and developed ever more efficient batteries and energy cells. Each entry traces the subject’s origin, education, discoveries and patents, as well as hobbies and family life. The breakthroughs of early innovators are cataloged and the work of living scientists and technicians is brought up to date. An appendix provides a cross-referenced timeline of innovation.

Batteries that can store electricity from solar and wind generation farms are a key component of a sustainable energy strategy. Featuring 15 peer-reviewed entries from the Encyclopedia of Sustainability Science and Technology, this book presents a wide range of battery types and components, from nanocarbons for supercapacitors to lead acid battery systems and technology. Worldwide experts provides a snapshot-in-time of the state-of-the art in battery-related R&D, with a particular focus on rechargeable batteries. Such batteries can store electrical energy generated by renewable energy sources such as solar, wind, and hydropower installations with high efficiency and release it on demand. They are efficient, non-polluting, self-contained devices, and their components can be recovered and used to recreate battery systems. Coverage also highlights the significant efforts currently underway to adapt battery technology to power cars, trucks and buses in order to eliminate pollution from petroleum combustion. Written for an audience of undergraduate and graduate students, researchers, and industry experts, Batteries for Sustainability is an invaluable one-stop reference to this essential area of energy technology.

Publisher’s Note: Products purchased from Third Party sellers are not guaranteed by the publisher for quality, authenticity, or access to any online entitlements included with the product. Thoroughly revised, comprehensive coverage of battery technology, characteristics, and applications This fully updated guide offers complete coverage of batteries and battery usage!from classic designs to emerging technologies. Compiled by a pioneer in secondary lithium batteries, the book contains all the information needed to solve engineering problems and make proper battery selections. You will get in-depth descriptions of the principles, properties, and performance specifications of every major battery type. Linden’s Handbook of Batteries, Fifth Edition, contains cutting-edge data and equations, design specifications, and troubleshooting techniques from international experts. New chapters discuss renewable energy systems, battery failure analysis, lithium-ion battery technology, materials, and component design. Recent advances in smartphones and hybrid car batteries are clearly explained, including maximizing re-chargeability, reducing cost, improving safety, and lessening environmental impact. Coverage includes: Electricity, electrochemistry, and batteriesRaw materialsBattery componentsPrinciples of electrochemical cell operationsBattery product overviewElectrochemical cell designs (platform technologies)Primary batteriesSecondary batteriesMiscellaneous and specialty batteriesBattery applicationsBattery industry infrastructure

Electric Vehicle Integration into Modern Power Networks provides coverage of the challenges and opportunities posed by the progressive integration of electric drive vehicles. Starting with a thorough overview of the current electric vehicle and battery state-of-the-art, this work describes dynamic software tools to assess the impacts resulting from the electric vehicles deployment on the steady state and dynamic operation of electricity grids, identifies strategies to mitigate them and the possibility to support simultaneously large-scale integration of renewable energy sources. New business models and control management architectures, as well as the communication infrastructure required to integrate electric vehicles as active demand are presented. Finally, regulatory issues of integrating electric vehicles into modern power systems are addressed. Inspired by two courses held under the EES-UETP umbrella in 2010 and 2011, this contributed volume consists of nine chapters written by leading researchers and professionals from the industry as well as academia.

The Oxford Handbook of Media, Technology, and Organization Studies

The Handbook of Lithium-Ion Battery Pack Design

Proceedings of the FISITA 2012 World Automotive Congress

Electrochemical Energy

Batteries for Sustainability

Energy storage devices are considered to be an important field of interest for researchers worldwide. Batteries and supercapacitors are therefore extensively studied and progressively evolving. The book not only emphasizes the fundamental theories, electrochemical mechanism and its computational view point, but also discusses recent developments in electrode designing based on nanomaterials, separators, fabrication of advanced devices and their performances.

This book provides a review of the latest advances in anion exchange membrane fuel cells. Starting with an introduction to the field, it then examines the chemistry and catalysis involved in this energy technology. It also includes an introduction to the mathematical modelling of these fuel cells before discussing the system design and performance of real-world systems. Anion exchange membrane fuel cells are an emerging energy technology that has the potential to overcome many of the obstacles of proton exchange membrane fuel cells in terms of the cost, stability, and durability of materials. The book is an essential reference resource for professionals, researchers, and policymakers around the globe working in academia, industry, and government.

