

Ion Exchange Membranes Fundamentals And Applications Membrane Science And Technology Vol 12 Membrane Science And Technologies

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Progress in Filtration and Separation

The socio-economic activities due to world development are promoting increasing pressures on land, creating competition and conflicts, resulting in suboptimal use of resources. Integrated planning and management of land resources is a top subject of Agenda 21 (managed by FAO), which deals with the cross-sectoral aspects of decision-making for the sustainable use and development of natural resources. This is essential for life-support systems and its productive capacity. In this context, there is a need to find new strategies for sustainable development that links social and economic progress with environmental protection and enhancement. Electrokinetic transport processes (EK) uses a low-level direct current as the “cleaning agent”. EK has been applied to the remediation of polluted soils and other contaminated matrices. It also shows a great potential to be used in different fields, as in saline soil restoration, nutrients recovery from wastes or repair and maintenance of building structures. EK may be an integrated approach for new strategies aiming at sustainable development and to support waste strategies, with worldwide interest. EK can also be coupled with phytoremediation and integrated with nanotechnology, enlarging the scope of its application. The conciliation of the EK in the recovery of secondary resources, remediation and conservation is a multidisciplinary novel approach that opens new technical

possibilities for waste minimization, through upgrading of particulate waste products and the recovery of secondary resources for industrial, agricultural or social use.

Adsorption, Ion Exchange and Catalysis

Including chemical, synthetic, and cross-disciplinary approaches; this book includes the necessary techniques and technologies to help readers better understand polymers for polymer electrolyte membrane (PEM) fuel cells. The methods in the book are essential to researchers and scientists in the field and will lead to further development in polymer and fuel cell technologies.

- Provides complete, essential, and comprehensive overview of polymer applications for PEM fuel cells
- Emphasizes state-of-the-art developments and methods, like PEMs for novel fuel cells and polymers for fuel cell catalysts
- Includes detailed chapters on major topics, like PEM for direct liquid fuel cells and fluoropolymers and non-fluorinated polymers for PEM
- Has relevance to a range of industries - like polymer engineering, materials, and green technology - involved with fuel cell technologies and R&D

Ion Exchange Membrane Electrodialysis

This multivolume work covers all aspects of membrane science and technology - from basic phenomena to the most advanced applications and future perspectives. Modern membrane engineering is critical to the development of process-intensification strategies and to the stimulation of industrial growth. The work presents researchers and industrial managers with an indispensable tool toward achieving these aims. Covers membrane science theory and economics, as well as applications ranging from chemical purification and natural gas enrichment to potable water. Includes contributions and case studies from internationally recognized experts and from up-and-coming researchers working in this multi-billion dollar field. Takes a unique, multidisciplinary approach that stimulates research in hybrid technologies for current (and future) life-saving applications (artificial organs, drug delivery).

Polymers for PEM Fuel Cells

Fundamental study and industrial application of ion exchange membranes started over half a century ago. Through ongoing research and development, ion exchange membrane technology is now applied to many fields and contributes to the improvement of our standard of living. Ion Exchange Membranes, 2nd edition states the ion exchange membrane technology from the standpoint of fundamentals and applications. It discusses not only various phenomena exhibited by membranes but also their applications in many fields with economical evaluations. This second edition is updated and revised, featuring ten expanded chapters. New to this edition is a computer simulation program of ion-exchange membrane

electrodialysis for water desalination that provides a guideline for designing, manufacturing and operating a practical-scale electro dialyzer. Meant to replace experiments, this program will be an important asset to those with time and monetary budgets. New edition features ten revised and expanded chapters, providing the latest developments in ion exchange membrane technology Computer simulation program, accessible through a companion website, provides a guideline for designing, manufacturing and operating practical-scale electro dialyzers Attractive visual presentation, including many figures and diagrams

Progress and Recent Trends in Microbial Fuel Cells

An eclectic mix of studies on chemical and electrochemical behaviour of membrane surfaces. The book looks at membranes - both organic and inorganic - from a host of different perspectives and in the context of many diverse disciplines. It explores the behaviours of both synthetic and biological membranes, employing physical, chemical and physiochemical perspectives, and blends state-of-the-art research of many disciplines into a coherent whole.

