

Electrochemical Oxygen Technology 1st Edition

Lithium air rechargeable batteries are the best candidate for a power source for electric vehicles, because of their high specific energy density. In this book, the history, scientific background, status and prospects of the lithium air system are introduced by specialists in the field. This book will contain the basics, current statuses, and prospects for new technologies. This book is ideal for those interested in electrochemistry, energy storage, and materials science.

Explores both electrochemistry fundamentals and the applications of oxygen in electrochemical systems. Much of the information is summarized in tables which are accompanied by a list of references to consult for details. Emphasizes fuel cells and metal/air batteries.

These meetings, held every four years, bring together researchers from academia and industry and offer a forum for discussions on the chemistry involved in the preparation of industrial heterogeneous catalysts. Contributions focus on the aspects of catalyst preparation. Reports on physico-chemical characteristics of catalysts and catalytic performances are limited to correlations with the preparation parameters. Contains a collection of the papers presented at the workshop

This book reviews research work on electrochemical power sources in the former Warsaw Pact countries. It explores the role carbon plays in the cathodes and anodes of power sources and reveals the latest research into the development of metal air batteries, supercapacitors, fuel cells and lithium-ion and lithium-ion polymer batteries. For the first time, a full chapter was devoted to metal-carbon composites as electrode materials of lithium-ion batteries

Fuel Cells and Hydrogen: From Fundamentals to Applied Research provides an overview of the basic principles of fuel cell and hydrogen technology, which subsequently allows the reader to delve more deeply into applied research. In addition to covering the basic principles of fuel cells and hydrogen technologies, the book examines the principles and methods to develop and test fuel cells, the evaluation of the performance and lifetime of fuel cells and the concepts of hydrogen production. Fuel Cells and Hydrogen: From Fundamentals to Applied Research acts as an invaluable reference book for fuel cell developers and students, researchers in industry entering the area of fuel cells and lecturers teaching fuel cells and hydrogen technology. Includes laboratory methods for fuel cell characterization and manufacture Outlines approaches in modelling components, cells and stacks Covers practical and theoretical methods for hydrogen production and storage

This book provides the latest information and methodologies of rotating disk electrode and rotating ring-disk electrode (RDE/RRDE) and oxygen reduction reaction (ORR). It is an ideal reference for undergraduate and graduate students, scientists, and engineers who work in the areas of energy, electrochemistry science and technology, fuel cells, and other electrochemical systems. Presents

a comprehensive description, from fundamentals to applications, of catalyzed oxygen reduction reaction and its mechanisms Portrays a complete description of the RDE (Rotating Disc Electrode)/RRDE (Rotating Ring-Disc Electrode) techniques and their use in evaluating ORR (Oxygen Reduction Reaction) catalysts Provides working examples along with figures, tables, photos and a comprehensive list of references to help understanding of the principles involved The "Bible on Anesthesia Equipment" returns in a new Fifth Edition, and once again takes readers step-by-step through all the basic anesthesia equipment. This absolute leader in the field includes comprehensive references and detailed discussions on the scientific fundamentals of anesthesia equipment, its design, and its optimal use. This thoroughly updated edition includes new information on suction devices, the magnetic resonance imaging environment, temperature monitoring and control, double-lumen tubes, emergency room airway equipment, and many other topics. Readers will have access to an online quizbank at a companion Website.

Issues in Hydrogen, Fuel Cell, Electrochemical, and Experimental Technologies: 2011 Edition is a ScholarlyEditions™ eBook that delivers timely, authoritative, and comprehensive information about Hydrogen, Fuel Cell, Electrochemical, and Experimental Technologies. The editors have built Issues in Hydrogen, Fuel Cell, Electrochemical, and Experimental Technologies: 2011 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Hydrogen, Fuel Cell, Electrochemical, and Experimental Technologies in this eBook to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Issues in Hydrogen, Fuel Cell, Electrochemical, and Experimental Technologies: 2011 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at <http://www.ScholarlyEditions.com/>.