Proceedings of the FISITA 2012 World Automotive Congress are selected from nearly 2,000 papers submitted to the 34th FISITA World Automotive Congress, which is held by Society of Automotive Engineers of China (SAE-China) and the International Federation of Automotive Engineering Societies (FISITA). This proceedings focus on solutions for sustainable mobility in all areas of passenger car, truck and bus transportation. Volume 4: Future Automotive Powertrain (II) focuses on: •Advanced Battery Technology •Hydrogen Fuel Cell Vehicle •Charging Infrastructure and Smart Grid Technology •Demonstration of Electric Vehicles in Cities Above all researchers, professional engineers and graduates in fields of automotive engineering, mechanical engineering and electronic engineering will benefit from this book. SAE-China is a national academic organization composed of enterprises and professionals who focus on research, design and education in the fields of automotive and related industries. FISITA is the umbrella organization for the national automotive societies in 37 countries around the world. It was founded in Paris in 1948 with the purpose of bringing engineers from around the world together in a spirit of cooperation to share ideas and advance the technological development of the automobile.

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 theeengineering 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.

A Primer

Lithium-Ion Battery Chemistries

History, Progress, and Applications

Electric Vehicle Battery Systems

Lithium-Ion Batteries Hazard and Use Assessment

Cutting Edge Directions

The new edition of the cornerstone text on electrochemistry Spans all the areas of electrochemistry, from the basics of thermodynamics and electrode kinetics to transport phenomena in electrolytes, metals, and semiconductors. Newly updated and expanded, the Third Edition covers important new treatments, ideas, and technologies while also increasing the book’s accessibility for readers in related fields. Rigorous and complete presentation of the fundamental concepts In-depth examples applying the concepts to real-life design problems Homework problems ranging from the reinforcing to the highly thought-provoking Extensive bibliography giving both the historical development of the field and references for the practicing electrochemist.

This book is a printed edition of the Special Issue "Nickel Metal Hydride Batteries" that was published in Batteries

Metal–air and metal–sulfur batteries (MABs/MSBs) represent one of the most efficient-energy storage technologies, with high round trip efficiency, a long life cycle, fast response at peak demand/supply of electricity, and decreased weight due to the use of atmospheric oxygen as one of the main reactants. This book presents an overview of the main MABs/MSBs from fundamentals to applications. Recent technological trends in their development are reviewed. It also offers a detailed analysis of these batteries at the material, component, and system levels, allowing the reader to evaluate the different approaches of their integration. The book provides a systematic overview of the components, design, and integration, and discusses current technologies, achievements, and challenges, as well as future directions. Each chapter focuses on a particular battery type including zinc–air batteries, lithium–air batteries, aluminum–air batteries, magnesium–air batteries, lithium–sulfur batteries, and vanadium–air redox flow batteries, and metal–sulfur batteries. Features the most recent advances made in metal–air/metal–sulfur batteries. Describes cutting-edge materials and technology for metal–air/metal–sulfur batteries. Includes both fundamentals and applications, which can be used to guide and promote materials as well as technology development for metal–air/metal–sulfur batteries. Provides a systematic overview of the components, design, and integration, and discusses current technologies, achievements, and challenges, as well as future directions. Covers a variety of battery types in depth, such as zinc–air batteries, lithium–air batteries, aluminum–air batteries, magnesium–air batteries, lithium–sulfur batteries, vanadium–air redox flow batteries, and metal–sulfur batteries.

Lithium-Ion Battery Chemistries: A Primer offers a simple description on how different lithium-ion battery chemistries work, along with their differences. It includes a refresher on the basics of electrochemistry and thermodynamics, and an understanding of the fundamental processes that occur in the lithium-ion battery. Furthermore, it reviews each of the major chemistries that are in use today, including Lithium-Iron Phosphate (LFP), Lithium-Cobalt Oxide (LCO), Lithium Manganese Oxide (LMO), Lithium-Nickel Manganese Cobalt (NMC), Lithium-Nickel Cobalt Aluminium (NCA), and Lithium-Titanate Oxide (LTO) and outlines the different types of anodes, including carbon (graphite, hard carbon, soft carbon, graphene), silicon, and tin. In addition, the book offers performance comparisons of different chemistries to help users select the right battery for the right application and provides explanations on why different chemistries have different performances and capabilities. Finally, it offers a brief look at emerging and beyond-lithium chemistries, including lithium-air, zinc-air, aluminum air, solid-state, lithium-sulfur, lithium-glass, and lithium-metal. Presents a refresher on the basics of electrochemistry and thermodynamics, along with simple graphics and images of complex concepts Provides a clear-and-concise description of lithium-ion chemistries and how they operate Covers the fundamental processes that occur in lithium-ion batteries Includes a detailed review of current and future chemistries