Comprehensive Membrane Science and Engineering

The applications of solvent extraction (SX) and liquid membranes (LM) span chemistry, metallurgy, hydrometallurgy, chemical/mineral processing, and waste treatment—making it difficult to find a single resource that encompasses fundamentals as well as advanced applications. Solvent Extraction and Liquid Membranes: Fundamentals and Applications in New Materials draws together a diverse group of internationally recognized experts to highlight key scientific and technological aspects of solvent extraction that are critical to future work in the field. The first chapters identify relevant thermodynamics, kinetics, and interfacial behavior principles and introduce methods for calculating extraction equilibria and kinetic parameters. The next chapters focus on engineering and technological aspects of various industrial processes and plant applications, including optimization and modeling tools and calculations. The final chapters examine new materials for metal extraction and separations, covering preparation and application processes for organic and inorganic sorbents, solid polymeric extractants, and solvent impregnated resins. Solvent Extraction and Liquid Membranes offers a comprehensive review of the most important principles, calculations, and procedures involved in this widely applicable separation technique. The book's pedagogical approach will benefit students and researchers in the field as well as working scientists and engineers who wish to apply solvent extraction to their own applications.

Anion Exchange Membrane Fuel Cells

"The objective of this book is to provide a short but reasonably comprehensive introduction to membrane science and

technology suitable for graduate students and persons with engineering or natural science background to gain a basic understanding of membranes, their function and application without studying a large number of different reference books."--P. xiii.

New Trends in Ion Exchange Studies

Modelling of heterogeneous processes, such as electrochemical reactions, extraction or ion-exchange, usually requires solving the transport problem associated to the process. Since the processes at the phase boundary are described by scalar quantities and transport quantities are vectors or tensors, coupling of them can take place only via conservation of mass, charge or momentum. In this book, transport of ionic species is addressed in a versatile manner, emphasizing the mutual coupling of fluxes in particular. Treatment is based on the formalism of irreversible thermodynamics, i.e. on linear (ionic) phenomenological equations, from which the most frequently used Nernst-Planck equation is derived. Limitations and assumptions made are thoroughly discussed. The Nernst-Planck equation is applied to selected problems at the electrodes and in membranes. Mathematical derivations are presented in detail so that the reader can learn the methodology of solving transport problems. Each chapter contains a large number of exercises, some of them more demanding than others.

Handbook of Chlor-Alkali Technology

This book presents the applications of ion-exchange materials in the chemical and food industries. It includes topics related to the application of ion exchange chromatography in water softening, purification and separation of chemicals, separation and purification of food products and catalysis. This title is a highly valuable source of knowledge on ion-exchange materials and their applications suitable for postgraduate students and researchers but also to industrial R&D specialists in chemistry, chemical, and biochemical technology. Additionally, this book will provide an in-depth knowledge of ion-exchange column and operations suitable for engineers and industrialists.

Sustainable Water for the Future

Fundamental Modelling of Membrane Systems: Membrane and Process Performance summarizes the state-of-the-art modeling approaches for all significant membrane processes, from molecular transport, to process level, helping researchers and students who carry out experimental research save time and accurately interpret experimental data. The book provides an overview of the different membrane technologies, handling micro-, ultra-, and nanofiltration, reverse and forward osmosis, pervaporation, gas permeation, supported liquid membranes, membrane contactors, membrane bioreactors and ion-exchange membrane systems. Examples of hybrid membrane systems are also included. Presents an

accessible reference on how to model membranes and membrane processes Provides a clear, mathematical description of mass transfer in membrane systems Written by well-known, prominent authors in the field of membrane science

Introduction to Membrane Science and Technology

Progress and Recent Trends in Microbial Fuel Cells provides an in-depth analysis of the fundamentals, working principles, applications and advancements (including commercialization aspects) made in the field of Microbial Fuel Cells research, with critical analyses and opinions from experts around the world. Microbial Fuel cell, as a potential alternative energy harnessing device, has been progressing steadily towards fruitful commercialization. Involvements of electrolyte membranes and catalysts have been two of the most critical factors toward achieving this progress. Added applications of MFCs in areas of bio-hydrogen production and wastewater treatment have made this technology extremely attractive and important. . Reviews and compares MFCs with other alternative energy harnessing devices, particularly in comparison to other fuel cells. Analyses developments of electrolyte membranes, electrodes, catalysts and biocatalysts as critical components of MFCs, responsible for their present and future progress. Includes commercial aspects of MFCs in terms of (i) generation of electricity, (ii) microbial electrolysis cell, (iii) microbial desalination cell, and (iv) wastewater and sludge treatment.

