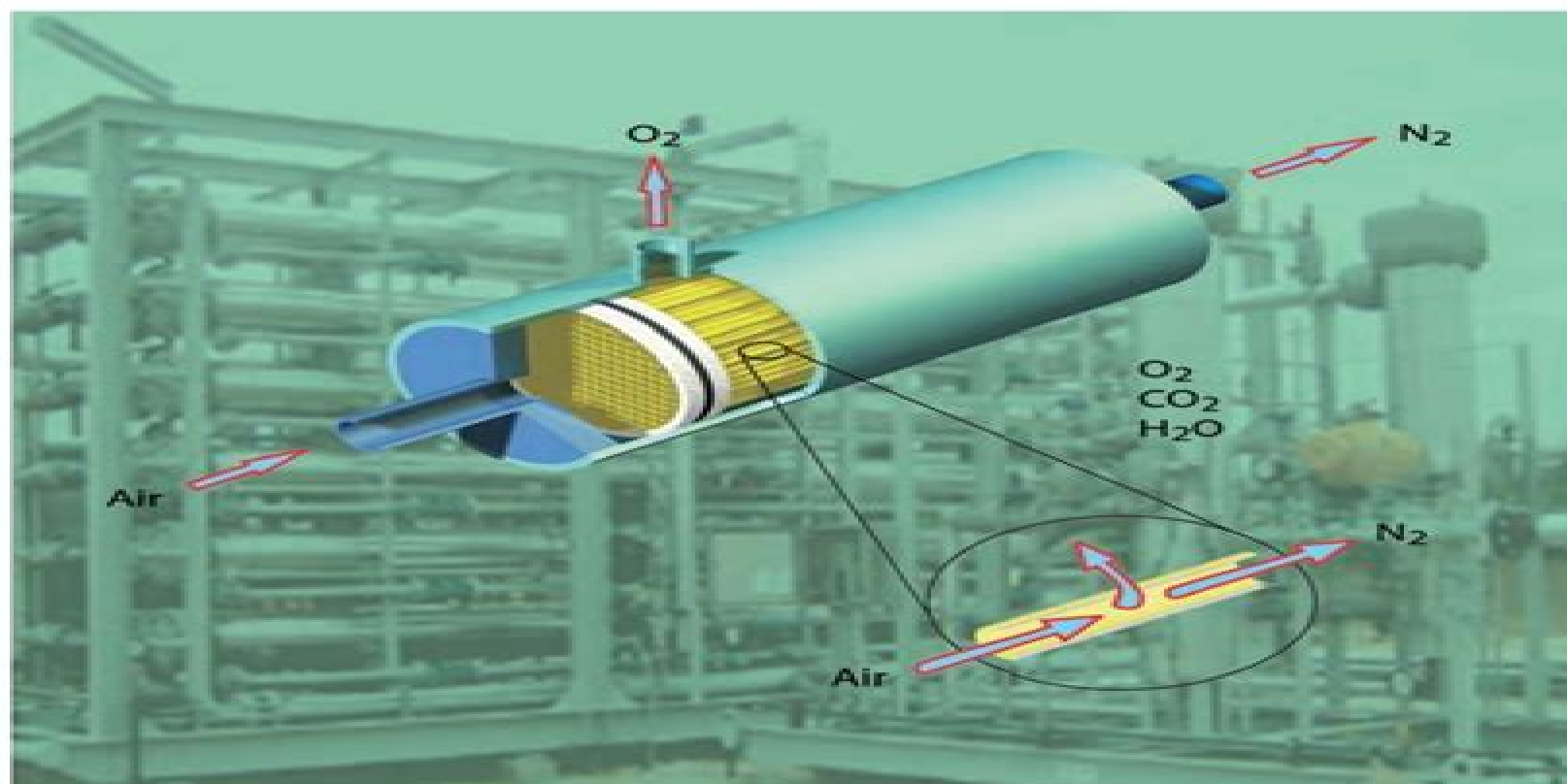


Edited by Enrico Drioli and Giuseppe Barbieri

Membrane Engineering for the Treatment of Gases

Volume 1: Gas-separation Problems with Membranes



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Membrane Engineering For The Treatment Of Gases

