

Book Review **Experimental Methods for Membrane Applications in Desalination and Water Treatment**

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ABSTRACT

Membrane technology plays a crucial role in desalination and water treatment, offering efficient solutions to water scarcity and contamination challenges. The book “Experimental Methods for Membrane Applications in Desalination and Water Treatment,” edited by Sergio G. Salinas-Rodríguez and Loreen O. Villacorte, serves as a comprehensive guide to experimental techniques, performance assessment, and fouling control in membrane-based water treatment processes. Published by IWA Publishing in 2024, this book comprises 19 chapters that cover a wide range of membrane applications in both academic and industrial settings.

The editors, Dr. Sergio G. Salinas-Rodríguez and Dr. Loreen O. Villacorte, bring significant expertise to this volume. Dr. Salinas-Rodríguez is an Associate Professor of Water Supply Engineering at IHE Delft, with over 75 publications and experience in teaching, research, and supervising graduate students in desalination. Dr. Villacorte is a Lead Water Treatment Specialist at Grundfos Denmark with extensive industry and academic experience in membrane-based treatment across multiple countries. Their combined leadership ensures the technical depth and practical relevance of the book. Key membrane technologies such as microfiltration (MF), ultrafiltration (UF), nanofiltration (NF), reverse osmosis (RO), forward osmosis (FO), and membrane distillation (MD) are introduced. Each chapter discusses mechanisms, advantages, limitations, and experimental setups for these processes. Analytical tools like silt density index (SDI), modified fouling index (MFI), and biofouling assessment techniques are described in detail, along with material characterization techniques such as SEM, FTIR, and AFM. The inclusion of computational methods like CFD modeling further enriches the book’s scope.

Chapters also delve into practical examples from real-world water treatment and desalination plants. For instance, biofouling analysis using optical coherence tomography (Chapter 17 by Prof. Johannes S. Vrouwenvelder) and LC-OCD for organic matter analysis (Chapter 11 by Prof. Pierre Le-Clech) stand out as high-impact contributions. Similarly, Chapter 4 on forward osmosis by Dr. Alberto Tiraferri offers foundational knowledge and experimental insights into emerging technologies. Table 1 summarizes the chapters and their corresponding experimental methods in membrane-based desalination and water treatment.

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Table 1 Overview of chapters and their corresponding experimental methods in membrane-based desalination and water treatment

Chapter	Topic	Experimental Method
2	Micro/Ultrafiltration	Membrane performance and cleaning tests
3	RO/NF	Osmotic pressure, salt rejection, normalization
4	Forward Osmosis	FO module design and mass balance
5	Membrane Distillation	Permeate flux, membrane thermal properties
6–8	Fouling Indices	SDI, MFI-0.45, MFI-UF (constant flux/pressure)
11–13	Organic Matter	LC-OCD, TEP, UV254, EEM spectroscopy
15–17	Biofouling	BGP, ATP, OCT imaging and biomass quantification
18	Membrane Autopsy	Visual inspection, SEM, cleaning test
19	CFD Modeling	Flow and mass transfer simulations

One of the book's most valuable strengths is its clear and methodical presentation of experimental procedures, enabling readers to replicate tests and assessments in both research and industrial contexts. The integration of theoretical and practical knowledge makes it a vital reference for environmental engineers, researchers, and postgraduate students.

However, the book could benefit from a concluding chapter that synthesizes the various insights and suggests future directions for research and technology development. Additionally, a comparative cost analysis of different membrane techniques, materials, and maintenance strategies would enhance its practical value for industry professionals. While some sections may be challenging for beginners due to the technical density, the addition of an introductory chapter on basic membrane science in future editions could improve accessibility.