Liquid Membranes

This book presents the applications of ion-exchange materials in the biomedical industries. It includes topics related to the application of ion exchange chromatography in determination, extraction and separation of various compounds such as amino acids, morphine, antibiotics, nucleotides, penicillin and many more. This title is a highly valuable source of knowledge on ion-exchange materials and their applications suitable for postgraduate students and researchers but also to industrial R&D specialists in chemistry, chemical, and biochemical technology. Additionally, this book will provide an in-depth knowledge of ion-exchange column and operations suitable for engineers and industrialists.

Carbon Dioxide Capture and Storage

7.1.1 Heavy Metals: What are They?

Environmental Ion Exchange

"Ion exchange", as Dr. Robert Kunin has said, "is a unique technology since it occupies a special place in at least three

other scientific disciplines - polymer chemistry, polyelectrolytes and adsorption. " It may also lay claim to being one of the most widely used industrially. From its origins in water treatment and the sugar industry, through hydrometallurgical applications as diverse as the treatment of plating wastes and the tonnage production of uranium, to the present-day production of ultrapure water for the microelectronics industry, the recovery of valuable materials from sewage effluents and pollution control, the uses of ion exchange are legion. As a result, it is well-nigh impossible to prevent infiltration by the real world of even the most academic of conferences on the subject. It came as no surprise to the Scientific Board of the NATO Advanced Study Institute on "Mass Transfer & Kinetics of Ion Exchange" that one third of the lecturers, and one half of their advanced students, were from Industry, nor that the two round-table discussions, which specially featured industrial applications and future requirements, were well attended and enthusiastically debated.

Electrochemical Water Electrolysis

Flow batteries have received attention in large-scale energy storage due to their flexible design, high safety, high energy efficiency, and environmental friendliness. In recent years, they have been rapidly developed and tested in a variety of scales that prove their feasibility and advantages of use. As energy becomes a global focus, it is important to consider flow battery systems. This book offers a detailed introduction to the function of different kinds of redox flow batteries, including vanadium flow batteries, as well as the electrochemical processes for their development, materials and components, applications, and near future prospects. Redox Flow Batteries: Fundamentals and Applications will give readers a full understanding of flow batteries from fundamentals to commercial applications.

Solvent Extraction and Liquid Membranes

This book is part of a series on sustainability. Specifically, it deals with the issue of sustainable water use. Fresh sources of potable water are being depleted across the world. Pure water is the goal of water utilities as well as several industries. Well past the experimental stage, membrane processes are now a proven and reliable method of providing high-quality, cost-effective water. Membrane technologies have immediate applications to treatment of fresh, brackish and sea waters, as well as wastewater reclamation. With innovative module design and engineering, micro- and ultra-filtrations have become effective and economical for drinking water production, particularly for removal of microorganisms. Membrane bioreactors are being developed for municipal and industrial water recycling. Various membrane processes are also used to remove contaminants from industrial wastewaters. This book covers the fundamental and practical concepts and issues regarding the application of membrane technologies for sustainable water treatment. It describes and compares the effectiveness of desalination versus water recycling for long-term sustainable water use. - Describes the global water situation with respect to sustainability - Emphasizes the role of membrane technologies - Compares the strategies of water recycling and

desalination

Hydrogen Exchange Mass Spectrometry of Proteins

"Ion exchange", as Dr. Robert Kunin has said, "is a unique technology since it occupies a special place in at least three other scientific disciplines - polymer chemistry, polyelectrolytes and adsorption. " It may also lay claim to being one of the most widely used industrially. From its origins in water treatment and the sugar industry, through hydrometallurgical applications as diverse as the treatment of plating wastes and the tonnage production of uranium, to the present-day production of ultrapure water for the microelectronics industry, the recovery of valuable materials from sewage effluents and pollution control, the uses of ion exchange are legion. As a result, it is well-nigh impossible to prevent infiltration by the real world of even the most academic of conferences on the subject. It came as no surprise to the Scientific Board of the NATO Advanced Study Institute on "Mass Transfer & Kinetics of Ion Exchange" that one third of the lecturers, and one half of their advanced students, were from Industry, nor that the two round-table discussions, which specially featured industrial applications and future requirements, were well attended and enthusiastically debated.

