



Ion Exchange Membranes

PREPARATION, CHARACTERIZATION,
MODIFICATION and APPLICATION

TOSHIKATSU SATA

Ion Exchange Membranes Preparation Characterization Modification And Application

Adewale Giwa



Ion Exchange Membranes Preparation Characterization Modification And Application:

Ion Exchange Membranes Toshikatsu Sata,2004 Various separation membranes have been developed since their discovery over half a century ago providing numerous benefits and fulfilling many applications in our everyday lives They lend themselves to techniques ranging from microfiltration and gas separation to what can be considered as the most advanced technique ion exchange

Ion Exchange Membranes Toshikatsu Sata,2007-10-31 Various separation membranes have been developed since their discovery over half a century ago providing numerous benefits and fulfilling many applications in our everyday lives They lend themselves to techniques ranging from microfiltration and gas separation to what can be considered as the most advanced technique ion exchange This book aimed at academic researchers engineers and industrialists contains a brief history of ion exchange and goes on to explain the preparation characterization modification and applications of these important membranes Discussions include the use of ion exchange in analytical and medical techniques as well as the development of future applications

Ion Exchange Membranes Yoshinobu Tanaka,2015-01-19 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

Ion Exchange Technology I Inamuddin Dr.,Mohammad Luqman,2012-06-02 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

Functional Nanostructured Materials and Membranes for Water Treatment Mikel Duke,Dongyuan Zhao,Rafael Semiat,2013-03-14 Membranes have emerged over the last 30 years as a viable water treatment technology Earth s population is growing and the need for alternative ways to generate potable water is rising The recent advent of nanotechnology opens the door to

improving processes in membrane technology which is a promising step on the way to solving the earth's potable water problem. Current performance is enhanced and new concepts are possible by engineering on the nanoscale. This book presents key areas of nanotechnology such as fouling tolerant and robust membranes, enhanced destruction of pollutants and faster monitoring of water quality. **Functional Nanostructured Materials and Membranes for Water Treatment** is part of the series on Materials for Sustainable Energy and Development edited by Prof. G. Q. Max Lu. The series covers advances in materials science and innovation for renewable energy, clean use of fossil energy and greenhouse gas mitigation and associated environmental technologies.

Ion Exchange Technologies Ayben Kilislioglu, 2012-11-07. This book contains information about the technological development of ion exchange in their application for industrial processes. Widely used and well-known fields of ion exchange like chromatography and electromembrane technology are described in this book with experimental details. Designing new materials for nanotechnology and nanomaterials as ion exchanger are also explained by experimental proofs. Ion exchange book is suitable not only for postgraduate students but also for researchers in chemistry, biochemistry and chemical technology.

Ion Exchange Processes for Water and Environment Management Amita Somya, Anish Khan, 2025-07-15. This book presents theory, principles and applications of ion exchangers for water and environment management. It begins with an introduction, ion exchange equilibrium, kinetics of ion exchange process and fundamental properties of ion exchangers which make them appropriate in various applications. The theories underlying the operation of ion exchange resins are explained as well as the production of resin products with groups adapted to specific ions or groups of ions including principles of ion exchange process, different synthetic procedures of ion exchangers and characterization techniques and the role of ion exchangers with their specific characteristics. This book is an invaluable tool to analytical chemists and researchers who are interested in the applications of ion exchange materials.

Seven Years of Membranes: Feature Paper 2017 Spas D. Kolev, 2018-08-09. This book is a printed edition of the Special Issue Seven Years of Membranes Feature Paper 2017 that was published in Membranes.

Alkaline Anion Exchange Membranes for Fuel Cells Jince Thomas, Alex Schechter, Flavio Grynszpan, Bejoy Francis, Sabu Thomas, 2024-02-05. Alkaline Anion Exchange Membranes for Fuel Cells. Build the fuel cells of the future with this cutting edge material. Alkaline anion exchange membranes (AAEMs) are cutting edge polyelectrolyte materials with growing renewable energy applications including fuel cells, batteries, hydrogen electrolyzers and electro dialysis technologies. Their use in relatively new alkaline exchange membrane fuel cells (AEMFCs) is designed to produce cost effective clean energy. Electricity produced by a chemical reaction. Rigorous studies are being conducted to meet the requirements of AAEMs precisely tailored for high anion conductivity and durability for future high energy efficient devices. Hence over the past few years the academic and industrial scientific communities have explored various polymeric composite and inorganic materials and studied their properties as a potential AAEM. The accumulated literature in this area of investigation is vast and in order to provide the community with the tools

needed to strive forward there is a clear need to condense this information in a single volume Alkaline Anion Exchange Membranes for Fuel Cells meets this need with a comprehensive overview of the properties of these membranes and their applications The book considers recent developments common challenges and the long term prospects for this field of research and engineering It constitutes a one stop resource for the development and production of AAEM fuel cells and related electrochemical applications Alkaline Anion Exchange Membranes for Fuel Cells readers will find Discussion of electrochemical applications like redox flow batteries water electrolysis and many more Detailed treatment of specially tailored cationic groups such as quaternary ammonium and guanidinium Expert advice on efficient fabrication and electrode assembly Alkaline Anion Exchange Membranes for Fuel Cells is ideal for electrochemists materials scientists polymer chemists electrical engineers and anyone working in power technology or related fields