Nanoscale electrochemistry has revolutionized electrochemical research and technologies and has made broad impacts in other fields, including nanotechnology and nanoscience, biology, and materials chemistry. Nanoelectrochemistry examines well-established concepts and principles and provides an updated overview of the field and its applications. This book covers three integral aspects of nanoelectrochemistry. The first two chapters contain theoretical background, which is essential for everyone working in the field—specifically, theories of electron transfer, transport, and double-layer processes at nanoscale electrochemical interfaces. The next chapters are dedicated to the electrochemical studies of nanomaterials and nanosystems, as well as the development and applications of nanoelectrochemical techniques. Each chapter is self-contained and can be read independently to provide readers with a compact, up-to-date critical review of the subfield of interest. At the same time, the presented collection of chapters serves as a serious introduction to nanoelectrochemistry for graduate students or scientists who wish to enter this emerging field. The applications discussed range from studies of biological systems to nanoparticles and from electrocatalysis to molecular electronics, nanopores, and membranes. The book demonstrates how electrochemistry has contributed to the advancement of nanotechnology and nanoscience. It also explores how electrochemistry has transformed itself by leading to the discovery of new phenomena, enabling unprecedented electrochemical measurements and creating novel

electrochemical systems.

Materials Aspects of Electrochemical Engineering is the main theme of this symposium. It charts the way ahead for the future development and economic viability of all types of electrochemical processing.

This new edition of Dr. Barbir's groundbreaking book still lays the groundwork for engineers, technicians and students better than any other resource, covering fundamentals of design, electrochemistry, heat and mass transport, as well as providing the context of system design and applications. Yet it now also provides invaluable information on the latest advances in modeling, diagnostics, materials, and components, along with an updated chapter on the evolving applications areas wherein PEM cells are being deployed."--pub. desc.

Among energy sources, hydrogen gas is clean and renewable and has the potential to solve the growing energy crisis in today's society because of its high-energy density and noncarbon fuel properties. It is also used for many potential applications in nonpolluting vehicles, fuel cells, home heating systems, and aircraft. In addition, using hydrogen as an energy carrier is a long-term option to reduce carbon dioxide emissions worldwide by obtaining high-value hydrocarbons through the hydrogenation of carbon dioxide. This book presents the recent progresses and developments in water-splitting processes as well as other hydrogen generation technologies with challenges and future perspectives from the point of energy sustainability.

Metal-air is a promising battery system that uses inexpensive metals for its negative electrode while unlimited, free and non-toxic oxygen is used for its positive electrode, however, only primary systems have been commercialized so far. Electrochemical Power Sources: Fundamentals, Systems, and Applications – Metal–Air Batteries: Present and Perspectives offers a comprehensive understanding of metal-air batteries as well as the solutions to the issues for overcoming the related difficulties of the secondary (rechargeable) system. Although metal-air batteries are widely studied as low-cost high-energy systems, their commercialization is limited to primary ones due to currently limited cycle life and insufficient reliability. For realization of the secondary systems, this book offers comprehensive understanding of metal-air batteries, including the details of both electrodes, electrolyte, cell/system, modelling and applications. Electrochemical Power Sources: Fundamentals, Systems, and Applications – Metal–Air Batteries: Present and Perspectives provides researchers, instructors, and students in electrochemistry, material science and environmental science; industry workers in cell manufacturing; and government officials in energy, environmental, power supply, and transportation with a valuable resource covering the most important topics of metal-air batteries and their uses. Outlines the general characteristics of metal-air compared with conventional batteries Offers a comprehensive understanding of various metal-air, featuring zinc, and lithium Contains comparisons and issues among various metal-air batteries and research efforts to solve them Includes applications and market prospects

This book encompasses the most updated and recent account of research and implementation of Microbial Electrochemical Technologies (METs) from pioneers and experienced researchers in the field who have been working on the interface between electrochemistry and microbiology/biotechnology for many years. It provides a holistic view of the METs, detailing the functional mechanisms, operational configurations, influencing factors governing the reaction process and integration strategies. The book not only provides historical perspectives of the technology and its evolution over the years but also the most recent examples of up-scaling and near future commercialization, making it a must-read for researchers, students, industry practitioners and science enthusiasts. Key Features: Introduces novel technologies that can impact the future infrastructure at the water-energy nexus. Outlines methodologies development and application of microbial electrochemical technologies and details out the illustrations of microbial and electrochemical concepts. Reviews applications across a wide

variety of scales, from power generation in the laboratory to approaches. Discusses techniques such as molecular biology and mathematical modeling; the future development of this promising technology; and the role of the system components for the implementation of bioelectrochemical technologies for practical utility. Explores key challenges for implementing these systems and compares them to similar renewable energy technologies, including their efficiency, scalability, system lifetimes, and reliability.