Fundamentals and Applications of Ion Exchange

Fundamental study and industrial application of ion exchange membranes started over half a century ago. Through the ongoing research and development, the ion exchange membrane technology is now applied to many fields and contributes to the improvement of our standard of living. Ion Exchange Membranes states the ion exchange membrane technology from the standpoint of fundamentals and applications. Discussing not only various phenomena exhibited by the membranes but also their applications in many fields with economical evaluations. * This volume looks at the latest developments in ion exchange membrane technology * Provides a full and wide explanation of ion exchange membranes * Easy-to-understand layout, including many figures and tables

Electrocatalysts for Low Temperature Fuel Cells

Progress in Filtration and Separation contains reference content on fundamentals, core principles, technologies, processes, and applications. It gives detailed coverage of the latest technologies and research, models, applications and standards, practical implementations, case studies, best practice, and process selection. Extensive worked examples are included that cover basic calculations through to process design, including the effects of key variables. Techniques and topics covered include pervaporation, electrodialysis, ion exchange, magnetic (LIMS, HIMS, HGMS), ultrasonic, and more. Solves the needs of university based researchers and R&D engineers in industry for high-level overviews of sub-topics within the solid-liquid

separation field Provides insight and understanding of new technologies and methods Combines the expertise of several separations experts

Fundamental Modeling of Membrane Systems

Understanding surfaces and interfaces is a key challenge for those working on hybrid nanomaterials and where new imaging and analysis spectroscopy/electron microscopy responses are vital. The variability and site recognition of biopolymers, such as DNA molecules, offer a wide range of opportunities for the self-organization of wire nanostructures into much more complex patterns, while the combination of 1D nanostructures consisting of biopolymers and inorganic compounds opens up a number of scientific and technological opportunities. This book discusses the novel synthesis of nanomaterials and their hybrid composites; nanobiocomposites; transition metal oxide nanocomposites; spectroscopic and electron microscopic studies; social, ethical, and regulatory implications of various aspects of nanotechnology; and significant foreseeable applications of some key hybrid nanomaterials. The book also looks at how technology might be used in the future, estimating, where possible, the likely timescales in which the most far-reaching applications of technology might become a reality. Current research trends and potential future advances, such as nanomaterials, nanometrology, electronics, optoelectronics, and nanobiotechnology, are discussed, in addition to the benefits they are currently providing in the short, medium, and long terms. Furthermore, the book explains the current and possible future industrial applications of nanotechnology, examines some of the barriers to its adoption by industry, and identifies what environmental, health and safety, ethical, or societal implications or uncertainties may arise from the use of the technology, both current and future.

Redox Flow Batteries

Hydrogen exchange mass spectrometry is widely recognized for its ability to probe the structure and dynamics of proteins. The application of this technique is becoming widespread due to its versatility for providing structural information about challenging biological macromolecules such as antibodies, flexible proteins and glycoproteins. Although the technique has been around for 25 years, this is the first definitive book devoted entirely to the topic. Hydrogen Exchange Mass Spectrometry of Proteins: Fundamentals, Methods and Applications brings into one comprehensive volume the theory, instrumentation and applications of Hydrogen Exchange Mass Spectrometry (HX-MS) - a technique relevant to bioanalytical chemistry, protein science and pharmaceuticals. The book provides a solid foundation in the basics of the technique and data interpretation to inform readers of current research in the method, and provides illustrative examples of its use in bio- and pharmaceutical chemistry and biophysics In-depth chapters on the fundamental theory of hydrogen exchange, and tutorial chapters on measurement and data analysis provide the essential background for those ready to adopt HX-MS.

Expert users may advance their current understanding through chapters on methods including membrane protein analysis, alternative proteases, millisecond hydrogen exchange, top-down mass spectrometry, histidine exchange and method validation. All readers can explore the diversity of HX-MS applications in areas such as ligand binding, membrane proteins, drug discovery, therapeutic protein formulation, biocomparability, and intrinsically disordered proteins.