Electromembrane Processes

Luigi Gurreri ,Alessandro Tamburini ,Giorgio Micale,2021-09-08 Electromembrane processes offer a multitude of applications allowing for the recovery of water other products and energy This book is a collection of contributions on recent advancements in electromembrane processes attained via experiments and or models The first paper is a comprehensive review article on the applications of electrodialysis for wastewater treatment highlighting current status technical challenges and key points for future perspectives The second paper focuses on ZSM 5 zeolite PVA mixed matrix CEMs with high monovalent permselectivity for recovering either acid or Li The third paper regards direct numerical simulations of electroconvection in an electrodialysis dilute channel with forced flow under potentiodynamic and galvanodynamic regimes The fourth paper investigates the reasons for the formation and properties of soliton like charge waves in overlimiting conditions The fifth paper focuses on the characterization of AEMs functionalized by surface modification via poly acrylic acid yielding monovalent permselectivity for reverse electrodialysis In the sixth paper CFD simulations of reverse electrodialysis systems are performed The seventh paper proposes an integrated membrane process including electrochemical intercalation deintercalation for the preparation of Li_2CO_3 from brine with a high Mg^{2+} / Li^+ mass ratio Finally the eighth paper is a perspective article devoted to the acid base flow battery with monopolar and bipolar membranes

Electromembrane Processes

Luboš Novák,2021-12-20 The book is a comprehensive view of all electromembrane processes including electromembrane processes for energy conversion a currently very significant problem The necessary theory and basic information needed for understanding the technology are explained in Part I Materials used for ion selective membranes and separation processes are described in Part II and the applications for synthesis and energy conversion in Part III

Nano-Enhanced and Nanostructured Polymer-Based Membranes for Energy Applications

Maria Giovanna Buonomenna,2022-01-22 There is a growing need for better membranes in several emerging application fields especially those related to energy conversion and storage as well as to water treatment and recycling Processability is an important functional property often ignored especially in the early discovery phase for new materials but it should be one of the most

important properties that needs to be considered in the development of better membrane materials Useful membrane materials have to be capable of being formed into thin membranes in particular for membrane gas separation water treatment and desalination and then packaged into large area membrane modules All gas separation membranes that are in current commercial use are based on polymers which are solution processable This book intends to deal with composite in most cases hybrid polymer based membranes for three separate application fields energy conversion energy storage and water treatment and recovery Each chapter will explain clearly the various membrane processes then go on to discuss in detail the corresponding advanced membranes used The logic that lies behind this is that you have to understand the process in order to develop new high performance membranes By taking this approach the author aims to overcome the disconnection that currently exists between membrane materials scientists and industrial process engineers Discusses interdisciplinary content by a single author approaching synthesis and development of materials from the perspective of their processability Describes the novel aspects of membrane science that is related to energy storage conversion and wastewater treatment Presents an emphasis on scientific results which have an impact on real applications in terms of renewable and clean energy challenges

Membrane-Based Salinity Gradient Processes for Water Treatment and Power Generation Sarper Sarp,Nidal Hilal,2018-07-25 Membrane Based Salinity Gradient Processes for Water Treatment and Power Generation focuses on the various types of membrane based salinity gradient processes that can be applied for desalination Topics cover salinity gradient processes for desalination such as Forward Osmosis FO and Pressure Retarded Osmosis PRO with chapters selected exclusively from a number of world leading experts in various disciplines and from different continents Sections include discussions on the theoretical and fundamental approaches to salinity gradient processes various types of membrane materials and development i e flat sheet and hollow fiber various salinity water sources for an economically feasible process and large scale applications Finally the book focuses on economically feasible process optimization when both operational and capital costs are considered Features specific details on salinity gradient techniques for various desalination applications of industrial and academic interest Contains unique discussions on membrane development and process optimization that normally only appear briefly in research articles Includes examples of internationally best practices for the evaluation of several system parameters including thermodynamic optimization high power density membrane development and more Discusses large scale applications and provides examples of such implementations such as Statkraft Japanese Megaton and Korean GMVP

