

Book Review

Advanced Nanomaterials for Membrane Synthesis and Its Applications

Editors: Woei-Jye Lau, Ahmad Fauzi Ismail, Arun Isloor & Amir Al-Ahmed

W. C. Chong

Department of Chemical Engineering, Lee Kong Chian Faculty of Engineering and
Science, Universiti Tunku Abdul Rahman, Jalan Sungai Long, Bandar Sungai Long,
Cheras, 43000 Kajang, Selangor, Malaysia

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ABSTRACT

The book compiled some of the most recent knowledge shared by the experts from different countries who specialize in membrane technology. The effort and knowledge sharing by the experts on the recent development of composite membrane fabrication are greatly appreciated. This book provides readers an overview and insight on how nanomaterials affect the membrane formation, enhance the properties of membrane and ultimately lead to different kinds of applications.

There are thirteen chapters in the book, covering the use of nanomaterials for a wide range of membranes and their applications (e.g., liquid, gas and energy). Each chapter starts with a brief overview of the topic, followed by the introduction of nanomaterials, fabrication methods of the composite membrane and performance of the modified membranes. Challenges and future prospect are also well discussed in most of the chapters, providing pragmatic perspective of the use of advanced nanomaterials in real world. The book also discussed graphene oxide (GO) and carbon nanotube (CNT) as the popular carbon based additives in the synthesis of microfiltration (MF), ultrafiltration (UF), nanofiltration (NF) and forward osmosis (FO) membranes. It highlights the potential use of these modified membranes in wastewater treatments including separation of dye, oil emulsion, natural organic matter and pharmaceuticals. Some of the latest development of photocatalytic membrane for persistent organic pollutants removal are included in the book, supplement by a discussion on the challenges of scaling up and commercialization of photocatalytic membrane. Besides, metal oxide framework (MOF) and zeolite are widely used in the membrane fabrication for gas separation enhancement. The selection of MOF and zeolite, methods in tuning capability of these nanomaterials affinity towards gas components, and various gas transport mechanisms across the membranes are summarized. One highlight of the book is the chapter on stimuli-responsive membrane, also known as smart membrane – a new generation of membrane which is getting more attention within the R&D circle. It gave readers the insights on the property changes of the modified membrane towards external stimuli such as magnetic fields, chemical cues, pH and temperature. The last four chapters in the book discuss on the application of composite membrane in sustainable energy generation. These include proton exchange membrane (PEM) for fuel cell application, pressure retarded osmosis (PRO) membrane in converting osmotic pressure gradient energy into electrical power and the use of ion exchange membrane (IEM) in salinity gradient energy harvesting using reverse electrodialysis.

This book is well written and it serves as a platform for knowledge sharing between the industry and academia. I highly recommend this book not only to academicians and researchers but also those working in the industrial R&D.

* Corresponding to: W. C. Chong (email: chongwchan@utar.edu.my)

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