

# Membrane cleaning methods

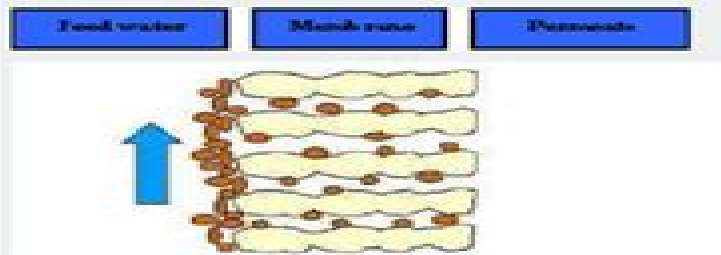
## Membrane technology

There are several different membrane cleaning methods, such as forward flush, backward flush and air flush.

- When **forward flush** is applied, membranes are flushed with feed water or permeate forward. The feed water or permeate flows through the system more rapidly than during the production phase. Because of the more rapid flow and the resulting turbulence, particles that are absorbed to the membrane are released and discharged. The particles that are absorbed to membrane pores are not released. These particles can only be removed through backward flushing.
- **Backward flush** is a reversed filtration process. Permeate is flushed through the feed water side of the system under pressure, applying twice the flux that is used during filtration. When the flux has not restored itself sufficiently after back flushing, a chemical cleaning process can be applied.
- During a **chemical cleaning process**, membranes are soaked with a solution of chlorine bleach, hydrochloric acid or hydrogen peroxide. First the solution soaks into the membranes for a number of minutes and after that a forward flush or backward flush is applied, causing the contaminants to be rinsed out.
- A newer cleaning method is the so-called **air flush or air/ water flush**. This is a forward flush during which air is injected in the supplier pipe. Because air is used (while the water speed remains the same), a much more turbulent cleaning system is created.

### Forward flush

When forward flush is applied in a membrane, the barrier that is responsible for dead-end management is opened. At the same time the membrane is temporarily performing cross-flow filtration, without the production of permeate. The purpose of a forward flush is the removal of a constructed layer of contaminants on the membrane through the creation of turbulence. A high hydraulic pressure gradient is in order during forward flush.



### Backward flush

When backward flush is applied the pores of a membrane are flushed inside out. The pressure on the permeate side of the membrane is higher than the pressure within the membranes, causing the pores to be cleaned. A backward flush is executed under a pressure that is a bout 2.5 times greater than the production pressure. Permeate is always used for a backward flush, because the permeate chamber must always be free of contagion. A consequence of backward flush is a decrease in recovery of the process. Because of this, a

# Methods In Membrane Technology 2

**J. Mulder**



## **Methods In Membrane Technology 2:**

Membrane Technologies for Biohydrogen Production and Purification Angelo Basile, Rambabu

Krishnamoorthy, 2025-11-01 Membrane Technologies for Biohydrogen Production and Purification Current Trends and Future Developments in Bio Membranes focuses on the introduction analysis and application of membrane technologies for biohydrogen production purification storage and transport The book provides comprehensive coverage of emerging membrane based technologies for the production and purification of biohydrogen by integrated engineering approaches with a special focus on novel membrane based techniques for maximizing biohydrogen yields It details recent developments in materials design and engineering aspects of membranes assisted biohydrogen technology illustrating their advantages over conventional systems improved performance and industry potential The book sheds light and gives a broad but very detailed view from the point of view of scientists researchers students and industrial engineers working in the field of biohydrogen and its technology transfer from laboratory to industry It also includes an exclusive chapter on case studies of pilot scale demonstrations of membrane assisted biohydrogen production and purification assuring the industrial potential of the book s topic This makes it a key reference for experts and R D managers interested in the industrial development of biohydrogen production as well as academic researchers and postgraduate students working in the wider areas of membrane technology and biohydrogen technology Emphasizes significance and impacts of deploying bio hydrogen at an industrial scale Discusses in detail different membrane based technologies for bio hydrogen production Resumes advanced 2D materials and integrated membrane systems for simultaneous biohydrogen production and purification Reviews membrane technologies for biohydrogen storage and transportation Highlights prospective pilot scale studies of membranes assisted biohydrogen technology showcasing their industrial potential