Advances in Membrane Technologies for Water Treatment Angelo Basile,Alfredo Cassano,Navin Kumar Rastogi,2015-02-28 Advances in Membrane Technologies for Water Treatment Materials Processes and Applications provides a detailed overview of advanced water treatment methods involving membranes which are increasingly seen as effective replacements for a range of conventional water treatment methods The text begins with reviews of novel membrane materials and advances in membrane operations then examines the processes involved with improving membrane

performance Final chapters cover the application of membrane technologies for use in water treatment with detailed discussions on municipal wastewater and reuse in the textile and paper industries Provides a detailed overview of advanced water treatment methods involving membranes Coverage includes advancements in membrane materials improvement in membrane performance and their applications in water treatment Discusses the use of membrane technologies in the production of drinking water desalination wastewater treatment and recovery

Electrochemical Membrane Technology Adewale Giwa,2024-01-23 Electrochemical Membrane Technology will have a strong impact on electrochemical and membrane separation research in the future and will contribute significantly to academic training and the well being of human society This book will include a comprehensive discussion of SWOT analysis of each electrochemical membrane technology and the discussion of energy production from electrochemical membrane technologies in a separate chapter This will be based theoretical and experimental studies on electrochemical membrane technologies and applications Written for chemical and environmental engineers professors and other university teachers research scientists graduate students water treatment managers research institutions and Research and Development departments of industries involved in sustainable water treatment and coproduction of valuable products from water treatment technologies Provides comparative analysis of energy production from electrochemical membrane technologies and a comprehensive analysis of the recent advances in these technologies Discusses the strengths weaknesses opportunities and threats challenges SWOT of each electrochemical membrane technology Addresses the importance energy co production

Promising Techniques for Wastewater Treatment and Water Quality Assessment Iqbal Ahmed,J. Kevin Summers,2021-12-01 This book reviews the primary aspects of wastewater treatment processing techniques and designs as well as water quality assessment Chapters address microwave digestive techniques of wastewater treatment advanced ozone oxidative and photo processes and reactive distillation for various applications The book is a useful resource for choosing applicable processing techniques and design parameters

Membrane Technology Sundergopal Sridhar,2018-09-03 Contributed by multiple experts the book covers the scientific and engineering aspects of membrane processes and systems It aims to cover basic concepts of novel membrane processes including membrane bioreactors microbial fuel cell forward osmosis electro dialysis and membrane contactors Maintains a pragmatic approach involving design operation and cost analysis of pilot plants as well as scaled up counterparts

Transport Perspectives for Porous Medium Applications Huijin Xu,Chen Yang,Liwei Zhang,2024-07-17 Porous media with their distinctive structure are indispensable in both scientific inquiry and engineering endeavors Their specialized composition makes them versatile finding utility in diverse domains ranging from subterranean aquifers to innovative energy converters and from biomedical technologies to environmental solutions The intricate pore networks within porous media serve as reservoirs for fluids and gases while significantly impacting the dynamics of transport processes Thus a comprehensive understanding of their inherent traits and behaviors is imperative for enhancing their operational efficiency

and resolving pertinent engineering challenges This comprehensive volume explores the latest transport advancements in porous media applications from measuring relative permeability to designing metal foam flow fields in fuel cells With a focus on cutting edge methodologies and technologies such as microstructure reconstruction and hierarchical porous catalysts this book aims to inspire innovation and drive progress in porous media applications Offering insights into emerging trends and future directions this book is a valuable resource for researchers engineers and students looking to make a significant impact in energy environment and engineering challenges Dive into the world of porous media and uncover new opportunities for collaboration and development in this dynamic field Dielectric Materials for Electrical Engineering Juan

Martinez-Vega,2013-03-04 The object of this book is to provide a comprehensive reference source for the numerous scientific communities engineers researchers students etc in various disciplines which require detailed information in the field of dielectric materials Part 1 focuses on physical properties electrical ageing and modeling including topics such as the physics of charged dielectric materials conduction mechanisms dielectric relaxation space charge electric ageing and end of life EOL models and dielectric experimental characterization Part 2 examines applications of specific relevance to dielectric materials insulating oils for transformers electro rheological fluids electrolytic capacitors ionic membranes photovoltaic conversion dielectric thermal control coatings for geostationary satellites plastics recycling and piezoelectric polymers **Current**

Trends and Future Developments on (Bio-) Membranes Angelo Basile,Kamran Ghasemzadeh,2023-09-14 Current Trends and Future Developments on Bio Membranes Recent Achievements for Ion Exchange Membranes focuses on introducing and analyzing ion exchange membranes performance and overviewing recent achievements in the structural development of ion exchange membranes in various applications Hence this book is a key reference text for R D managers in who are interested in the development of ion exchange membrane technologies as well as academic researchers and postgraduate students working in the wider area of strategic treatments separation and purification processes Reviews the ion exchange membranes including fundamentals and processes Provides thorough coverage of transport aspects and fundamentals of various ion exchange membranes systems such as fuel cells electro dialysis and more Describes the two main categories of ion exchange membranes inorganic and organic Covers numerous new applications of ion exchange membranes

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