Volume 1 Gas Separation Problems With Membranes

Enrico Drioli, Giuseppe Barbieri



Membrane Engineering For The Treatment Of Gases Volume 1 Gas Separation Problems With Membranes:

Membrane Engineering for the Treatment of Gases: Gas-separation problems with membranes E. Drioli, Giuseppe Barbieri, 2011 This two volume set presents the state of the art and potential for future developments in membrane engineering for the separation of gases

Membrane Engineering for the Treatment of Gases Enrico Drioli, Giuseppe Barbieri, Adele Brunetti, 2017-10-06 Elaborating on recent and future developments in the field of membrane engineering Volume 1 focuses on new membrane materials which have recently emerged in gas separation Covering graphene graphene oxide based membranes PIMs thermally rearranged membranes and new mixed matrix membranes alongside membrane pilot plant trials of gas separation such as CO₂ from flue gas and biogas as well as a cost analysis of competitive membrane and hybrid systems this book provides a comprehensive account Together with Volume 2 these books form an innovative reference work on membrane engineering and technology in the field of gas separation and gaseous phase membrane reactors

Membrane Engineering for the Treatment of Gases: Volume 1 Enrico Drioli, Giuseppe Barbieri, Adele Brunetti, 2017-10-06 Volume 1 Gas separation issues with membranes volume 2 Gas separation issues combined with membrane reactors

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Membrane Technology for CO₂ Sequestration Zeinab Abbas Jawad, 2019-03-26 This book addresses the fundamentals of CO₂ storage for long term sequestration in a subsurface geologic formation In general membrane gas separation can find a large room of application in flue gas To achieve the development of this technology on a larger scale than which is possible in the lab we have to use membrane engineering Consequently greater emphasis is placed on novel materials for gas separation Possible design strategies and role of novel materials are discussed Additionally the latest progress in design and preparation of asymmetric membranes for natural gas purification are highlighted In fact further development should focus on module and process design in order to bring gas separation membrane technology into commercial application Therefore the key issues to propel current research towards industrial application are examined Besides the feasibility of implementing polyimide membrane for CO₂ removal under real industrial conditions and its economic viability are highlighted In order to exhibit excellent film forming properties zeolite membrane and cellulose acetate butyrate membrane are addressed Interestingly it was found that the most accurate theoretical three

phase model is arguably revised Pal model with average percentage error of 0.74% **Membranes For Gas Separations**

Moises A Carreon, 2017-08-11 This book aims at illustrating several examples of different membrane compositions ranging from inorganic polymeric metallic metal organic framework and composite which have been successfully deployed to separate industrially relevant gas mixtures including hydrogen nitrogen methane carbon dioxide olefins paraffins among others Each book chapter highlights some of the current and key fundamental and technological challenges for these membranes that must be overcome in order to envision its application at industrial level **Membrane Engineering for**

the Treatment of Gases Enrico Drioli, Giuseppe Barbieri, 2011-07-06 Membranes already have important applications in artificial organs the processing of biotechnological products food manufacture waste water treatment and seawater desalination Their uses in gaseous mixture separations are however far from achieving their full potential Separation of air components natural gas dehumidification and sweetening separation and recovery of CO₂ from biogas and H₂ from refinery gases are all examples of current industrial applications The use of membranes for reducing the greenhouse effect and improving energy efficiency has also been suggested New process intensification strategies in the petrochemical industry have opened up another growth area for gas separation membrane systems and membrane reactors This two volume set presents the state of the art in membrane engineering for the separation of gases It addresses future developments in carbon capture and utilization H₂ production and purification and O₂ N₂ separation Topics covered include the applications of membrane gas separation in the petrochemical industry implementation of membrane processes for post combustion capture commercial applications of membranes in gas separations simulation of membrane systems for CO₂ capture design and development of membrane reactors for industrial applications Pd based membranes in hydrogen production modelling and simulation of membrane reactors for hydrogen production and purification novel hybrid membrane pressure swing adsorption process for gas separation molecular dynamics as a new tool for membrane design and physical aging of membranes for gas separations Volume 2 looks at problems combined with membrane reactors **Membrane Reactor**