This book discusses systematically the theoretical research and the applications of electrochemical oxygen reduction. Oxygen reduction reaction is a common issue in electrochemistry, but is also an important process involved in the field of energy, cryogenic fuel cells, metal–air cells, oxygen sensors and hydrogen peroxide preparation. This book is divided into 6 chapters; it starts with a description of dynamic mechanisms, followed by a detailed introduction on the related experimental methods and related catalyst preparation technology. By providing the basic methods and testing techniques, and by demonstrating their applications, it helps readers gain a better understanding of oxygen reduction reactions, making it a valuable resource for the industrialization of scientific research achievements. Accordingly, the book appeals to a broad readership, particularly graduate students, those working at universities and research organizations, and industrial researchers.

There is an increasing challenge for chemical industry and research institutions to find cost-efficient and environmentally sound methods of converting natural resources into fuels chemicals and energy. Catalysts are essential to these processes and the Catalysis Specialist Periodical Report series serves to highlight major developments in this area. This series provides systematic and detailed reviews of topics of interest to scientists and engineers in the catalysis field. The coverage includes all major areas of heterogeneous and homogeneous catalysis and also specific applications of catalysis such as NO_x control kinetics and experimental techniques such as microcalorimetry. Each chapter is compiled by recognised experts within their specialist fields and provides a summary of the current literature. This series will be of interest to all those in academia and industry who need an up-to-date critical analysis and summary of catalysis research and applications. Catalysis will be of interest to anyone working in academia and industry that needs an up-to-date critical analysis and summary of catalysis research and applications.

This book offers comprehensive coverage of carbon-based nanomaterials and electrochemical energy conversion and storage technologies such as batteries, fuel cells, supercapacitors, and hydrogen generation and storage, as well as the latest material and new technology development. It addresses a variety of topics such as electrochemical processes, materials, components, assembly and manufacturing, degradation mechanisms, challenges, and strategies. With in-depth discussions ranging from electrochemistry fundamentals to engineering components and applied devices, this all-inclusive reference offers a broad view of various carbon nanomaterials and technologies for electrochemical energy conversion and storage devices.

Bioelectrochemical Systems (BESs) are innovative and sustainable devices. They combine biological and electrochemical processes to engineer sensors, treat wastewater and/or produce electricity, fuel or high-value chemicals. In BESs, scientists have managed to incorporate biological catalysts, i.e. enzymes and/or microorganisms, and make them work in advanced electrochemical cells. BESs operate under mild conditions — at close to ambient temperature and pressure and at circumneutral pH — and represent a sustainable alternative to precious metal-based systems. Incorporating biological catalysts into devices while maintaining their activity and achieving electrical communication with electrode surfaces is a critical challenge when trying to advance the field of BESs. From implantable enzymatic biosensors to microbial electrosynthesis, and from laboratory-scale systems and fundamental studies to marketed devices, this book provides a comprehensive overview of recent advances related to