Ion Exchange in Environmental Processes

Liquid Membranes: Principles and Applications in Chemical Separations and Wastewater Treatment discusses the principles and applications of the liquid membrane (LM) separation processes in organic and inorganic chemistry, analytical chemistry, biochemistry, biomedical engineering, gas separation, and wastewater treatment. It presents updated, useful, and systematized information on new LM separation technologies, along with new developments in the field. It provides an overview of LMs and LM processes, and it examines the mechanisms and kinetics of carrier-facilitated transport through LMs. It also discusses active transport, driven by oxidation-reduction, catalytic, and bioconversion reactions on the LM interfaces; modifications of supported LMs; bulk aqueous hybrid LM processes with water-soluble carriers; emulsion LMs and their applications; and progress in LM science and engineering. This book will be of value to students and young researchers who are new to separation science and technology, as well as to scientists and engineers involved in the research and development of separation technologies, LM separations, and membrane reactors. - Provides comprehensive knowledge-based information on the principles and applications of a variety of liquid membrane separation processes. - Contains a critical analysis of new technologies published in the last 15 years.

The Principles of Ion-Selective Electrodes and of Membrane Transport

Including chemical, synthetic, and cross-disciplinary approaches; this book includes the necessary techniques and technologies to help readers better understand polymers for polymer electrolyte membrane (PEM) fuel cells. The methods in the book are essential to researchers and scientists in the field and will lead to further development in polymer and fuel cell technologies. • Provides complete, essential, and comprehensive overview of polymer applications for PEM fuel cells • Emphasizes state-of-the-art developments and methods, like PEMs for novel fuel cells and polymers for fuel cell catalysts • Includes detailed chapters on major topics, like PEM for direct liquid fuel cells and fluoropolymers and non-fluorinated polymers for PEM • Has relevance to a range of industries - like polymer engineering, materials, and green technology - involved with fuel cell technologies and R&D

Sustainable Energy from Salinity Gradients

Industrial application of ion exchange membranes started from saline water desalination. However, now it extends widely in many fields such as drinking water or wastewater treatment, demineralisation of amino acid, whey, sugar liquor, recovery of useful components, treatment of organic substances and contributes to the improvement of our standard of living. The application of ion exchange membranes must expand further if we pay attention to unique functions of the membranes for separating ionic species from non-ionic substances or other kinds of ionic species. This book discusses the performance of an electrodialyser from the stand point of fundamental and practical views.

Hybrid Nanocomposites

This book covers new systems in technology that have developed our knowledge of ion exchange. This book discusses ion exchange resins to enhance cell growth; anion exchange membrane; nanosystems in ion exchange and ion exchange in environmental applications. The ion exchange system is used in bionanotechnology, cosmetic industry and water treatment.

Ion Exchange Technology I

Environmental Ion Exchange: Principles and Design contains the most important ion exchange-related design and application issues. Using tables, graphs, and conversion tables, this book teaches you the basics, giving you the knowledge to use ion exchange to reuse, recover, and recycle. This hands-on guide explains how to apply ion exchange to reuse

Applications of Ion Exchange Materials in Chemical and Food Industries

Lithium-Ion Batteries: Fundamentals and Applications offers a comprehensive treatment of the principles, background, design, production, and use of lithium-ion batteries. Based on a solid foundation of long-term research work, this authoritative monograph: Introduces the underlying theory and history of lithium-ion batteries Describes the key components of lithium-ion batteries, including negative and positive electrode materials, electrolytes, and separators Discusses electronic conductive agents, binders, solvents for slurry preparation, positive thermal coefficient (PTC) materials, current collectors, and cases Examines the assembly processes and electrochemical performance of lithium-ion batteries Explores applications in power tools, electric vehicles, aerospace, and more Lithium-Ion Batteries: Fundamentals and Applications delivers a systematic overview of lithium-ion batteries, from physical properties to manufacturing technologies. The book also supplies valuable insight into potential growth opportunities in this exciting market.

Electrokinetics Across Disciplines and Continents

IPCC Report on sources, capture, transport, and storage of CO₂, for researchers, policy-makers and engineers.

