Porous Membrane Modeling With Comsol

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RAMOS MOONEY

Hollow Fiber Membrane Contactors CRC Press
Osmotically Driven Membrane Processes provides an overview of membrane systems and separation processes, recent trends in membranes and membrane processes, and advancements in osmotically driven membrane systems. It focuses on recent advances in monitoring and controlling wastewater using membrane technologies. It explains and clarifies important research studies as well as discusses advancements in the field of organic-inorganic pollution.
Elements of Chemical Reaction Engineering IGI Global
The new edition of the cornerstone text on electrochemistry Spans all the areas of electrochemistry, from the basicsof thermodynamics and electrode kinetics to transport phenomena inelectrolytes, metals, and semiconductors. Newly updated andexpanded, the Third Edition covers important new treatments, ideas,and technologies while also increasing the book's accessibility forreaders in related fields. Rigorous and complete presentation of the fundamentalconcepts In-depth examples applying the concepts to real-life designproblems Homework problems ranging from the reinforcing to the highlythought-provoking Extensive bibliography giving both the historical developmentof the field and references for the practicing electrochemist.
Computational Modeling in Bioengineering and Bioinformatics Springer
"This 10-volume compilation of authoritative, research-based articles contributed by thousands of researchers and experts from all over the world emphasized modern issues and the presentation of potential opportunities, prospective solutions, and future directions in the field of information science and technology"--Provided by publisher.
Micro- and Nanofluidics for Bionanoparticle Analysis Springer Nature
In this textbook, the author teaches readers how to model and simulate a unit process operation through developing mathematical model equations, solving model equations manually, and comparing results with those simulated through software. It covers both lumped parameter systems and distributed parameter systems, as well as using MATLAB and Simulink to solve the system model equations for both. Simplified partial differential equations are solved using COMSOL, an effective tool to solve PDE, using the fine element method. This book includes end of chapter problems and worked examples, and summarizes reader goals at the beginning of each chapter.
Micro- and Nanosystems for Biotechnology Elsevier
This book is an ensemble of six major chapters, an introduction, and a closure on modeling transport phenomena in porous media with applications. Two of the six chapters explain the underlying theories, whereas the rest focus on new applications. Porous media transport is essentially a multi-

scale process. Accordingly, the related theory described in the second and third chapters covers both continuum- and meso-scale phenomena. Examining the continuum formulation imparts rigor to the empirical porous media models, while the mesoscopic model focuses on the physical processes within the pores. Porous media models are discussed in the context of a few important engineering applications. These include biomedical problems, gas hydrate reservoirs, regenerators, and fuel cells. The discussion reveals the strengths and weaknesses of existing models as well as future research directions.

PEM Fuel Cells The Electrochemical Society

This book on hollow fiber contractors presents an up-to-date compilation of the latest developments and milestones in this membrane technology. Hollow Fiber Membrane Contactors: Module Fabrication, Design and Operation, and Potential Applications provides a comprehensive discussion of hollow fiber membrane applications (including a few case studies) in biotechnology, chemical, food, and nuclear engineering. The chapters in this book have been classified using the following, based on different ways of contacting fluids with each other: Gas-liquid contacting; Liquid-liquid contacting; Supported liquid membrane; Supported gas membrane; Fluid-fluid contacting. Other features include: Discusses using non-dispersive solvent extraction, hollow fiber strip dispersion, hollow fiber supported liquid membranes and role of process intensification in integrated use of these processes Provides technical and economic perspectives with several case studies related to specific scenarios Demonstrates module fabrication, design, operation and maintenance of hollow fiber contactors for different applications and performance Presents discussion on newer concepts like membrane emulsification, membrane nanoprecipitation, membrane crystallization and membrane condenser Special focus on emerging areas such as the use of hollow fiber contactor in back end of nuclear fuel cycle, membrane distillation, dehumidification of air and gas absorption and stripping Discusses theoretical analysis including computational modeling of different hollow fiber membrane processes, and presents emphasis on newly developed area of hollow fiber membrane based analytical techniques Presents discussion on upcoming area dealing with hollow fiber contactors-based technology in fermentation and enzymatic transformation and in chiral separations This book is equally suited for newcomers to the field, as well as for engineers and scientists that have basic knowledge in this field but are interested in obtaining more information about specific future applications.