Electrochemical Storage Materials

Applications of Evolutionary Computation

Design and Analysis of Large Lithium-Ion Battery Systems

Fundamentals and Applications

Batteries in a Portable World

Materials, Technologies and Applications

Electrochemical Energy: Advanced Materials and Technologies covers the development of advanced materials and technologies for electrochemical energy conversion and storage. The book was created by participants of the International Conference on Electrochemical Materials and Technologies for Clean Sustainable Energy (ICES-2013) held in Guangzhou, China, and incorporates select papers presented at the conference. More than 300 attendees from across the globe participated in ICES-2013 and gave presentations in six major themes: Fuel cells and hydrogen energy Lithium batteries and advanced secondary batteries Green energy for a clean environment Photo-Electrocatalysis Supercapacitors Electrochemical clean energy applications and markets Comprised of eight sections, this book includes 25 chapters featuring highlights from the conference and covering every facet of synthesis, characterization, and performance evaluation of the advanced materials for electrochemical energy. It thoroughly describes electrochemical energy conversion and storage technologies such as batteries, fuel cells, supercapacitors, hydrogen generation, and their associated materials.

The book contains a number of topics that include electrochemical processes, materials, components, assembly and manufacturing, and degradation mechanisms. It also addresses challenges related to cost and performance, provides varying perspectives, and emphasizes existing and emerging solutions. The result of a conference encouraging enhanced research collaboration among members of the electrochemical energy community, Electrochemical Energy: Advanced Materials and Technologies is dedicated to the development of advanced materials and technologies for electrochemical energy conversion and storage and details the technologies, current achievements, and future directions in the field.

The Handbook of Lithium-Ion Battery Pack Design: Chemistry, Components, Types and Terminology offers to the reader a clear and concise explanation of how Li-ion batteries are designed from the perspective of a manager, sales person, product manager or entry level engineer who is not already an expert in Li-ion battery design. It will offer a layman’s explanation of the history of vehicle electrification, what the various terminology means, and how to do some simple calculations that can be used in determining basic battery sizing, capacity, voltage and energy. By the end of this book the reader has a solid understanding of all of the terminology around Li-ion batteries and is able to do some simple battery calculations. The book is immensely useful to beginning and experienced engineer alike who are moving into the battery field. Li-ion batteries are one of the most unique systems in automobiles today in that they combine multiple engineering disciplines, yet most engineering programs focus on only a single engineering field. This book provides you with a reference to the history, terminology and design criteria needed to understand the Li-ion battery and to successfully lay out a new battery concept. Whether you are an electrical engineer, a mechanical engineer or a chemist this book helps you better appreciate the inter-relationships between the various battery engineering fields that are required to understand the battery as an Energy Storage System. Offers an easy explanation of battery terminology and enables better understanding of batteries, their components and the market place. Demonstrates simple battery scaling calculations in an easy to understand description of the formulas Describes clearly the various components of a Li-ion battery and their importance Explains the differences between various Li-ion cell types and chemistries and enables the determination which chemistry and cell type is appropriate for which application Outlines the differences between battery types, e.g., power vs energy battery Presents graphically different vehicle configurations: BEV, PHEV, HEV Includes brief history of vehicle electrification and its future

Offers the first comprehensive account of this interesting and growing research field Printed Batteries: Materials, Technologies and Applications reviews the current state of the art for printed batteries, discussing the different types and materials, and describing the printing techniques. It addresses the main applications that are being developed for printed batteries as well as the major advantages and remaining challenges that exist in this rapidly evolving area of research. It is the first book on printed batteries that seeks to promote a deeper understanding of this increasingly relevant research and application area. It is written in a way so as to interest and motivate readers to tackle the many challenges that lie ahead so that the entire research community can provide the world with a bright, innovative future in the area of printed batteries. Topics covered in Printed Batteries include, Printed Batteries: Definition, Types and Advantages; Printing Techniques for Batteries, Including 3D Printing; Inks Formulation and Properties for Printing Techniques; Rheological Properties for Electrode Slurry; Solid Polymer Electrolytes for Printed Batteries; Printed Battery Design; and Printed Battery Applications. Covers everything readers need to know about the materials and techniques required for printed batteries, informs on the applications for printed batteries and what the benefits are Discusses the challenges that lie ahead as innovators continue with their research Printed Batteries: Materials, Technologies and Applications is a unique and informative book that will appeal to academic researchers, industrial scientists, and engineers working in the areas of sensors, actuators, energy storage, and printed electronics.