Ion Exchange Membranes

Adsorption, Ion Exchange and Catalysis is essentially a mixture of environmental science and chemical reactor engineering. More specifically, three important heterogeneous processes, namely, adsorption, ion exchange and catalysis, are analysed, from fundamental kinetics to reactor design with emphasis on their environmental applications. In Chapter 1, the subject of air and water pollution is dealt with. Data about pollutants and emission sources are given and the treatment methods are shortly presented. In Chapter 2, the very basics and historical development of adsorption, ion exchange and catalysis are presented as well as their environmental applications. Chapter 3 is devoted to heterogeneous processes and reactor analysis. All types of reactors are described in depth and reactor modelling, hydraulics and mass/heat transfer phenomena are examined for each type of reactor. Chapters 4 and 5 are dedicated to adsorption & ion exchange and catalysis, respectively. The basic principles are presented including kinetics, equilibrium, mass/heat transfer phenomena as well as the analytical solutions of the reactor models presented in Chapter 3. In the sixth chapter, the subject of scale up is approached. The two Annexes at the end of the book contain physical properties of substances of environmental interest as well as unit conversion tables. Finally, nearly all the examples contained are based on real experimental data found in literature with environmental interest. Most of the examples consider all aspects of operation design – kinetics, hydraulics and mass transfer. * Provides basic knowledge of major environmental problems and connects them to chemical engineering

Proton Exchange Membrane Fuel Cell

Today, membranes and membrane processes are used as efficient tools for the separation of liquid mixtures or gases in the chemical and biomedical industry, in water desalination and wastewater purification. Despite the fact that various membrane processes, like reverse osmosis, are described in great detail in a number of books, processes involving ion-exchange membranes are only described in a fragmented way in scientific journals and patents; even though large industrial applications, like electrodialysis, have been around for over half a century. Therefore, this book is emphasizing on the most relevant aspects of ion-exchange membranes. This book provides a comprehensive overview of ion-exchange membrane separation processes covering the fundamentals as well as recent developments of the different products and processes and their applications. The audience for this book is heterogeneous, as it includes plant managers and process engineers as well as research scientists and graduate students. The separate chapters are based on different topics. The first chapter describes the relevant Electromembrane processes in a general overview. The second chapter explains thermodynamic and physicochemical fundamentals. The third chapter gives information about ion-exchange membrane

preparation techniques, while the fourth and fifth chapter discusses the processes as unit operations giving examples for the design of specific plants. First work on the principles and applications of electrodialysis and related separation processes Presently no other comprehensive work that can serve as both reference work and text book is available Book is suited for teaching students and as source for detailed information

Ion-Exchange Membrane Separation Processes

Ion-exchange Technology I: Theory and Materials describes the theoretical principles of ion-exchange processes. More specifically, this volume focuses on the synthesis, characterization, and modelling of ion-exchange materials and their associated kinetics and equilibria. This title is a highly valuable source not only to postgraduate students and researchers but also to industrial R&D specialists in chemistry, chemical, and biochemical technology as well as to engineers and industrialists.

Polymers for PEM Fuel Cells

This book comprehensively describes the fundamentals of electrochemical water electrolysis as well as the latest materials and technological developments. It addresses a variety of topics such as electrochemical processes, materials, components, assembly and manufacturing, and degradation mechanisms, as well as challenges and strategies. It also includes an understanding of how materials and technologies for electrochemical water electrolysis have developed in recent years, and it describes the progress in improving performance and providing benefits to energy systems and applications. Features the most recent advances in electrochemical water electrolysis to produce hydrogen Discusses cutting-edge materials and technologies for electrochemical water electrolysis Includes both experimental and theoretical approaches that can be used to guide and promote materials as well as technological development for electrochemical water electrolysis Comprises work from international leading scientists active in electrochemical energy and environmental research and development Provides invaluable information that will benefit readers from both academia and industry With contributions from researchers at the top of their fields, the book includes in-depth discussions covering the engineering of components and applied devices, making this an essential read for scientists and engineers working in the development of electrochemical energy devices and related disciplines.

ICREEC 2019

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associated kinetics and equilibria. This title is a highly valuable source not only to postgraduate students and researchers but also to industrial R&D specialists in chemistry, chemical, and biochemical technology as well as to engineers and industrialists.

