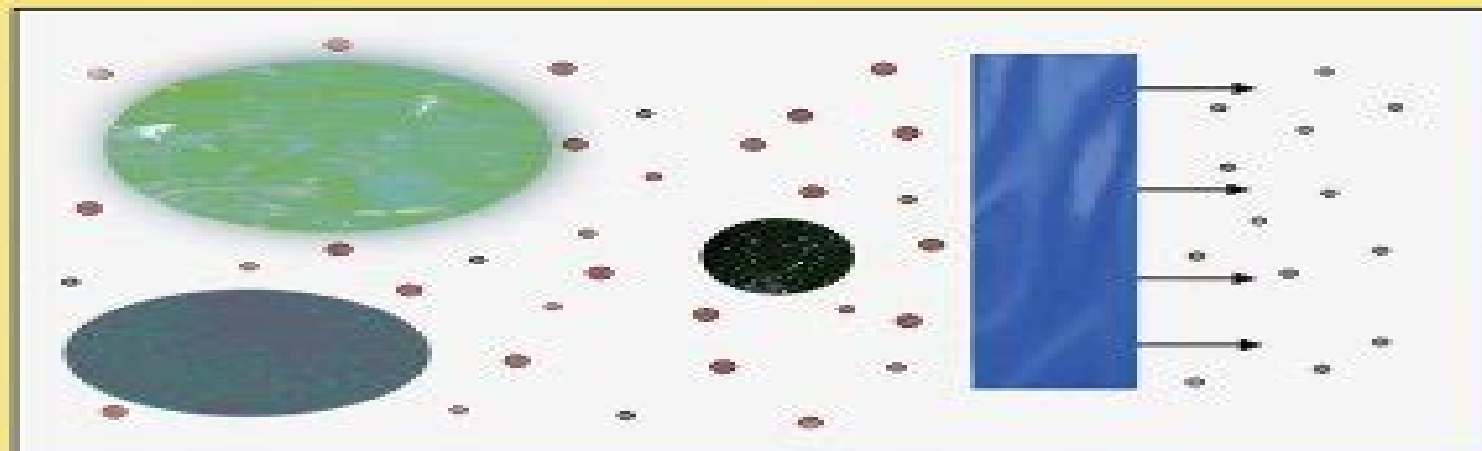


# Advanced Membrane Technology and Applications



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*Edited by*  
Norman N. Li  
Anthony G. Fane  
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# Advanced Membrane Technology And Applications

**Richard W. Baker**



## **Advanced Membrane Technology And Applications:**

*Advanced Membrane Technology and Applications* Norman N Li, Anthony G. Fane, W. S. Winston Ho, Takeshi Matsuura, 2011-09-20 Advanced membranes from fundamentals and membrane chemistry to manufacturing and applications A hands on reference for practicing professionals Advanced Membrane Technology and Applications covers the fundamental principles and theories of separation and purification by membranes the important membrane processes and systems and major industrial applications It goes far beyond the basics to address the formulation and industrial manufacture of membranes and applications This practical guide Includes coverage of all the major types of membranes ultrafiltration microfiltration nanofiltration reverse osmosis including the recent high flux and low pressure membranes and anti fouling membranes membranes for gas separations and membranes for fuel cell uses Addresses six major topics membranes and applications in water and wastewater membranes for biotechnology and chemical biomedical applications gas separations membrane contractors and reactors environmental and energy applications and membrane materials and characterization Includes discussions of important strategic issues and the future of membrane technology With chapters contributed by leading experts in their specific areas and a practical focus this is the definitive reference for professionals in industrial manufacturing and separations and research and development practitioners in the manufacture and applications of membranes scientists in water treatment pharmaceutical food and fuel cell processing industries process engineers and others It is also an excellent resource for researchers in industry and academia and graduate students taking courses in separations and membranes and related fields