This book constitutes the refereed conference proceedings of the 21st International Conference on the Applications of Evolutionary Computation, EvoApplications 2018, held in Parma, Italy, in April 2018, collocated with the Evo* 2018’s events EuroGP, EvoCOP, and EvoMUSART. The 59 revised full papers presented were carefully reviewed and selected from 84 submissions. EvoApplications 2018 combined research from 14 different domains: business analytics and finance (EvoBAFIN); computational biology (EvoBIO); communication networks and other parallel and distributed systems (EvoCOMNET); complex systems (EvoCOMPLEX); energy-related optimization (EvoENERGY); games and multi-agent systems (EvoGAMES); image analysis, signal processing and pattern recognition (EvoIASP); realworld industrial and commercial environments (EvoINDUSTRY); knowledge incorporation in evolutionary computation (EvoKNOW); continuous parameter optimization (EvoNUM); parallel architectures and distributed infrastructures (EvoPAR); evolutionary robotics (EvoROBOT); nature-inspired algorithms in software engineering and testing (EvoSET); and stochastic and dynamic environments (EvoSTOC).

Printed Batteries

Batteries and Energy Technology Joint Session (General) - 226th ECS Meeting

Electric Vehicle Integration into Modern Power Networks

Lithium-ion Battery Materials and Engineering

Profiles of 95 Influential Electrochemists

Electrochemical Systems

Batteries find their applications in an increasing range of every-day products: discmen, mobile phones and electric cars need very different battery types. This handbook gives a concise survey about the materials used in modern battery technology. The physico-chemical fundamentals are as well treated as are the environmental and recycling aspects. It will be a profound reference source for anyone working in the research and development of new battery systems, regardless if chemist, physicist or engineer.

This book constitutes the thoroughly refereed post-conference proceedings of the 4th International ICST Conference on Sensor Systems and Software, S-Cube 2013, held in Lucca, Italy, 2013. The 8 revised full papers and 2 invited papers presented cover contributions on different technologies for wireless sensor networks, including security protocols, middleware, analysis tools and frameworks.

This comprehensive handbook covers all fundamentals of electrochemistry for contemporary applications. It provides a rich presentation of related topics of electrochemistry with a clear focus on energy technologies. It covers all aspects of electrochemistry starting with theoretical concepts and basic laws of thermodynamics, non-equilibrium thermodynamics and multiscale modeling. It further gathers the basic experimental methods such as potentiometry, reference electrodes, ion-sensitive electrodes, voltammetry and amperometry. The contents cover subjects related to mass transport, the electric double layer, ohmic losses and experimentation affecting electrochemical reactions. These aspects of electrochemistry are especially examined in view of specific energy technologies including batteries, polymer electrolyte and biological fuel cells, electrochemical capacitors, electrochemical hydrogen production and photoelectrochemistry. Organized in six parts, the overall complexity of electrochemistry is presented and makes this handbook an authoritative reference and definitive source for advanced students, professionals and scientists particularly interested in industrial and energy applications.

This new resource provides you with an introduction to battery design and test considerations for large-scale automotive, aerospace, and grid applications. It details the logistics of designing a professional, large, Lithium-ion battery pack, primarily for the automotive industry, but also for non-automotive applications. Topics such as thermal management for such high-energy and high-power units are covered extensively, including detailed design examples. Every aspect of battery design and analysis is presented from a hands-on perspective. The authors work extensively with engineers in the field and this book is a direct response to frequently-received queries. With the authors’ unique expertise in areas such as battery thermal evaluation and design, physics-based modeling, and life and reliability assessment and prediction, this book is sure to provide you with essential, practical information on understanding, designing, and building large format Lithium-ion battery management systems.

Battery Safety and Abuse Tolerance

Materials and Electrochemistry

Behaviour of Lithium-Ion Batteries in Electric Vehicles

Part 1: Engines - Fundamentals

Volume 4: Future Automotive Powertrains (II)
From Crystallography to Manufacturing Technology

Including new information on emerging battery systems and their applications; this definitive guide provides authoritative coverage of the characteristics; properties; and performance of every major battery type. --

This work gives a comprehensive overview on materials, processes and technological challenges for electrochemical storage and conversion of energy. Optimization and development of electrochemical cells requires consideration of the cell as a whole, taking into account the complex interplay of all individual components. Considering the availability of resources, their environmental impact and requirements for recycling, the design of new concepts has to be based on the understanding of relevant processes at an atomic level.

