Book Reviews

Inorganic Membranes — Synthesis, Characteristics and Applications

Edited by Ramesh R. Bhave, published by Van Nostrand Reinhold, New York, NY, 1991, 312 pp., £43.50, ISBN 0-442-31876-6.

Micro-porous and ceramic membranes have been used successfully for nearly half a century as gas diffusion barriers for the enrichment of uranium. However, most of this early work involving ceramic membranes was carried out for the nuclear energy industry during the second worldwar and shortly after. Very little of this work has been published in regular scientific journals and not too many details are known about fabrication techniques, operational problems or conditions of these membranes.

Only recently, i.e. around 1980, inorganic membranes were rediscovered for the separation in liquid media and since then there has been a rapidly growing interest in the development of new membranes and their application in the chemical, petrochemical and, in particular, the food and drug industry. The increasing importance of inorganic membranes is also reflected in an increasing number of publications. Unfortunately these publications are spread over a large number of very different scientific journals. This makes it very troublesome to obtain an overview over the present state-of-the-art of inorganic membranes.

The book of R. R. Bhave is filling this gap in today's literature on synthetic membranes and their application. In nine chapters the most relevant aspects of inorganic membranes are comprehensively covered. Following a short introduction by J. Gillot the synthesis of inorganic membranes is described quite thoroughly and in sufficient depth by A. J. Burggraaf and K. Keizer. The next two chapters by H. P. Hsieh and R. R. Bhave, respectively, describe the general properties of inorganic membranes and their permeation and separation behaviour in liquid phase separations. In the next relatively short chapter also by R. R. Bhave, some module and system design aspects are treated. The use of inorganic membranes in gas separation and as membrane reactors to enhance the efficiency of chemical reactions is discussed by R. J. R. Uhlhorn, V. T. Zaspalis and A. J. Burggraaf. The last two chapters by R. R. Bhave, J. Guibaud, B. Tabodo de la Fuente, V. K. Venkataraman and M. Rumeau are strictly application oriented describing the use of inorganic membranes in the food and drug industry and in advanced waste water treatment.

Because of background and interest of the different authors the book is somewhat heterogeneous. Some chapters, such as Chapter 2 'Synthesis of Inorganic Membranes' are focussed more on fundamental aspects, while others such as Chapter 4 'Permeation and Separation Characteristics of Inorganic Membranes in Liquid Phase Application' are more application oriented covering some general aspects of the transport properties of inorganic membranes. Chapter 8 'Inorganic Membranes in Food and Biotechnology Applications' and Chapter 9 'Inorganic Membranes for the Filtration of Water, Wastewater Treatment and Process Industry Filtration Application' treat the practical application of inorganic membranes in selected technically relevant examples. A comparison of the performance of polymeric and inorganic membranes as given in Chapter 8 is problematic because of different operating conditions and product costs. It does, however, give some hints where the authors see the advantages of the inorganic membranes over polymeric products. The list of inorganic membrane manufacturers given in the appendix of the book is quite useful, but it might be very soon outdated in a rapidly growing and changing market.

All in all, the book gives a comprehensive overview of the state-of-the art of inorganic membranes including their preparation and application. It is equally suited for scientists and engineers as well as for students who want an easy to understand and application oriented introduction into the technology of inorganic membranes. It is reasonably well balanced covering the most relevant aspects in sufficient depth.

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The Silicon Heteroatom Bond

Edited by S. Patai and Z. Rappoport, published by John Wiley & Sons, 529 pp., £90, ISBN 0-471-92904-2.

The Silicon Heteroatom Bond is an update of the *'Patai Rappoport' Chemistry and Organic Compounds* published in 1989. The book contains five chapters from the originally published volume together with an appendix to each of these chapters covering the most

recent literature. In addition, the volume has a new chapter on organosilicon–nitrogen compounds including publications on this subject which have appeared in the last five years. Following a tradition of the series, all twelve chapters have been written by experts in their field. Two most interesting articles summarize the chemistry of 'Hypervalent Silicon Compounds' (R. J. P. Corriu), two chapters are devoted to the chemistry of 'Siloxane Polymers and Copolymers' (T. C. Kendrick, Dow Corning) and six further chapters give a summary on the chemistry of 'