



Book Review

MEMBRANES IN CLEAN TECHNOLOGIES

Theory and Practice

Andrzej B. Koltuniewicz, and Enrico Drioli (Editors), vol. 1
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In the last years, membrane processes have shown their potential in the rationalization of the production systems. However, the preparation of synthetic membranes and their utilization on a large industrial scale, is more recent development which has rapidly gained a substantial importance due to the large number of practical applications.

Membrane processes are used to produce potable water from the sea, to clean industrial effluents and recover valuable constituents, to separate gases and vapors, and to concentrate, purify, or fractionate macromolecular mixtures in the food and pharmaceutical industries.

The membranes used in the various applications differ widely in their structure and function and in the way they are operated in the various membrane processes. It is difficult to obtain a reasonably comprehensive and complete overview of the entire field of membranes and membrane processes including their applications.

The applications are extremely wide and covered in the literature by a large number of publications in different scientific journals and in several books focusing more on certain aspects of membrane science such as theoretical treatment of membrane function, engineering consideration of membrane process design, or membrane preparation and large scale production.

The book entitled *Membranes in Clean Technologies. Theory and Practice* is a practical ‘how to do’ guide for either reengineering existing technologies or implementing innovative processes, including over 6,000 pertinent references.

It is structured in two volumes and three parts: part I *Engineering of Membrane Processes*, part II *Membranes in Clean Industry*, and part III *Materials in Management with Membranes – Separation of Metals, Acids, and Hydrocarbons*.

The first volume focuses on the theory and engineering of membrane processes, and presents the use of membrane processes in such industries as water, textiles, tannery, paper, metal plating, electronic, and pharmaceuticals. After an introduction to the development of “clean technology” concepts, in chapter 2 are presented the separation of mixtures and mass transport in membranes. The separation of mixtures is important in many industrial branches for fractioning, purification, and concentration of final products, which make them more valuable. Semi permeable membranes are used for separation of homogenous and heterogeneous mixtures based on different rates of overall transport for different components through the membrane.

In chapter 3, *Membranes*, the main topic is the preparation and characterization of porous symmetric, asymmetric and composite membranes made from polymers or inorganic materials. The preparation of hybrid organic – inorganic membranes, supported liquid membranes and other special property membranes is also discussed.

In the next chapter of the volume, the more relevant aspects in membrane processes are described in details, and their technical and commercial advantages as well as their limitations are pointed out. New membrane processes, like membrane contactors, are more briefly treated and also, potential applications are indicated.

Part II of this book, *Membranes in Clean Industry*, deals with membranes in industries like water, textiles, paper, metal plating, electronic, and pharmaceuticals.

Chapter 5 of the first volume, *Water industry*, is dedicated to the practical application of membranes and membrane processes used in water industry. The most important aspect in water recovery, reuse, and recycling is to control the composition of the water streams. Membranes play an important role in recovery and/or destructive conversion for removal of various substances from the water, and therefore, have become more attractive to water processing and other technologies.

In the sixth chapter, after a short introduction to the water consumption and management in textile industry, some applications with membrane processes are described for water purification and reuse in textile industry. Also combined treatment schemes are suggested, which include membrane processes.

Chapter 7, *Tannery industry*, begins with general information about tannery industry. Furthermore, membrane processes potentially used to recover the majority of the chemicals used in the tannery processes are presented.

Membrane processes which can be used for removal pollutants from paper industry are presented in eighth chapter.

In chapter 9, the main topic is the use of membrane processes in reclaiming metals from the electroplating, for water recycling in electroless plating, and for water recovery from etching effluents from rinsing stainless steel.

The last chapter of the first volume presents membrane applications in pharmaceutical industry. Membrane processes play a key role in the production of a wide range of medicines. The pharmaceutical industry applies a numerous membrane types from microporous, through ultrafiltration to nanofiltration/reverse osmosis systems, which are designed for sterile filtration, cell harvesting, concentration, and purification of pharmaceuticals.

The role that membrane science and membrane engineering play in our life, justifies growing efforts in the education of young generations of researchers, processes engineers, and environmental specialists, based on their basic properties and on their possible applications. The book *Membranes in Clean Technologies. Theory and Practice* has been written with the scope of contributing to these efforts.

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