[Advanced Membrane Science and Technology for Sustainable Energy and Environmental Applications](#) Angelo Basile, Suzana Pereira Nunes, 2011-08-24 Membrane materials allow for the selective separation of gas and vapour and for ion transport Materials research and development continues to drive improvements in the design manufacture and integration of membrane technologies as critical components in both sustainable energy and clean industry applications Membrane utilisation offers process simplification and intensification in industry providing low cost and efficient and reliable operation and contributing towards emissions reductions and energy security Advanced membrane science and technology for sustainable energy and environmental applications presents a comprehensive review of membrane utilisation and integration within energy and environmental industries Part one introduces the topic of membrane science and engineering from the fundamentals of membrane processes and separation to membrane characterization and economic analysis Part two focuses on membrane utilisation for carbon dioxide CO<sub>2</sub> capture in coal and gas power plants including pre and post combustion and oxygen transport technologies Part three reviews membranes for the petrochemical industry with chapters covering hydrocarbon fuel natural gas and synthesis gas processing as well as advanced biofuels production Part four covers membranes for alternative energy applications and energy storage such as membrane technology for redox and lithium batteries fuel cells and hydrogen production Finally part five discusses

membranes utilisation in industrial and environmental applications including microfiltration ultrafiltration and forward osmosis as well as water wastewater and nuclear power applications With its distinguished editors and team of expert contributors Advanced membrane science and technology for sustainable energy and environmental applications is an essential reference for membrane and materials engineers and manufacturers as well as researchers and academics interested in this field Presents a comprehensive review of membrane science and technology focusing on developments and applications in sustainable energy and clean industry Discusses the fundamentals of membrane processes and separation and membrane characterization and economic analysis Addresses the key issues of membrane utilisation in coal and gas power plants and the petrochemical industry the use of membranes for alternative energy applications and membrane utilisation in industrial and environmental applications

### **Membrane Technology: Applications to Industrial Wastewater**

**Treatment** Ana Caetano,1995 Presents case studies of how new membrane separation techniques are being used to minimize the environmental impact of pollution from textile tannery pulp and paper metal finishing and electroplating food and other industries in order to comply with increasing by stricter European standards The 13 lectures are from an advanced course given in Sipra Italy in October 1992 Addressed to engineers technical managers and graduate students No index Annotation copyright by Book News Inc Portland OR

### **Membrane Technology and Engineering for Water**

**Purification** Rajindar Singh,2014-09-25 Membrane Technology and Engineering for Water Purification Second Edition is written in a practical style with emphasis on process description key unit operations systems design and costs plant equipment description equipment installation safety and maintenance process control plant start up and operation and troubleshooting It is supplemented by case studies and engineering rules of thumb The author is a chemical engineer with extensive experience in the field and his technical knowledge and practical know how in the water purification industry are summarized succinctly in this new edition This book will inform you which membranes to use in water purification and why where and when to use them It will help you to troubleshoot and improve performance and provides case studies to assist understanding through real life examples Membrane Technology section updated to include forward osmosis electrodialysis and diffusion dialysis Hybrid Membrane Systems expanded to cover zero liquid discharge salt recovery and removal of trace contaminants Includes a new section on plant design energy and economics

### *Membrane Technology and Applications*

Richard W. Baker,2004-05-31 Table of Contents Preface Acknowledgments for the first edition Acknowledgments for the second edition 1 Overview of Membrane Science and Technology 1 2 Membrane Transport Theory 15 3 Membranes and Modules 89 4 Concentration Polarization 161 5 Reverse Osmosis 191 6 Ultrafiltration 237 7 Microfiltration 275 8 Gas Separation 301 9 Pervaporation 355 10 Ion Exchange Membrane Processes Electrodialysis 393 11 Carrier Facilitated Transport 425 12 Medical Applications of Membranes 465 13 Other Membrane Processes 491 Appendix 523 Index 535

**Advanced Nanomaterials for Membrane Synthesis and Its Applications** Woei Jye Lau,Ahmad Fauzi Ismail,Arun M.

Isloor, Amir Al-Ahmed, 2018-11-21 Advanced Nanomaterials for Membrane Synthesis and Its Applications provides the academic and industrial communities the most up to date information on the latest trends in membrane nanomaterials and membrane nanotechnology used in wastewater treatment environmental technology and energy The rapid advances in nanomaterials and nanotechnology development over the past decade have resulted in significant growth of the membrane business for various industrial processes particularly in nanotechnology based membrane processes While membrane technology is increasingly being used for liquid and gas separations it has great potential in a variety of additional applications As the worldwide academic community has a strong interest in advanced membrane processes particularly membrane nanotechnology for specific separations this book provides a timely update on the topic Presents a unique focus on the use of advanced nanomaterials in membrane fabrication modification and in the description of membrane nanotechnologies such as nanofiltration thin film nanocomposites and nanofibers for various applications Describes next generation membranes providing first resource details on the development and commercialization stages of these new membranes Represents the state of the art on the use of nanomaterials in membrane science Treatise on Water Science

, 2010-09-01 Water quality and management are of great significance globally as the demand for clean potable water far exceeds the availability Water science research brings together the natural and applied sciences engineering chemistry law and policy and economics and the Treatise on Water Science seeks to unite these areas through contributions from a global team of author experts The 4 volume set examines topics in depth with an emphasis on innovative research and technologies for those working in applied areas Published in partnership with and endorsed by the International Water Association IWA demonstrating the authority of the content Editor in Chief Peter Wilderer a Stockholm Water Prize recipient has assembled a world class team of volume editors and contributing authors Topics related to water resource management water quality and supply and handling of wastewater are treated in depth Food Processing Stephanie Clark, Stephanie Jung, Buddhi

Lamsal, 2014-06-03 FOOD PROCESSING Food Processing Principles and Applications Second Edition is the fully revised new edition of this best selling food technology title Advances in food processing continue to take place as food scientists and food engineers adapt to the challenges imposed by emerging pathogens environmental concerns shelf life quality and safety as well as the dietary needs and demands of humans In addition to covering food processing principles that have long been essential to food quality and safety this edition of Food Processing Principles and Applications unlike the former edition covers microbial enzyme inactivation kinetics alternative food processing technologies as well as environmental and sustainability issues currently facing the food processing industry The book is divided into two sections the first focusing on principles of food processing and handling and the second on processing technologies and applications As a hands on guide to the essential processing principles and their applications covering the theoretical and applied aspects of food processing in one accessible volume this book is a valuable tool for food industry professionals across all manufacturing sectors and

serves as a relevant primary or supplemental text for students of food science      Membrane Separation Principles and Applications Ahmad Fauzi Ismail, Mukhlis A. Rahman, Mohd Hafiz Dzarfan Othman, Takeshi Matsuura, 2018-09-07 Membrane Separation Principles and Applications From Material Selection to Mechanisms and Industrial Uses the latest volume in the Handbooks in Separation Science series is the first single resource to explore all aspects of this rapidly growing area of study Membrane technology is now accepted as one of the most effective tools for separation and purification primarily due to its simple operation The result has been a proliferation of studies on this topic however the relationships between fundamental knowledge and applications are rarely discussed This book acts as a guideline for those who are interested in exploring membranes at a more progressive level Covering methods of pressure driving force partial pressure driving force concentration driving force electrical potential driving force hybrid processes and more this volume is more complete than any other known resource on membrane separations Covers membrane material selection membrane fabrication membrane characterization separation mechanisms and applications in each chapter Authored by contributors who are internationally recognized as experts in their respective fields Organized by the driving force behind each type of membrane separation a unique approach that more clearly links fundamental principles with their dominant applications      **Nanostructured Polymer Membranes, Volume 2** Visakh P. M., Olga B. Nazarenko, 2016-08-26 The 2nd volume on applications with discuss the various aspects of state of the art new challenges and opportunities for gas and vapor separation of polymer membranes membranes for wastewater treatment polymer electrolyte membranes and methanol fuel cells polymer membranes for water desalination optical electrochemical and anion polyanion sensors polymeric pervaporation membranes organic organic separation biopolymer electrolytes for energy devices carbon nanoparticles for pervaporation polymeric membranes and mixed matrix membranes for nanofiltration application      **Advanced Membrane Technology** Norman N. Li, 2003 Drawn from an October 2001 conference held in Italy the 38 papers in this volume characterize the primary types of membranes and their processes particularly in wastewater purification and bioprocessing The papers are arranged into sections on membrane contactors nanofiltration charged membrane      **Science and Technology of Separation Membranes** Tadashi Uragami, 2017-02-10 Offers a comprehensive overview of membrane science and technology from a single source Written by a renowned author with more than 40 years experience in membrane science and technology and polymer science Covers all major current applications of membrane technology in two definitive volumes Includes academic analyses applications and practical problems for each existing membrane technology Includes novel applications such as membrane reactors hybrid systems and optical resolution as well as membrane fuel cells      **Chemical Engineering Progress**, 2009      *Membrane Technologies for Water Treatment* Alberto Figoli, Jan Hoinkis, Jochen Bundschuh, 2016-02-18 Focuses on the application of membrane technologies in removing toxic metals metalloids from water Particular attention is devoted to the removal of arsenic uranium and fluoride These compounds are all existing in the earth's crust at levels between two and five thousands

micrograms per kg parts per million on average and these compounds can be considered highly toxic to humans who are exposed to them primarily from air food and water In order to comply with the new maximum contaminant level numerous studies have been undertaken to improve established treatments or to develop novel treatment technologies for removing toxic metals from contaminated surface and groundwater Among the technologies available applicable for water treatment membrane technology has been identified as a promising technology to remove such toxic metals from water The book describes both pressure driven traditional processes such as Nanofiltration Reverse Osmosis Ultrafiltration etc and more advanced membrane processes such as forward osmosis membrane distillation and membrane bio reactors employed in the application of interest Key aspect of this book is to provide information on both the basics of membrane technologies and on the results depending on the type of technology employed

*Handbook of Environmental Engineering* Rao Surampalli,Tian C. Zhang,Satinder Kaur Brar,Krishnamoorthy Hegde,Rama Pulicharla,Mausam Verma,2018-08-24 A complete guide to environmental remediation technologies techniques and regulations This practical resource offers comprehensive coverage of the latest environmental codes alongside step by step remediation procedures The book features information on all segments of the market including water air quality and hazardous wastes and enables you to ensure compliance with federal regulations Handbook of Environmental Engineering fully explains engineering methods and technologies and directly connects them to applicable standards You will get details on environmental tools such as sensors and monitoring toxicity controls and treatments and waste disposal Measurement data environmental impact assessments and real world examples demonstrate how to apply each technique in the field

**Inorganic Membranes for Energy and Environmental Applications** Arun C. Bose,2008-10-08 Research interest in inorganic membrane materials and processes has significantly increased in recent years due to novel potentially low cost energy and fuel production applications This book documents the recent progress in membrane science especially in advanced materials and novel reaction and separation concepts The book classifies membranes based on the mechanism of operation i e size exclusion filtration solution diffusion and mixed ion electron conduction of the permeate streams

**Two-Dimensional (2D) Nanomaterials in Separation Science** Rasel Das,2021-04-26 This book covers newly emerging two dimensional nanomaterials which have been recently used for the purpose of water purification It focuses on the synthesis methods of 2D materials and answers how scientists engineers nanotechnologist environmentalists could use these materials for fabricating new separation membranes and most probably making commercially feasible technology The chapters are written by a collection of international experts ensuring a broad view of each topic The book will be of interest to experienced researchers as well as young scientists looking for an introduction into 2D materials based cross disciplinary research

*Chemical Nanoscience and Nanotechnology* Francisco Torrens,A. K. Haghi,Tanmoy Chakraborty,2019-08-05 This new volume presents a wealth of practical experience and research on new methodologies and important applications in chemical nanotechnology It also includes small scale

nanotechnology related projects that have potential applications in several disciplines of chemistry and nanotechnology In this book contributions range from new methods to novel applications of existing methods to gain understanding of the material and or structural behavior of new and advanced systems Topics cover computational methods in chemical engineering and chemoinformatics studies of some of physico chemical properties of several important nanoalloy clusters the use of 3D reconstruction of nanofibrous membranes nanotechnology research for green engineering and sustainability nanofiltration and carbon nanotubes applications in water treatment and much more

**Application of Nanotechnology in Membranes for Water Treatment** Alberto Figoli, Jan Hoinkis, Sacide Alsoy Altinkaya, Jochen Bundschuh, 2017 The book focuses on Application of Nanotechnology in Membranes for Water Treatment but not only provides a series of innovative solutions for water reclamation through advanced membrane technology but also serves as a medium to promote international cooperation and networking for the development of advanced membrane technology for Universal well being and to achieve the common goal of supplying economically environmentally and societally sustainable freshwater and better sanitation systems This book is unique because the chapters were authored by established researchers all around the globe based on their recent research findings In addition this book provides a holistic coverage of membrane development for water treatment from the membrane preparation and characterizations to the performance for specific processes and applications Since that water scarcity has become a global risk and one of the most serious challenges for the scientific community in this century the publication of this book is therefore significant as it will serve as a medium for a good reference of an alternative solution in water reclamation This book will provide the readers with a thorough understanding of the different available approaches for manufacturing membranes both with innovative polymeric systems and inorganic nano materials which could give enhanced functionalities catalytic and antimicrobial activities to improve the performance of the existing membranes It will be useful for leading decision and policy makers water sector representatives and administrators policy makers from the governments business leaders business houses in water treatment and engineers scientists from both industrialized and developing countries as well Provided by publisher

*Membranes and Functional Materials* Risa Suryana, Noto Susanto Gultom, Syed Imran Shafiq, 2024-11-06 Special topic volume with invited peer reviewed papers only



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