functional electrodes for BESs. Suitable for researchers and graduate students of chemistry, biochemistry, materials science and environmental science and technology. Contents: Fundamentals: Fundamentals of Enzymatic Electrochemical Systems (Victoria Flexer and Nicolas Brun) Fundamentals of Microbial Electrochemical Systems (Stefano Freguia, Kun Guo, and Pablo Ledezma) Continuum in Enzymatic and Microbial Bioelectrocatalysis (Frédéric Barrière) Electron Transfer Between Bacteria and Electrodes (Lucie Semeneć, Sanja Aracic, Elizabeth R Mathews, and Ashley E Franks) Electrodes for Enzymatic Electrochemical Systems: Architectures of Enzyme Electrodes Using Redox Mediators (Victoria Flexer, Antonin PrévotEAU, and Nicolas Brun) Functional Electrodes for Enzymatic Electrosynthesis (Lin Zhang, Mathieu Etienne, Neus Vilà, and Alain Walcarius) Redox Hydrogels as an Efficient Strategy for Immobilization of Enzymes at Electrode Interfaces (Joshua W Gallaway, and Scott Calabrese Barton) Conducting Polymer Hydrogels and Their Applications as Electrode Materials (Yu Zhao, Lanlan Li, Lijia Pan, Guihua Yu, and Yi Shi) Nanocarbon-Based Enzymatic Electrodes (Nicolas Brun, Mohammed Baccour, and Victoria Flexer) Carbonaceous Electrodes Featuring Tunable Mesopores for Use as Enzyme Electrodes (Seiya Tsujimura) Electrodes for Microbial Electrochemical Systems: Materials and Their Surface Modification for Use as Anode in Microbial Bioelectrochemical Systems (Kun Guo, Antonin PrévotEAU, Sunil A Patil, and Korneel Rabaey) Electrodes for Cathodic Microbial Electrosynthesis Processes: Key-Developments and Criteria for Effective Research and Implementation (Ludovic Jourdin and David Strik) Non-Carbonaceous Electrodes for Microbial Electrochemical Systems (Hernán Romeo, Diego Massazza, Rodrigo Parra, and Juan Pablo Busalmen) Imaging and Characterization of Bioelectrodes: Imaging and Characterization of Microbial Electrodes (Yang Lu and Bogdan C Donose) Spectroscopic Methods for Characterizing Redox Chemistry at Metalloprotein-Modified Electrodes (Philip A Ash and Kylie A Vincent) Spectroelectrochemistry of Microbial Biofilms (Diego Millo and Bernardino Virdis) Scanning Electrochemical Microscopy: A New Tool for Studying Enzymatic Reactions (Dodzi Zigah and Olivier Fontaine) Readership: Suitable for researchers, postgraduate and graduate students of chemistry, biochemistry and environmental sci

From reviews of previous volumes: 'This volume continues the valuable service that has been rendered by the Modern Aspects series.' -Journal of Electroanalytical Chemistry 'Extremely well referenced and very readable....Maintains the overall high standards of the series.' -Journal of the American Chemical Society

High Temperature Solid Oxide Fuel Cells: Fundamentals, Design and Applications provides a comprehensive discussion of solid oxide fuel cells (SOFCs). SOFCs are the most efficient devices for the electrochemical conversion of chemical energy of hydrocarbon fuels into electricity, and have been gaining increasing attention for clean and efficient distributed power generation. The book explains the operating principle, cell component materials, cell and stack designs and fabrication processes, cell and stack performance, and applications of SOFCs. Individual chapters are written by internationally renowned authors in their respective fields, and the text is supplemented by a large number of references for further information. The book is primarily intended for use by researchers, engineers, and other technical people working in the field of SOFCs. Even though the technology is advancing at a very rapid pace, the information contained in most of the chapters is fundamental enough for the book to be useful even as a text for SOFC technology at the graduate level.

Fuel Cells is a concise, up-to-date and accessible guide to the evolution of the use of electrochemistry to generate power. The author provides a comprehensive exploration of the history of fuel cells, the environmental concerns which came into prominence in the 1980s and the economic factors associated with this method of power generation. Examples discussed include Alkaline Fuel Cells, Phosphoric Acid Fuel Cells, Molten Carbonate Fuel Cells and Solid Oxide Fuel Cells, making this a valuable and insightful read for those in the power generation

market and those in electrochemistry, such as engineers, managers and academics. Explores multiple variations of fuel cell technology and evaluates their cost and application Provides detailed historical context, beginning in 1839 with the development of electrolysis Discusses the most up-to-date advancements and methods of fuel cell technology today

Encyclopedia of Sustainable Technologies provides an authoritative assessment of the sustainable technologies that are currently available or in development. Sustainable technology includes the scientific understanding, development and application of a wide range of technologies and processes and their environmental implications. Systems and lifecycle analyses of energy systems, environmental management, agriculture, manufacturing and digital technologies provide a comprehensive method for understanding the full sustainability of processes. In addition, the development of clean processes through green chemistry and engineering techniques are also described. The book is the first multi-volume reference work to employ both Life Cycle Analysis (LCA) and Triple Bottom Line (TBL) approaches to assessing the wide range of technologies available and their impact upon the world. Both approaches are long established and widely recognized, playing a key role in the organizing principles of this valuable work. Provides readers with a one-stop guide to the most current research in the field Presents a grounding of the fundamentals of the field of sustainable technologies Written by international leaders in the field, offering comprehensive coverage of the field and a consistent, high-quality scientific standard Includes the Life Cycle Analysis and Triple Bottom Line approaches to help users understand and assess sustainable technologies

This issue of ECS Transactions (ECST) comprises a selection of papers presented at the 24th national meeting of the Mexican Electrochemical Society (MES) and the second meeting of the Mexican Section of The Electrochemical Society (ECS), carried out in Puerto Vallarta, Jalisco, from May 31 to June 5, 2009.