Engineering Angelo Basile, Marcello De Falco, Gabriele Centi, Gaetano Iaquaniello, 2016-09-19 Uniquely focussed on the engineering aspects of membrane reactors Provides tools for analysis with specific regard to sustainability Applications include water treatment wastewater recycling desalination biorefineries agro food production Membrane reactors can bring energy saving reduced environmental impact and lower operating costs **Membrane Technology for Sustainability**

Rizwan Nasir, Danial Qadir, Hafiz Abdul Mannan, 2025-09-30 This book is a comprehensive assessment of the pivotal role that membrane technology plays in addressing ongoing environmental and sustainability challenges It covers various aspects of membrane technology with a focus on gas separation and water treatment membranes and explains their principles design and applications Readers interested in sustainable engineering will learn about membrane materials fabrication techniques performance optimization and system integration along with a holistic perspective on the capabilities and limitations of

membranes This book presents real world case studies and success stories highlighting the practical implementation of membrane technologies in various industries Features Explains the use of membrane technology and its transformative potential for a greener and more resilient environment Discusses membrane technology and its applications in gas and water treatment Includes case studies that illustrate the performance of membrane processes in different applications with regard to sustainability Provides insights into the challenges and opportunities of using membrane technology to improve gas and water treatment Includes information on new membrane materials processes applications and future trends This book is a great reference for researchers and graduate students in environmental engineering water engineering and chemical engineering It is also an excellent resource for environmental engineers and professionals in the water and gas industry interested in sustainability

Membrane Engineering Enrico Drioli, Lidieta Giorno, Francesca Macedonio, 2018-12-17

Modern membrane science and technology aids engineers in developing and designing more efficient and environmentally friendly processes The optimal material and membrane selection as well as applications in the many involved industries are provided This work is the ideal introduction for engineers working in membrane science and applications wastewater desalination adsorption and catalysis process engineers in separation science biologists and biochemists environmental scientists and most of all students Its multidisciplinary approach also stimulates thinking of hybrid technologies for current and future life saving applications artificial organs drug delivery

27th European Symposium on Computer Aided Process Engineering, 2017-09-21 27th European Symposium on Computer Aided Process Engineering Volume 40 contains the papers presented at the 27th European Society of Computer Aided Process Engineering ESCAPE event held in Barcelona October 1 5 2017 It is a valuable resource for chemical engineers chemical process engineers researchers in industry and academia students and consultants for chemical industries Presents findings and discussions from the 27th European Society of Computer Aided Process Engineering ESCAPE event

Sustainable Nanoscale Engineering Gyorgy Szekely, Andrew G. Livingston, 2019-09-18 Sustainable Nanoscale Engineering From Materials Design to Chemical Processing presents the latest on the design of nanoscale materials and their applications in sustainable chemical production processes The newest achievements of materials science in particular nanomaterials opened new opportunities for chemical engineers to design more efficient safe compact and environmentally benign processes These materials include metal organic frameworks graphene membranes imprinted polymers polymers of intrinsic microporosity nanoparticles and nanofilms to name a few Topics discussed include gas separation CO₂ sequestration continuous processes waste valorization catalytic processes bioengineering pharmaceutical manufacturing supercritical CO₂ technology sustainable energy molecular imprinting graphene nature inspired chemical engineering desalination and more Describes new efficient and environmentally accepted processes for nanomaterials design Includes a large array of materials such as metal organic frameworks graphene imprinted polymers and more Explores the contribution of these materials in the development of sustainable chemical processes

Current Trends and Future Developments on (Bio-) Membranes Angelo Basile, Fausto Gallucci, 2020-01-05 Current Trends and Future Developments in Bio Membranes Recent Advances in Metallic Membranes presents recent developments in metallic membranes used in membrane reactors to save energy It also offers a comprehensive review of the present state of the art on the fabrication and design of metallic membranes and membrane reactors considering various applications This book focuses on the structure preparation characterization and applications of metallic membranes and membrane reactors as well as transport mechanisms and simulation aspects As recent research has focused on the development of metallic membranes and their applications this book is an ideal reference on different production procedures and their use Reviews metallic membranes research and applications Outlines the mechanisms of metallic membrane based processes Includes structure preparation characterization and properties of metallic membranes Highlights various applications of metallic membranes in energy production **Accelerating the Transition to a Hydrogen Economy** Tonni Agustiono