Design and Operation of Solid Oxide Fuel Cells John Wiley & Sons

The Chemical Engineer's Practical Guide to Fluid Mechanics: Now Includes COMSOL Multiphysics 5 Since most chemical processing applications are conducted either partially or totally in the fluid phase, chemical engineers need mastery of fluid mechanics. Such knowledge is especially valuable in the biochemical, chemical, energy, fermentation, materials, mining, petroleum, pharmaceuticals, polymer, and waste-processing industries. Fluid Mechanics for Chemical Engineers: with Microfluidics, CFD, and COMSOL Multiphysics 5, Third Edition, systematically introduces fluid mechanics from the perspective of the chemical engineer who must understand actual physical behavior and solve real-world problems. Building on the book that earned Choice Magazine's Outstanding Academic Title award, this edition also gives a comprehensive introduction to the popular COMSOL Multiphysics 5 software. This third edition contains extensive coverage of both microfluidics and computational fluid dynamics, systematically demonstrating CFD through detailed examples using COMSOL Multiphysics 5 and ANSYS Fluent. The chapter on turbulence now presents valuable CFD techniques to investigate practical situations such as turbulent mixing and recirculating flows. Part I offers a clear, succinct, easy-to-follow introduction to macroscopic fluid mechanics, including physical properties; hydrostatics; basic rate laws; and fundamental principles of flow through equipment. Part II turns to microscopic fluid mechanics: Differential equations of fluid mechanics Viscous-flow problems, some including polymer processing Laplace's equation; irrotational and porous-media flows Nearly unidirectional flows, from boundary layers to lubrication, calendering, and thin-film applications Turbulent flows, showing how the k-ε method extends conventional mixing-length theory Bubble motion, two-phase flow, and fluidization Non-Newtonian fluids, including inelastic and viscoelastic fluids Microfluidics and electrokinetic flow effects, including electroosmosis, electrophoresis, streaming potentials, and electroosmotic switching Computational fluid mechanics with ANSYS Fluent and COMSOL Multiphysics Nearly 100 completely worked practical examples include 12 new COMSOL 5 examples: boundary layer flow, non-Newtonian flow, jet flow, die flow, lubrication, momentum diffusion, turbulent flow, and others. More than 300 end-of-chapter problems of varying complexity are presented, including several from University of Cambridge exams. The author covers all material needed for the fluid mechanics portion of the professional engineer's exam. The author's website (fmche.engin.umich.edu) provides additional notes, problem-solving tips, and errata. Register your book for convenient access to downloads, updates, and/or corrections as they become available. See inside book for details.

Osmotically Driven Membrane Processes Academic Press

Computational Modeling in Bioengineering and Bioinformatics promotes complementary disciplines that hold great promise for the advancement of research and development in complex medical and biological systems, and in the environment, public health, drug design, and so on. It provides a common platform by bridging these two very important and complementary disciplines into an interactive and attractive forum. Chapters cover biomechanics and bioimaging, biomedical decision support system, data mining, personalized diagnoses, bio-signal processing, protein structure prediction, tissue and cell engineering, biomedical image processing, analysis and visualization, high performance computing and sports bioengineering. The book's chapters are the result of many international projects in the area of bioengineering and bioinformatics done at the Research and Development Center for Bioengineering BioIRC and by the Faculty of Engineering at the University of Kragujevac, Serbia. Presents recent advances at the crossroads of biomedical engineering and bioinformatics, one of the hottest areas in biomedical and clinical research Discusses a wide range of leading-edge research topics, including biomechanics and bioimaging, biomedical decision support systems, data mining, personalized diagnoses, bio-signal processing, protein structure prediction, tissue and cell engineering, amongst others Includes coverage of biomechanical, bioengineering and computational methods of treatment and diagnosis

Modelling and Simulation of Nanofiltration Membranes John Wiley & Sons

The book is engineering oriented and covers a large variety of topics ranging from fundamental principles to performance evaluation and applications. It is written systematically and completely on the subject with a summary of state-of-the-art fuel cell technology, filling the need for a timely resource. This is a unique book serving academic researchers, engineers, as well as people working in the fuel cell industry. It is also of substantial interest to students, engineers, and scientists in mechanical engineering, chemistry and chemical engineering, electrochemistry, materials science and engineering, power generation and propulsion systems, and automobile engineering.

An Introduction to Fluid Dynamics Elsevier

Non-Newtonian materials are encountered in virtually all of the chemical and process industries and a full understanding of their nature and flow characteristics is an essential requirement for engineers and scientists involved in their formulation and handling. This book will bridge the gap between much of the highly theoretical and mathematically complex work of the rheologist and the practical needs of those who have to design and operate plants in which these materials are handled and processed. At the same time, numerous references are included for the benefit of those who need to delve more deeply into the subject. The starting point for any work on non-newtonian fluids is their characterisation over the range of conditions to which they are likely to be subjected during manufacture or utilisation, and this topic is treated early on in the book in a chapter commissioned from an expert in the field of rheological measurements. Coverage of topics is extensive and this book offers a unique and rich selection of material including the flow of single phase and multiphase mixtures in pipes, in packed and fluidised bed systems, heat and mass transfer in boundary layers and in simple duct flows, and mixing etc. An important and novel feature of the book is the inclusion of a wide selection of worked examples to illustrate the methods of calculation. It also incorporates a large selection of problems for the reader to tackle himself.