Solid Oxide-Based Electrochemical Devices: Advances, Smart Materials and Future Energy Applications provides a complete overview of the theoretical and applied aspects of energy-related solid oxide technologies. The book presents detailed thermodynamic and other basic requirements for fuel cells, electrolyzers, supercapacitors, batteries, sensors and air treatment devices. It delves into physical-chemical, electrochemical and mechanical properties of smart materials developed and offers insights into fundamental analysis and modeling. Detailed protocols for operation are suggested and discussed, including component development to optimize functionality, cost and upscaling. Practitioners in the fuel cell or power to gas industries, engineering researchers developing new technologies in those areas, and device and system designers can use the in-depth, structured information about the relationship between technologies and materials offered to make better-informed decisions during the planning and implementation of those technologies. Covers the theoretical concepts, components, advances and applications of solid oxide fuel cell, electrolyzer,

battery, sensor and pollution abatement technologies Explores applications of new smart and metamaterials in the construction of energy-related solid oxide devices Presents examples of prototypes, including their cost estimate and requirements for large-scale production, integration and operation

As global demands for energy and lower carbon emissions rise, developing systems of energy conversion and storage becomes necessary. This book explores how Electrochemical Energy Storage and Conversion (EESC) devices are promising advanced power systems that can directly convert chemical energy in fuel into power, and thereby aid in proposing a solution to the global energy crisis. The book focuses on high-temperature electrochemical devices that have a wide variety of existing and potential applications, including the creation of fuel cells for power generation, production of high-purity hydrogen by electrolysis, high-purity oxygen by membrane separation, and various high-temperature batteries. High-Temperature Electrochemical Energy Conversion and Storage: Fundamentals and Applications provides a comprehensive view of the new technologies in high-temperature electrochemistry. Written in a clear and detailed manner, it is suitable for developers, researchers, or students of any level.

Metal-air batteries (MABs) have attracted attention because of their high specific energy, low cost, and safety features. This book discusses science and technology including material selection, synthesis, characterization, and their applications in MABs. It comprehensively describes various composite bifunctional electrocatalysts, corrosion/oxidation of carbon-containing air cathode catalysts, and how improvements can be achieved in the catalytic activities of oxygen reduction reaction and oxygen evolution reaction and their durability/stability. This book also analyzes, compares, and discusses composite bifunctional electrocatalysts in the applications of MABs, matching the fast information of commercial MABs in requirements. Aimed at researchers and industry professionals, this comprehensive work provides readers with an appreciation for what bifunctional composite electrocatalysts are capable of, how this field has grown in the past decades, and how bifunctional composite electrocatalysts can significantly improve the performance of MABs. It also offers suggestions for future research directions to overcome technical challenges and further facilitate research and development in this important area.

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.

Metal Oxide-Based Nanostructured Electrocatalysts for Fuel Cells, Electrolyzers, and Metal-Air Batteries is a comprehensive book summarizing the recent overview of these new materials developed to date. The book is motivated by research that focuses on the reduction of noble metal content in catalysts to reduce the cost associated to the entire system. Metal oxides gained significant interest in heterogeneous catalysis for basic research and industrial deployment. Metal Oxide-Based Nanostructured Electrocatalysts for Fuel Cells, Electrolyzers, and Metal-Air Batteries puts these opportunities and challenges into a broad context, discusses the recent researches and technological advances, and finally provides several pathways and guidelines that could inspire the development of ground-breaking electrochemical devices for energy production or storage. Its primary focus is how materials development is an important approach to produce electricity for key applications such as automotive and industrial. The book is appropriate for those working in academia and R&D in the disciplines of materials science, chemistry, electrochemistry, and engineering. Includes key aspects of materials design to improve the performance of electrode materials for energy conversion and storage device applications Reviews emerging metal oxide materials for hydrogen production, hydrogen oxidation, oxygen reduction and oxygen evolution Discusses metal oxide electrocatalysts for water-splitting, metal-air batteries, electrolyzer, and fuel cell applications