"An excellent book for those who are interested in learning thecurrent status of research and development . . . [and] who want toget a comprehensive overview of the currentstate-of-the-art." --E-Streams This book provides up-to-date information on research anddevelopment in the rapidly growing area of networks based on themultihop ad hoc networking paradigm. It reviews all classes ofnetworks that have successfully adopted this paradigm, pointing outhow they penetrated the mass market and sparked breakthroughresearch. Covering both physical issues and applications, Mobile Ad HocNetworking: Cutting Edge Directions offers useful tools forprofessionals and researchers in diverse areas wishing to learn about the latest trends in sensor, actuator, and robotnetworking, mesh networks, delay tolerant and opportunisticnetworking, and vehicular networks. Chapter coverage includes: Multihop ad hoc networking Enabling technologies and standards for mobile multihopwireless networking Resource optimization in multiradio multichannel wireless meshnetworks QoS in mesh networks Routing and data dissemination in opportunistic networks Task farming in crowd computing Mobility models, topology, and simulations in VANET MAC protocols for VANET Wireless sensor networks with energy harvesting nodes Robot-assisted wireless sensor networks: recent applicationsand future challenges Advances in underwaternetwork acoustic networking Security in wireless ad hoc networks Mobile Ad Hoc Networking will appeal to researchers,developers, and students interested in computer science, electricalengineering, and telecommunications.

This fundamental guide teaches readers the basics of battery design for electric vehicles. Working through this book, you will understand how to optimise battery performance and functionality, whilst minimising costs and maximising durability. Beginning with the basic concepts of electrochemistry, the book moves on to describe implementation, control and management of batteries in real vehicles, with respect to the battery materials. It describes how to select cells and batteries with explanations of the advantages and disadvantages of different battery chemistries, enabling readers to put their knowledge into practice and make informed and successful design decisions, with a thorough understanding of the trade-offs involved. The first of its kind, and written by an industry expert with experience in academia, this is an ideal resource for both students and researchers in the fields of battery research and development as well as for professionals in the automotive industry extending their interest towards electric vehicles.

21st International Conference, EvoApplications 2018, Parma, Italy, April 4-6, 2018, Proceedings

Electric Powertrain

Selected Entries from the Encyclopedia of Sustainability Science and Technology

Rechargeable Batteries

Handbook of Batteries

Anion Exchange Membrane Fuel Cells

Electric Vehicle Battery Systems provides operational theory and design guidance for engineers and technicians working to design and develop efficient electric vehicle (EV) power sources. As Zero Emission Vehicles become a requirement in more areas of the world, the technology required to design and maintain their complex battery systems is needed not only by the vehicle designers, but by those who will provide recharging and maintenance services, as well as utility infrastructure providers. Includes fuel cell and hybrid vehicle applications. Written with cost and efficiency foremost in mind, Electric Vehicle Battery Systems offers essential details on failure mode analysis of VRLA, NiMH battery systems, the fast-charging of electric vehicle battery systems based on Pb-acid, NiMH, Li-ion technologies, and much more. Key coverage includes issues that can affect electric vehicle performance, such as total battery capacity, battery charging and discharging, and battery temperature constraints. The author also explores electric vehicle performance, battery testing (15 core performance tests provided), lithium-ion batteries, fuel cells and hybrid vehicles. In order to make a practical electric vehicle, a thorough understanding of the operation of a set of batteries in a pack is necessary. Expertly written and researched, Electric Vehicle Battery Systems will prove invaluable to automotive engineers, electronics and integrated circuit design engineers, and anyone whose interests involve electric vehicles and battery systems. * Addresses cost and efficiency as key elements in the design process * Provides comprehensive coverage of the theory, operation, and configuration of complex battery systems, including Pb-acid, NiMH, and Li-ion technologies * Provides comprehensive coverage of the theory, operation, and configuration of complex battery systems, including Pb-acid, NiMH, and Li-ion technologies

The why, what and how of the electric vehicle powertrain Empowers engineering professionals and students with the knowledge and skills required to engineer electric vehicle powertrain architectures, energy storage systems, power electronics converters and electric drives. The modern electric powertrain is relatively new for the automotive industry, and engineers are challenged with designing affordable, efficient and high-performance electric powertrains as the industry undergoes a technological evolution. Co-authored by two electric vehicle (EV) engineers with decades of experience designing and putting into production all of the powertrain technologies presented, this book provides readers with the hands-on knowledge, skills and expertise they need to rise to that challenge. This four-part practical guide provides a comprehensive review of battery, hybrid and fuel cell EV systems and the associated energy sources, power electronics, machines, and drives. The first part of the book begins with a historical overview of electromobility and the related environmental impacts motivating the development of the electric powertrain. Vehicular requirements for electromechanical propulsion are then presented. Battery electric vehicles (BEV), fuel cell electric vehicles (FCEV), and conventional and hybrid electric vehicles (HEV) are then described, contrasted and compared for vehicle propulsion. The second part of the book features in-depth analysis of the electric powertrain traction machines, with a particular focus on the induction machine and the surface- and interior-permanent magnet ac machines. The brushed dc machine is also considered due to its ease of operation and understanding, and its historical place, especially as the traction machine on NASA's Mars rovers. The third part of the book features the theory and applications for the propulsion, charging, accessory, and auxiliary power electronics converters. Chapters are presented on isolated and non-isolated dc-dc converters, traction inverters, and battery charging. The fourth part presents the introductory and applied electromagnetism required as a foundation throughout the book. • Introduces and holistically integrates the key EV powertrain technologies. • Provides a comprehensive overview of existing and emerging automotive solutions. • Provides experience-based expertise for vehicular and powertrain system and sub-system level study, design, and optimization. • Presents many examples of powertrain technologies from leading manufacturers. • Discusses the dc traction machines of the Mars rovers, the ultimate EVs from NASA. • Investigates the environmental motivating factors and impacts of electromobility. • Presents a structured university teaching stream from introductory undergraduate to postgraduate. • Includes real-world problems and assignments of use to design engineers, researchers, and students alike. • Features a companion website with numerous references, problems, solutions, and practical assignments. • Includes introductory material throughout the book for the general scientific reader. • Contains essential reading for government regulators and policy makers. Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles is an important professional resource for practitioners and researchers in the battery, hybrid, and fuel cell EV transportation industry. The book is a structured holistic textbook for the teaching of the fundamental theories and applications of energy sources, power electronics, and electric machines and drives to engineering undergraduate and postgraduate students. Textbook Structure and Suggested Teaching Curriculum This is primarily an engineering textbook covering the automotive powertrain, energy storage and energy conversion, power electronics, and electrical machines. A significant additional focus is placed on the engineering design, the energy for transportation, and the related environmental impacts. This textbook is an educational tool for practicing engineers and others, such as transportation policy planners and regulators. The modern automobile is used as the vehicle upon which to base the theory and applications, which makes the book a useful educational reference for our industry colleagues, from chemists to engineers. This material is also written to be of interest to the general reader, who may have little or no interest in the power electronics and machines. Introductory science, mathematics, and an inquiring mind suffice for some chapters. The general reader can read the introduction to each of the chapters and move to the next as soon as the material gets too advanced for him or her. Part I Vehicles and Energy Sources Chapter 1 Electromobility and the Environment Chapter 2 Vehicle Dynamics Chapter 3 Batteries Chapter 4 Fuel Cells Chapter 5 Conventional and Hybrid Powertrains Part II Electrical Machines Chapter 6 Introduction to Traction Machines Chapter 7 The Brushed DC Machine Chapter 8 Induction Machines Chapter 9 Surface-permanent-magnet AC Machines Chapter 10: Interior-permanent-magnet AC Machines Part III Power Electronics Chapter 11 DC-DC Converters Chapter 12 Isolated DC-DC Converters Chapter 13 Traction Drives and Three-phase Inverters Chapter 14 Battery Charging Chapter 15 Control of the Electric Drive Part IV Basics Chapter 16 Introduction to Electromagnetism, Ferromagnetism, and Electromechanical Energy Conversion The first third of the book (Chapters 1 to 6), plus parts of Chapters 14 and 16, can be taught to the general science or engineering student in the second or third year. It covers the introductory automotive material using basic concepts from mechanical, electrical, environmental, and electrochemical engineering. Chapter 14 on electrical charging and Chapter 16 on electromagnetism can also be used as a general introduction to electrical engineering. The basics of electromagnetism, ferromagnetism and electromechanical energy conversion (Chapter 16) and dc machines (Chapter 7) can be taught to second year (sophomore) engineering students who have completed introductory electrical circuits and physics. The third year (junior) students typically have covered ac circuit analysis, and so they can cover ac machines, such as the induction machine (Chapter 8) and the surface permanent-magnet ac machine (Chapter 9). As the students typically have studied control theory, they can investigate the control of the speed and torque loops of the motor drive (Chapter 15). Power electronics, featuring non-isolated buck and boost converters (Chapter 11), can also be introduced in the third year. The final-year (senior) students can then go on to cover the more advanced technologies of the interior-permanent-magnet ac machine (Chapter 10). Isolated power converters (Chapter 12), such as the full-bridge and resonant converters, inverters (Chapter 13), and power-factor-corrected battery chargers (Chapter 14), are covered in the power electronics section. This material can also be covered at the introductory postgraduate level. Various homework, simulation, and research exercises are presented throughout the textbook. The reader is encouraged to attempt these exercises as part of the learning experience. Instructors are encouraged to contact the author, John Hayes, direct to discuss course content or structure.

THE WORLD'S LEADING GUIDE TO BATTERY TECHNOLOGY Comprehensive, coherent, and completely up-to-date, Handbook of Batteries, Third Edition brings you the expertise of 80 of the world's top experts -- a wealth of hands-on knowledge compiled and edited by two pioneering researchers who are top-ranked consultants to the battery industry. . Making vital data and equations instantly accessible for a wide range of applications, the Handbook has more authoritative information than any other source on the characteristics, properties, and performance of every major battery type. This edition's four new chapters give you new, fully-detailed information on Lithium Ion and Propulsion and Industrial Nickel-Metal Hydride batteries, and portable fuel cells -- including small fuel cells (less than 1000 Watts) which are potentially competitive with battery sytems. Thoroughly updating all developments in the field since 1995, the Third Edition of this ultimate state-of-the-art guide: *Brings you up to speed on today's cutting edge battery technologies, materials and methods *Helps you predict battery performance under all operating conditions *Simplifies the selection of the most suitable batteries for a wide range of applications

Linden's Handbook of Batteries, 4th EditionMcGraw Hill Professional

Advanced Materials and Technologies

Linden's Handbook of Batteries, Fourth Edition

Battery Health, Performance, Safety, and Cost

Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles

Handbook of Battery Materials

Lithium Batteries

Gaining public attention due, in part, to their potential application as energy storage devices in cars, Lithium-ion batteries have encountered widespread demand, however, the understanding of lithium-ion technology has often lagged behind production. This book defines the most commonly encountered challenges from the perspective of a high-end lithium-ion manufacturer with two decades of experience with lithium-ion batteries and over six decades of experience with batteries of other chemistries. Authors with years of experience in the applied science and engineering of lithium-ion batteries gather to share their view on where lithium-ion technology stands now, what are the main challenges, and their possible solutions. The book contains real-life examples of how a subtle change in cell components can have a considerable effect on cell's performance. Examples are supported with approachable basic science commentaries. Providing a unique combination of practical know-how with an in-depth perspective, this book will appeal to graduate students, young faculty members, or others interested in the current research and development trends in lithium-ion technology.

The most complete and up-to-date guide to battery technology and selection Thoroughly revised throughout, Linden's Handbook of Batteries, Fourth Editions provides authoritative coverage of the characteristics, properties, and performance of every major battery type. New information on emerging battery systems and their applications is included in this definitive volume. International experts offer unparalleled technical guidance on using leading-edge technologies, materials, and methods in new designs and products, and selecting the most suitable battery for a particular application. All of the in-depth data you need is contained in this comprehensive resource. The book will be useful to graduate students, battery researchers, applications engineers, and all others interested in the state-of-the-art in battery technology. Linden's Handbook of Batteries, Fourth Edition covers: PRINCIPLES OF OPERATION PRIMARY AND SECONDARY BATTERIES SPECIALIZED BATTERY SYSTEMS FUEL CELLS AND ELECTROCHEMICAL CAPACITORS Includes new chapters on: Battery modeling Battery electrolytes Lithium-ion batteries Battery selection for consumer electronics Batteries for electric, hybrid, and plug-in hybrid vehicles Batteries for electrical energy storage systems Batteries for biomedical applications Button cell batteries Batteries for military and space applications, including reserve water-activated and reserve military batteries Electrochemical capacitors

Providing a concise overview of lithium-ion (Li-ion) battery energy storage systems (ESSs), this book also presents the full-scale fire testing of 100 kilowatt hour (kWh) Li-ion battery ESSs. It details a full-scale fire testing plan to perform an assessment of Li-ion battery ESS fire hazards, developed after a thorough technical study. It documents the results of the testing plan including external and internal ignition testing, ESS positioning, temperature and heat flux measurements, pressure measurement, weather meters, and data acquisition systems. A comprehensive literature review and gap analysis reveal the current state of research into this vital aspect of energy storage. The authors cover the characteristics and hazards of Li-ion batteries, their anatomy and design, commercial and residential ESSs, historical fire incidents, and ESS codes and regulations. Researchers and professionals working in fire protection engineering, battery systems engineering, or energy storage will find this book a useful example of a fire testing plan. The results of the hazard assessment offer insights for those involved in electrical, fire, and building codes, as well as practitioners in design standards and fire testing.

Lithium-Ion Batteries Hazard and Use Assessment examines the usage of lithium-ion batteries and cells within consumer, industrial and transportation products, and analyzes the potential hazards associated with their prolonged use. This book also surveys the applicable codes and standards for lithium-ion technology. Lithium-Ion Batteries Hazard and Use Assessment is designed for practitioners as a reference guide for lithium-ion batteries and cells. Researchers working in a related field will also find the book valuable.

Linden's Handbook of Batteries, Fifth Edition

Nickel Metal Hydride Batteries

Nanomaterials for Electrochemical Energy Storage Devices

A Handbook on Rechargeable Batteries for Non-engineers

Chemistry, Components, Types and Terminology

4th International ICST Conference, S-Cube 2013, Lucca, Italy, June 11-12, 2013, Revised Selected Papers

The papers included in this issue of ECS Transactions were originally presented in the symposium ¿Battery Safety and Abuse Tolerance¿, held during the 218th meeting of The Electrochemical Society, in Las Vegas, Nevada from October 10 to 15, 2010.

This book surveys state-of-the-art research on and developments in lithium-ion batteries for hybrid and electric vehicles. It summarizes their features in terms of performance, cost, service life, management, charging facilities, and safety. Vehicle electrification is now commonly accepted as a means of reducing fossil-fuels consumption and air pollution. At present, every electric vehicle on the road is powered by a lithium-ion battery. Currently, batteries based on lithium-ion technology are ranked first in terms of performance, reliability and safety. Though other systems, e.g., metal-air, lithium-sulphur, solid state, and aluminium-ion, are now being investigated, the lithium-ion system is likely to dominate for at least the next decade -- which is why several manufacturers, e.g., Toyota, Nissan and Tesla, are chiefly focusing on this technology. Providing comprehensive information on lithium-ion batteries, the book includes contributions by the world's leading experts on Li-ion batteries and vehicles.

Our most basic relationship with the world is one of technological mediation. Nowadays our available tools are digital, and increasingly what counts in economic, social, and cultural life is what can be digitally stored, distributed, replayed, augmented, and switched. Yet the digital remains very much materially configured, and though it now permeates nearly all human life it has not eclipsed all older technologies. This Handbook is grounded in an understanding that our technologically mediated condition is a condition of organization. It maps and theorizes the largely uncharted territory of media, technology, and organization studies. Written by scholars of organization and theorists of media and technology, the chapters focus on specific, and specifically mediating, objects that shape the practices, processes, and effects of organization. It is in this spirit that each chapter focuses on a specific technological object, such as the Battery, Clock, High Heels, Container, or Smartphone, asking the question, how does this object or process organize? In staying with the object the chapters remain committed to the everyday, empirical world, rather than being confined to established disciplinary concerns and theoretical developments. As the first sustained and systematic interrogation of the relation between technologies, media, and organization, this Handbook consolidates, deepens, and further develops the empirics and concepts required to make sense of the material forces of organization.

Battery technology is constantly changing, and the concepts and applications of these changes are rapidly becoming increasingly more important as more and more industries and individuals continue to make "greener" choices in their energy sources. As global dependence on fossil fuels slowly wanes, there is a heavier and heavier importance placed on cleaner power sources and methods for storing and transporting that power. Battery technology is a huge part of this global energy revolution. Rechargeable battery technologies have been a milestone for moving toward a fossil-fuel-free society. They include groundbreaking changes in energy storage, transportation, and electronics. Improvements in battery electrodes and electrolytes have been a remarkable development, and, in the last few years, rechargeable batteries have attracted significant interest from scientists as they are a boon for electric vehicles, laptops and computers, mobile phones, portable electronics, and grid-level electricity storage devices. Rechargeable Batteries: History, Progress, and Applicationsoutlines the history, development, future, and applications for rechargeable batteries for energy storage applications. It also provides an in-depth description of various energy storage materials and is an invaluable reference guide for electrochemists, chemical engineers, students, faculty, and R&D professionals in energy storage science, material science, and renewable energy. This is a must-have for any engineer's library who works with batteries and energy storage.

Principles, Materials and Systems

Linden's Handbook of Batteries, 4th Edition

Fire Hazard Assessment of Lithium Ion Battery Energy Storage Systems

Springer Handbook of Electrochemical Energy
Batteries for Electric Vehicles
Innovators in Battery Technology