Kurniawan, Majeti Narasimha Vara Prasad, 2024-11-07 Accelerating the Transition to a Hydrogen Economy Achieving Carbon Neutrality provides a guide to the transition to net zero carbon emissions through the hydrogen economy Within the context of the Industrial Revolution 4.0 the book explores the implications of the hydrogen economy on the nexus of food waste energy and provides an overview of the impacts of the hydrogen economy on the energy industry The book examines the role of the hydrogen economy in achieving net zero carbon emissions in the waste sector methods for achieving decarbonization in different industries and parts of the economy and the technologies that can achieve this Each chapter provides a synopsis of the fundamental knowledge and latest developments to ensure readers of all experience levels and backgrounds can benefit from the book Future perspectives and actionable next steps are suggested alongside case studies that provide a roadmap to decarbonization Evaluates the nexus of technology society environment and economics for the hydrogen economy from the perspective of sustainability Critically analyzes current and potential contributions of the hydrogen economy to net zero carbon emission Offers insights to government and policymakers on how to support and accelerate the hydrogen economy for decarbonization *Pd-based Membranes* Thijs Peters, Alessio Caravella, 2019-03-26 Palladium Pd based

membranes have received a great deal of attention from both academia and industry thanks to their ability to selectively separate hydrogen from gas streams The integration of such membranes with appropriate catalysts in membrane reactors allows for hydrogen production with CO₂ capture that can be applied in smaller bioenergy or combined heat and power CHP plants as well as in large scale power plants Pd based membranes are therefore regarded as a Key Enabling Technology KET to facilitate the transition towards a knowledge based low carbon and resource efficient economy This Special Issue of the journal Membranes on Pd based Membranes Overview and Perspectives contains nine peer reviewed articles Topics include manufacturing techniques understanding of material phenomena module and reactor design novel applications and demonstration efforts and industrial exploitation **Materials Science of Membranes for Gas and Vapor Separation**

Benny Freeman, Yuri Yampolskii, Ingo Pinnau, 2006-05-12 *Materials Science of Membranes for Gas and Vapor Separation* is a one stop reference for the latest advances in membrane based separation and technology Put together by an international team of contributors and academia the book focuses on the advances in both theoretical and experimental materials science and engineering as well as progress in membrane technology Special attention is given to comparing polymer and inorganic organic separation and other emerging applications such as sensors This book aims to give a balanced treatment of the subject area allowing the reader an excellent overall perspective of new theoretical results that can be applied to advanced materials as well as the separation of polymers The contributions will provide a compact source of relevant and timely information and will be of interest to government industrial and academic polymer chemists chemical engineers and materials scientists as well as an ideal introduction to students

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

[Nanocomposite Membranes for Water and Gas Separation](#) Mohtada Sadrzadeh, Toraj Mohammadi, 2019-11-13 *Nanocomposite Membranes for Water and Gas Separation* presents an introduction to the application of nanocomposite membranes in both water and gas separation processes This in depth literature review and discussion focuses on state of the art nanocomposite membranes current challenges and future progress including helpful guidelines for the further improvement of these materials for water and gas separation processes Chapters address material development synthesis protocols and the numerical simulation of nanocomposite membranes

along with current challenges and future trends in the areas of water and gas separation Explains the development of nanocomposite membranes through bio mimicking nanomaterials Discusses the surface modification of nanomaterials to fabricate robust nanocomposite membranes Outlines the environmental and operational challenges for the application of nanocomposite membranes

Membrane Gas Separation Benny Freeman, Yuri Yampolskii, 2011-06-20 Gas separation membranes offer a number of benefits over other separation technologies and they play an increasingly important role in reducing the environmental impacts and costs of many industrial processes This book describes recent and emerging results in membrane gas separation including highlights of nanoscience and technology novel polymeric and inorganic membrane materials new membrane approaches to solve environmental problems e g greenhouse gases aspects of membrane engineering and recent achievements in industrial gas separation It includes Hyperbranched polyimides amorphous glassy polymers and perfluorinated copolymers Nanocomposite mixed matrix membranes Polymeric magnetic membranes Sequestration of CO₂ to reduce global warming Industrial applications of gas separation Developed from sessions of the most recent International Congress on Membranes and Membrane Processes Membrane Gas Separation gives a snapshot of the current situation and presents both fundamental results and applied achievements

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