Microbial Electrochemical and Fuel Cells: Fundamentals and Applications contains the most updated information on bio-electrical systems and their ability to drive an electrical current by mimicking bacterial interactions found in nature to produce a small amount of power. One of the most promising features of the microbial fuel cell is its application to generate power from wastewater, and its use in the treatment of water to remove contaminants, making it a very sustainable source of power generation that can feasibly find application in rural areas where providing more conventional sources of power is often difficult. The book explores, in detail, both the technical aspects and applications of this technology, and was written by an international team of experts in the field who provide an introduction to microbial fuel cells that looks at their electrochemical principles and mechanisms, explains the materials that can be used for the various sections of the fuel cells, including cathode and anode materials, and provides key analysis of microbial fuel cell performance looking at their usage in hydrogen production, waste treatment, and sensors, amongst other applications. Includes coverage of the types and principles of electrochemical cells Provides information on the construction of fuel cells and appropriate materials Presents the latest on this renewable source of energy and the process for the treatment of waste water

Atomic-Scale Modelling of Electrochemical Systems A comprehensive overview of atomistic computational electrochemistry, discussing methods, implementation, and state-of-the-art applications in the field The first book to review state-of-the-art computational and theoretical methods for modelling, understanding, and predicting the properties of electrochemical interfaces. This book presents a detailed description of the current methods, their background, limitations, and use for addressing the electrochemical interface and reactions. It also highlights several applications in electrocatalysis and electrochemistry. Atomic-Scale Modelling of Electrochemical

Systems discusses different ways of including the electrode potential in the computational setup and fixed potential calculations within the framework of grand canonical density functional theory. It examines classical and quantum mechanical models for the solid-liquid interface and formation of an electrochemical double-layer using molecular dynamics and/or continuum descriptions. A thermodynamic description of the interface and reactions taking place at the interface as a function of the electrode potential is provided, as are novel ways to describe rates of heterogeneous electron transfer, proton-coupled electron transfer, and other electrocatalytic reactions. The book also covers multiscale modelling, where atomic level information is used for predicting experimental observables to enable direct comparison with experiments, to rationalize experimental results, and to predict the following electrochemical performance. Uniquely explains how to understand, predict, and optimize the properties and reactivity of electrochemical interfaces starting from the atomic scale Uses an engaging “tutorial style” presentation, highlighting a solid physicochemical background, computational implementation, and applications for different methods, including merits and limitations Bridges the gap between experimental electrochemistry and computational atomistic modelling Written by a team of experts within the field of computational electrochemistry and the wider computational condensed matter community, this book serves as an introduction to the subject for readers entering the field of atom-level electrochemical modeling, while also serving as an invaluable reference for advanced practitioners already working in the field.

Issues in Hydrogen, Fuel Cell, Electrochemical, and Experimental Technologies: 2013 Edition is a ScholarlyEditions™ book that delivers timely, authoritative, and comprehensive information about Fuel Cells. The editors have built Issues in Hydrogen, Fuel Cell, Electrochemical, and Experimental Technologies: 2013 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Fuel Cells in this book to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Issues in Hydrogen, Fuel Cell, Electrochemical, and Experimental Technologies: 2013 Edition has been produced by the world’s leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at <http://www.ScholarlyEditions.com/>.

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 expected end of the “oil age” will lead to increasing focus and reliance on alternative energy conversion devices, among which fuel cells have the potential to play an important role. Not only can phosphoric acid and solid oxide fuel cells already efficiently convert today’s fossil fuels, including methane, into electricity, but other types of fuel cells, such as polymer electrolyte membrane fuel cells, have the potential to become the cornerstones of a possible future hydrogen economy. Featuring 21 peer-reviewed entries from the *Encyclopedia of Sustainability Science and Technology*, *Fuel Cells* offers concise yet comprehensive coverage of the current state of research and identifies key areas for future investigation. Internationally renowned specialists provide authoritative introductions to a wide variety of fuel cell types, and discuss materials, components, and systems for these technologies. The entries also cover sustainability and marketing considerations, including comparisons of fuel cells with alternative technologies.

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