Fundamentals and Applications of Ion Exchange

The Principles of Ion Selective Electrodes and of Membrane Transport is a collection of research works on the theory, principles, and fundamentals of ion-selective electrodes and of membrane transport. This book is organized into two parts encompassing 15 chapters that highlight the application of the membrane model. Part A is a general discussion of membrane potentials and membrane transport. This part describes the formulations of the interfacial potential contribution due to phase boundaries. This part also explores the diffusion potential, the nonideality of diffusion layers or membrane phases, the liquid-junction potential arising in conventional potentiometric measuring cells. Other topics covered in this part include the practical solution for the membrane potential; the ion-transport and the electrical properties of bulk membranes; and the characteristics of lipid bilayer membranes. Part B considers the fundamentals of ion-selective electrodes. This part begins with discussions of the principles, response behavior, ion selectivity, and detection limits of solid-state membrane electrodes. This part also examines several important extensions and modifications of the Sandblom-Eisenman-Walker theory; the characteristics of neutral carrier membrane electrodes; and the theory of glass electrodes.

Lithium-Ion Batteries

The main idea of this study is to scrutinize the performance efficiency and enhancement of modelling and simulations of PEM fuel cell. Besides, the research of PEM fuel cell performance can figure out many critical issues for an alternative resource energy. The chapters collected in the book are contributions by invited researchers with a long-standing experience in different research areas. I hope that the material presented here is understandable to a wide audience, not only energy engineers but also scientists from various disciplines. The book contains nine chapters in three sections: (1) "General Information About PEM Fuel Cell", (2) "PEM Fuel Cell Technology" and (3) "Many Different Applications of PEM Fuel Cell". This book presents detailed and up-to-date evaluations in different areas and was written by academics with experience in their field. It is anticipated that this book will make a scientific contribution to PEM fuel cell and other alternative energy resource workers, researchers, academics, PhD students and other scientists both in the present and in the future.

Ion Exchange Membranes

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.

Surface Chemistry and Electrochemistry of Membranes

Salinity gradient energy, also known as blue energy and osmotic energy, is the energy obtainable from the difference in salt concentration between two feed solutions, typically sea water and river water. It is a large-scale renewable resource that can be harvested and converted to electricity. Efficient extraction of this energy is not straightforward, however.

Sustainable Energy from Salinity Gradients provides a comprehensive review of resources, technologies and applications in this area of fast-growing interest. Key technologies covered include pressure retarded osmosis, reverse electrodialysis and accumulator mixing. Environmental and economic aspects are also considered, together with the possible synergies between desalination and salinity gradient energy technologies. Sustainable Energy from Salinity Gradients is an essential text for R&D professionals in the energy & water industry interested in salinity gradient power and researchers in academia from post-graduate level upwards. For more than ten years the Editors have been sharing substantial research activities in the fields of renewable energy and desalination, successfully participating to a number of European Union research projects and contributing to the relevant scientific literature with more than 100 papers and 2 books on Desalination technologies and their coupling with Renewable Energy. They are intensely working in the field of Salinity Gradient Power, carrying out research with specific focus on open-loop and closed-loop reverse electrodialysis and pressure retarded osmosis. Covers applications of pressure retarded osmosis, reverse electrodialysis, and capacitive mixing for salinity gradient power in one convenient volume Presents the environmental aspects and economics of salinity gradient energy Explores possible synergies between desalination and salinity gradient energy

Ion Exchange Technology I

Meeting the need for a text on solutions to conditions which have so far been a drawback for this important and trend-setting technology, this monograph places special emphasis on novel, alternative catalysts of low temperature fuel cells. Comprehensive in its coverage, the text discusses not only the electrochemical, mechanistic, and material scientific background, but also provides extensive chapters on the design and fabrication of electrocatalysts. A valuable resource

aimed at multidisciplinary audiences in the fields of academia and industry.

Applications of Ion Exchange Materials in Biomedical Industries

This book highlights peer reviewed articles from the 1st International Conference on Renewable Energy and Energy Conversion, ICREEC 2019, held at Oran in Algeria. It presents recent advances, brings together researchers and professionals in the area and presents a platform to exchange ideas and establish opportunities for a sustainable future. Topics covered in this proceedings, but not limited to, are photovoltaic systems, bioenergy, laser and plasma technology, fluid and flow for energy, software for energy and impact of energy on the environment.

Ionic Transport Processes

Concentrated treatment of all aspects of technology and handling directly related to the products of electrolysis. Thoroughly up to date and should become the standard reference in its field.

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