Access to Supercomputers MDPI

A new window to local studies of interface phenomena at solid state surfaces has been opened by the development of local probe techniques such as Scanning Tunneling Microscopy (STM) or Atomic Force Microscopy (AFM) and related methods during the past fifteen years. The in-situ application of local probe methods in different systems belongs to modern nanotechnology and has two aspects: an analytical aspect and a preparative aspect. The first aspect covers the application of the local probe methods to characterize thermodynamic, structural and dynamic properties of solid state surfaces and interfaces and to investigate local surface reactions. Two methods which are still in the beginning of their development represent the second aspect: tip and cantilever. They can be used to form defined nano-objects such as molecular or atomic clusters, quantum dots etc. as well as to structure or modify solid state surfaces in the nanometer range. This IUPAC monograph is a comprehensive treatment of both aspects and presents the current state of knowledge. It is written for scientists active in the area of nanotechnology.

Modeling and Simulation of Chemical Process Systems Springer

This book examines the characteristics of Proton Exchange Membrane (PEM) Fuel Cells with a focus on deriving realistic finite element models. The book also explains in detail how to set up measuring systems, data analysis, and PEM Fuel Cells' static and dynamic characteristics. Covered in detail are design and operation principles such as polarization phenomenon, thermodynamic analysis, and overall voltage; failure modes and mechanisms such as permanent faults, membrane degradation, and water management; and modelling and numerical simulation including semi-empirical, one-dimensional, two-dimensional, and three-dimensional models. It is appropriate for graduate students, researchers, and engineers who work with the design and reliability of hydrogen fuel cells, in particular proton exchange membrane fuel cells.

Hydrometallurgical Recycling of Lithium-Ion Battery Materials Academic Press

Design and Operation of Solid Oxide Fuel Cells: The Systems Engineering Vision for Industrial Application presents a comprehensive, critical and accessible review of the latest research in the field of solid oxide fuel cells (SOFCs). As well as discussing the theoretical aspects of the field, the book explores a diverse range of power applications, such as hybrid power plants, polygeneration, distributed electricity generation, energy storage and waste management—all with a focus on modeling and computational skills. Dr. Sharifzadeh presents the associated risks and limitations throughout the discussion, providing a very complete and thorough analysis of SOFCs and their control and operation in power plants. The first of its kind, this book will be of particular interest to energy engineers, industry experts and academic researchers in the energy, power and transportation industries, as well as those working and researching in the chemical, environmental and material sectors. Closes the gap between various power engineering disciples by considering a diverse variety of applications and sectors Presents and reviews a variety of modeling techniques and considers regulations throughout Includes CFD modeling examples and process simulation and optimization programming guidance

Fluid Mechanics for Chemical Engineers BoD – Books on Demand

Nanofiltration (NF) is a relatively recent membrane process and offers a plethora of application areas due to its selective removal for ions and removal of organic matter above 200 g/mol molar mass. Application fields enlarged substantially in the last 25 years. Accordingly, there is an increasing need for process design and optimisation tools. Therefore, current research studiesfocus on a better understanding of mass transport phenomenon as well as the application and enhancement of the existing models to the real process streams. In this thesis work, characterisation of NF membranes and investigations of their mass transport phenomenon through both experimental and modelling studies were of concern. For these purposes, flat sheet samples of four commercially available membranes were selected. Since the performance of a NF membrane is related to its structural and charge properties, membrane characterisation studies by microscopy, contact angle and electrokinetic measurements were conducted. A systematic experimental program was applied covering a wide spectrum of feed streams concerning both charged and uncharged solutes. Particularly charged streams regarding single salts and their mixtures were emphasised. Moreover, the effects of the operating conditions and the solution pH on membrane performances were investigated. Standard performance characterisation experiments, consisting of pure water permeability, organic and single salt rejection measurements, gave initial information on the membrane charge and performance characteristics. In mixture solutions of salts, distinctive behaviours of membranes to different ion types at different combinations were observed. Furthermore, artificial seawater experiments were conducted in order to determine the convenience of the considered NF membranes for this recently recognised process as an intensification step in the pre-treatment of seawater. A practical tool was developed for the performance description and prediction purposes. For this purpose, currently available models were scrutinized. A physical model, based on extended Nernst-Planck equation describing mass transport through membrane active layer in conjunction with different partition equations at membrane and bulk interfaces, was built. Some modelling parameters were obtained either directly from the characterisation data or by applying some other straightforward models using experimental data. For the latter purpose, Fortran 90 programming code was used. As the programming efforts increase with the number of components in the feed stream, an

