



Introduction to Membrane Science and Technology

The book by Prof. Strathmann focuses on fundamental and applied aspects of synthetic membranes used in applications such as gas and liquid separations, pervaporation, dialysis, and controlled drug delivery. Polymer membranes used for separations applications are a key focus area, given their extensive utilization in the applications discussed, but there are also sections on other types of membranes (e.g., metal membranes, glass membranes, etc.). The book contains an extensive and useful discussion of the basic theory governing mass transport in membranes. There is an informative discussion of membrane characterization techniques, with much emphasis on techniques to characterize porous membranes (e.g., ultrafiltration, microfiltration, etc.). A detailed discussion of membrane formation processes, especially the phase separation processes that are ubiquitously used in industry to prepare membranes at large scale, is provided. Here, the author's extensive experience shines through rather convincingly. There is a considerable amount of industrial knowledge related to membrane formation, so a detailed discussion of this topic requires insights that can only be gained by making membranes and working with colleagues and companies who make membranes, as Prof. Strathmann has done for many years. The author has organized the membrane formation information in a convenient and coherent format. He has always been both a scientist and an engineer, and in addition to the scientific aspects of membrane science, the engineering aspects (membrane module design and performance, process design using membranes, etc.) are also covered.

The author has been a pioneer and a world authority in electrically driven membrane processes, such as electrodialysis, having engaged in research in this area for several decades. Thus, the book contains extensive and insightful discussions of the fundamental theory, materials science, characterization, performance and practical applications of electrically driven membrane processes. Although there are discussions of many different membrane applications, for me, among the richest and perhaps most useful sections of the book are those in which the author discusses ion transport in membranes and describes the use of membranes in applications such as electrodialysis. Furthermore, there is currently a wave of interest in the membrane community around applications such as capacitive deionization, reverse electrodialysis,

etc. that rely on control of water and ion transmission across membranes, so the book is quite timely. Researchers working in or interested in these applications should definitely get this book—it has the best, most comprehensive, and most useful description of these topics available.

There is also a discussion of transport mechanisms in other membranes, such as gas separation and reverse osmosis membranes. The drawing of the pressure profile across a nonporous solution-diffusion membrane used for gas separations (Figure 4.12 on page 243) is in agreement with commonly held views on this subject. The pressure profile presented for reverse osmosis membranes (Figure 4.7 on page 231) is more reminiscent of the pressure profile through a porous membrane rather than a solution-diffusion membrane. Readers interested in this topic are directed to other references for alternative descriptions of water transport in reverse osmosis membranes.^[1–4]

Experts in the membrane field will find this to be a handy reference book, with strong sections on membrane formation, membrane characterization, and theory related to transport in membranes. The sections on electrodialysis and related processes are particularly strong. Novices and students will find both a broad discussion of the most important fundamental and practical aspects of membranes as well as a substantial discussion of theory. The book is well written and logically organized. It also fills a niche in the literature in this area; there is no other book with as comprehensive a discussion of transport phenomena in electrically driven membrane separations.

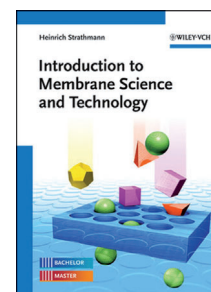
The author has been a leading research and technology contributor in the membrane field for many decades, so the book is filled with insights from a world authority in this area. The book is particularly timely given the strong surge in interest from the scientific as well as industrial communities regarding membranes to control the flow of water and ions in both existing applications and in new applications related to separations and power generation (e.g., reverse electrodialysis).

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