**Membrane Technology Enhancement for Environmental Protection and Sustainable Industrial Growth** Zhien Zhang, Wenxiang Zhang, Mohamed Mehdi Chehimi, 2020-12-14 This book presents a detailed discussion of the fundamentals and practical applications of membrane technology enhancement in a range of industrial processes energy recovery and resource recycling To date most books on the applications of membrane technology have mainly focused on gas pollution removal or industrial wastewater treatment In contrast the enhancement of various membrane processes in the areas of energy and the environment has remained largely overlooked This book highlights recent works and industrial products using membrane technology while also discussing experiments and modeling studies on the membrane enhancement process

**Comprehensive Membrane Science and Engineering** Enrico Drioli, Lidietta Giorno, Enrica Fontananova, 2017-07-20 Comprehensive Membrane Science and Engineering Second Edition Four Volume Set is an interdisciplinary and innovative reference work on membrane science and technology Written by leading researchers and industry professionals from a range of backgrounds chapters elaborate on recent and future developments in the field of membrane science and explore how the field has advanced since the previous edition published

in 2010 Chapters are written by academics and practitioners across a variety of fields including chemistry chemical engineering material science physics biology and food science Each volume covers a wide spectrum of applications and advanced technologies such as new membrane materials e g thermally rearranged polymers polymers of intrinsic microporosity and new hydrophobic fluoropolymer and processes e g reverse electrodialysis membrane contractors membrane crystallization membrane condenser membrane dryers and membrane emulsifiers that have only recently proved their full potential for industrial application This work covers the latest advances in membrane science linking fundamental research with real life practical applications using specially selected case studies of medium and large scale membrane operations to demonstrate successes and failures with a look to future developments in the field Contains comprehensive cutting edge coverage helping readers understand the latest theory Offers readers a variety of perspectives on how membrane science and engineering research can be best applied in practice across a range of industries Provides the theory behind the limits advantages future developments and failure expectations of local membrane operations in emerging countries

**Nanostructured Polymer Membranes, Volume 1** Visakh P. M., Olga B. Nazarenko, 2016-11-18 This book is intended to serve as a one stop reference resource for important research accomplishments in the area of nanostructured polymer membranes and their processing and characterizations It will be a very valuable reference source for university and college faculties professionals post doctoral research fellows senior graduate students and researchers from R D laboratories working in the area of polymer nanobased membranes The various chapters are contributed by prominent researchers from industry academia and government private research laboratories across the globe and comprise an up to date record on the major findings and observations in the field

**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

**Materials and Technologies of Membranes, Optoelectronics and Heat and Mass Transfer** Ke Chen, Mohd Zamri Mohd Yusop, Yong Suk Yang, Agus Dwi

Anggono, 2025-03-14 Special topic volume with invited peer reviewed papers only **Biofuel Production Technologies: Critical Analysis for Sustainability** Neha Srivastava, Manish Srivastava, P. K. Mishra, Vijai Kumar Gupta, 2020-03-23

Production and utilization of sustainable energy toward maintaining a clean environment is a major challenge At the same time the continued depletion of fossil fuels and the global dependency on non renewable fuels is a chief concern Moreover the long term economic and environmental issues associated with the high utilization of fossil fuel such as global warming are also important particularly in the context of the predicted increase in the global population to around 5 billion by 2050 In

recent years researchers have been investigating alternative renewable fuels to replace fossil fuels. Of the various options, biofuels are especially attractive due to their low production costs and the fact that they are pollution free. Also known as transportation fuels, their energy is derived from biological resources or through the biological processes. Biofuels such as biohydrogen, biomethane, biogas, ethanol, and butanol offer a number of advantages and can be economically produced from cellulosic biomass. As such, they can play a vital role in sustainably meeting future energy demands. Biofuels have the potential to become a global primary energy source, offering significant reductions in greenhouse gas emissions as well as opportunities to increase economic and social development in rural communities and reduce the problems associated with waste disposal. However, low yields and lack of process technology are some of the aspects that need to be addressed. This book offers an overview of existing biofuels and the technologies to solve the problems associated with their practical implementation. Evaluating the biofuel options and discussing the opportunities and risks in relation to resources, technologies, practices, markets, and policy, it provides insights into the development of economically viable bioenergy industries.