equation based software Comsol Multiphysics was utilised. Herewith, model could be applied straightforwardly to multicomponents streams. Simulations were conducted systematically started from single salts, extended to salt mixtures and finally for seawater. A good agreement between experimental and simulation results were obtained. Suggestions were made to improve both the predictive ability and the reliability of the model. Incorporating the predictive model with system economics in a case study indicated that such an approach enables determining the optimum operating conditions and selecting the most appropriate membrane characteristics for the regarding process.

Electrochemical Systems John Wiley & Sons

Modern membrane engineering is critical to the development of process-intensification strategies and to the stimulation of industrial growth. Membrane Distillation (MD) is a broad reference that covers specific information on membranes available and methods for MD membrane preparation and characterization. The book offers an introduction to the terminology and fundamental concepts as well as a historical review of MD development. Commercial membranes used in MD as well as laboratory-made membranes, including emerging membranes, are described in detail and illustrated by a number of clear and instructive schematic drawings and images. A comprehensive review on the development of MD membranes, MD modules, MD membrane characterization, MD configurations, applications in different areas and theoretical models Introduction to the terminology and fundamental concepts associated with MD as well as an historical review of MD development Description of commercial membranes used in MD as well as laboratory-made membranes, including emerging membranes

Turbulence in Porous Media Logos Verlag Berlin GmbH

Finite element methods for approximating partial differential equations that arise in science and engineering analysis find widespread application. Numerical analysis tools make the solutions of coupled physics, mechanics, chemistry, and even biology accessible to the novice modeler. Nevertheless, modelers must be aware of the limitations and difficulties in developing numerical models that faithfully represent the system they are modeling. This textbook introduces the intellectual framework for modeling with Comsol Multiphysics, a package which has unique features in representing multiply linked domains with complex geometry, highly coupled and nonlinear equation systems, and arbitrarily complicated boundary, auxiliary, and initial conditions. But with this modeling power comes great opportunities and great perils. Progressively, in the first part of the book the novice modeler develops an understanding of how to build up complicated models piecemeal and test them modularly. The second part of the book introduces advanced analysis techniques. The final part of the book deals with case studies in a broad range of application areas including nonlinear pattern formation, thin film dynamics and heterogeneous catalysis, composite and effective media for heat, mass, conductivity, and dispersion, population balances, tomography, multiphase flow, electrokinetic, microfluidic networks, plasma dynamics, and corrosion chemistry. As a revision of Process Modeling and Simulation with Finite Element Methods, this book uses the very latest features of Comsol Multiphysics. There are new case studies on multiphase flow with phase change, plasma dynamics, electromagnetohydrodynamics, microfluidic mixing, and corrosion. In addition, major improvements to the level set method for multiphase flow to ensure phase conservation is introduced. More information about COMSOL can be found here.

Proton Exchange Membrane Fuel Cells Springer

The signaling dynamics in neuronal networks includes processes ranging from lifelong neuromodulation to direct synaptic neurotransmission. In chemical synapses, the time delay it takes to pass a signal from one neuron to the next lasts for less than a millisecond. At the post-synaptic neuron, further signaling is either up- or down-regulated, dependent on the specific neurotransmitter and receptor. While this up- and down-regulation of signals usually runs perfectly well and enables complex performance, even a minor dysfunction of this signaling system can cause major complications, in the shape of neurological disorders. The field of organic bioelectronics has the ability to interface neurons with high spatiotemporal recording and stimulation techniques. Local chemical stimulation, i.e. local release of neurotransmitters, enables the possibility of artificially altering the chemical environment in dysfunctional signaling pathways to regain or restore neural function. To successfully interface the biological nervous system with electronics, a range of demands must be met. Organic bioelectronic techniques and materials are capable of reaching the demands on the biological as well as the electronic side of the interface. These demands span from high performance biocompatible materials, to miniaturized and specific device architectures, and high dose control on demand within milliseconds. The content of this thesis is a continuation of the development of organic bioelectronic devices for neurotransmitter delivery. Organic materials are utilized to electrically control the dose of charged neurotransmitters by translating electric charge into controlled artificial release. The first part of the thesis, Papers 1 and 2, includes further development of the resistor-type release device called the organic electronic ion pump. This part includes material evaluation, microfluidic incorporation, and device design considerations. The aim for the second part of this thesis, Papers 3 and 4, is to enhance temporal performance, i.e. reduce the delay between electrical signal and neurotransmitter delivery to corresponding delay in biological neural signaling, while retaining tight dosage control. Diffusion of neurotransmitters between nerve cells is a slow process, but since it is restricted to short distances, the total time delay is short. In our organic bioelectronic devices, several orders of magnitude in speed can be gained by switching from lateral to vertical delivery geometries. This is realized by two different types of vertical diodes combined with a lateral preload and waste configuration. The vertical diode assembly was further expanded with a control electrode that enables individual addressing in each of several combined release sites. These integrated circuits allow for release of neurotransmitters with high on/off release ratios, approaching delivery times on par with biological neurotransmission.