Municipal Sewage and Sludge: Treatment and Disposal Strategies Sughosh Madhav, Himanshu Gupta, Arun Lal Srivastav, Sirajuddin Ahmed, 2026-02-03. This book is highly beneficial for a better understanding of the techniques involved in sewage treatment plants and the recovery of components from the contaminated matrix for valuable applications. The generation of a huge amount of sewage and sewage in cities and sub cities is a big environmental crisis. Discharge of untreated or partially treated sewage imposes severe environmental pollution and health hazards. Various types of sewage treatment methods are used in different cities based on the current requirements. There are various norms, laws, and policies for the safe disposal of sludge and the discharge of sewage. In this proposed book, the generation of various sewage and sludge will be discussed in detail. Chemical analysis of sewage and sludge has been included in this proposed book. The impact of sewage and sludge on water resources, soil, crops, and human health is also included in this proposed book. Various traditional and advanced treatment technologies of sewage treatment will be part of the proposed book. Reuse and recovery of nutrients and metals are also incorporated in this proposed book. One proposed chapter is dedicated to legislation in sewage discharge and sludge disposal, which is also included in this proposed book. So in this proposed book, we tried to incorporate a holistic view related to environmental issues of sewage and sludge and their management strategies. This not only leads to enhancement of valuable resources but also reduces the problem of environmental contamination. The conclusive reports presented in the present book will also help different researchers and government authorities to implement the best possible methods in the treatment of sewage and sludge in different industries.

*Nanomaterials for the Detection and Removal of Wastewater Pollutants* Barbara Bonelli, Francesca S. Freyria, Ilenia Rossetti, Rajandrea Sethi, 2020-06-12. *Nanomaterials for the Detection and Removal of Wastewater Pollutants* assesses the role of nanotechnology and nanomaterials in improving both the detection and removal of inorganic and organic contaminants from wastewater that originates from municipal and

industrial plants The book covers how nanotechnology is being used to remove common contaminants including dyes chlorinated solvents nitrites nitrates and emerging contaminants such as pharmaceuticals personal care products and pesticides Sections cover nanofiltration adsorption and remediation Nanomaterial immobilization recovery is also addressed along with the quantification of heat mass transport limitations sizing aspects and transport phenomena Finally regulatory aspects regarding contaminants and nanoparticles in the environment are covered This book is an important resource for both materials scientists and environmental scientists looking to see how nanotechnology can play a role in making wastewater a less hazardous part of the global ecosystem Addresses the role of new nanotechnology based solutions for the detection and removal of common and emerging contaminants Discusses the environmental impact of nanoparticles used in wastewater contaminant detection and removal Explores the major challenges for using nanomaterials to detect and remove contaminants from wastewater

**Advanced Materials and Materials for Membrane Production** Hideaki

Tsukamoto, Paulo Mendonca, Ke Chen, Sugianto Sugianto, 2024-12-16 Special topic volume with invited peer reviewed papers only

Membrane Technology in Environmental Management Kazuo Yamamoto, T. Urase, 2000 Membrane technology is now widely used in environmental management Its range of application is growing based on a steadily growing understanding of the fundamental processes that are occurring These proceedings report the significant progress that has been made in membrane research development and applications in recent years including the fundamentals of reverse osmosis nanofiltration ultrafiltration and microfiltration and the study of microbial communities The 45 papers selected deal with membranes in drinking water treatment in industrial water and wastewater treatment and in wastewater treatment and reuse membrane separation bioreactors fouling control and membrane applications in chemical analysis They form an unrivalled survey of the state of the technology and make a major contribution towards a firm basis for future research and development of membrane technology in environmental management

Advanced Engineering and Technology Dong Keon Kim, Jong Wan Hu, Jong Won Jung, Jun Won Seo, 2015-04-20 Selected peer reviewed papers from the International Conference on Advanced Engineering and Technology ICAET 2014 December 19 21 2014 Incheon South Korea

**Development of a New Experimental Protocol for Fabrication of Zirconia Nanofiltration Membranes on Alumina Supports** Abdullah Hassan Ali, 1994

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