The Graphene Revolution Prentice Hall

This issue of ECS Transactions is devoted to all aspects of research, development, and engineering of proton exchange membrane (PEM) fuel cells and attacks, as well as low-temperature direct-fuel cells. The intention of the symposium is to bring together the international community working on the subject and to enable effective interactions between the research and engineering communities. This issue is sold as a two-part set.

NASA Tech Briefs World Scientific Publishing Company

PEM Fuel Cells: Fundamentals, Advanced Technologies, and Practical Application provides a comprehensive introduction to the principles of PEM fuel cell, their working condition and application, and the latest breakthroughs and challenges for fuel cell technology. Each chapter follows a systematic and consistent structure with clear illustrations and diagrams for easy understanding. The opening chapters address the basics of PEM technology; stacking and membrane electrode assembly for PEM, degradation mechanisms of electrocatalysts, platinum dissolution and redeposition, carbon-support corrosion, bipolar plates and carbon nanotubes for the PEM, and gas diffusion layers. Thermodynamics, operating conditions, and electrochemistry address fuel cell efficiency and the fundamental workings of the PEM. Instruments and techniques for testing and diagnosis are then presented alongside practical tests. Dedicated chapters explain how to use MATLAB and COMSOL to conduct simulation and modeling of catalysts, gas diffusion layers, assembly, and membrane. Degradation and failure modes are discussed in detail, providing strategies and protocols for mitigation. High-temperature PEMs are also examined, as are the fundamentals of EIS. Critically, the environmental impact and life cycle of the production and storage of hydrogen are addressed, as are the risk and durability issues of PEMFC technology. Dedicated chapters are presented on the economics and commercialization of PEMFCs, including discussion of installation costs, initial capital costs, and the regulatory frameworks; apart from this, there is a separate chapter on their application to the automotive industry. Finally, future challenges and applications are considered. PEM Fuel Cells: Fundamentals, Advanced Technologies, and Practical Application provides an in-depth and comprehensive reference on every aspect of PEM fuel cells fundamentals, ideal for researchers, graduates, and students. Presents the fundamentals of PEM fuel cell technology, electrolytes, membranes, modeling, conductivity, recent trends, and future applications Addresses commercialization, public policy, and the environmental impacts of PEMFC in dedicated chapters Presents state-of-the-art PEMFC research alongside the underlying concepts

Proton Exchange Membrane Fuel Cells 9 Cuvillier Verlag

In 2003, Russian physicists Andre Geim and Konstantin Novoselov found a way to produce graphene – the thinnest substance in the world – by using sticky tape to separate an atom-thick layer from a block of graphite. Their efforts would win the 2010 Nobel Prize for Physics, and now the applications of graphene and other 'two-dimensional' substances form a worldwide industry. Graphene is far stronger than steel, a far better conductor than any metal, and able to act as a molecular sieve to purify water. Electronic components made from graphene are a fraction of the size of silicon microchips and can be both flexible and transparent, making it possible to build electronics into clothing, produce solar cells to fit any surface, or even create invisible temporary tattoos that monitor your health. Ultra-thin materials give us the next big step forward since the transistor revolutionised electronics. Get ready for the graphene revolution.

Best Sellers - Books :
• How To Win Friends & Influence People (dale Carnegie Books)
• The Silent Patient
• America's Cultural Revolution: How The Radical Left Conquered Everything
• Are You There God? It's Me, Margaret. By Judy Blume
• Twisted Love (twisted, 1)
• The Democrat Party Hates America
• Haunting Adeline (cat And Mouse Duet) By H. D. Carlton
• How To Catch A Leprechaun
• Spare By Prince Harry The Duke Of Sussex
• The Body Keeps The Score: Brain, Mind, And Body In The Healing Of Trauma By Bessel Van Der Kolk M.d.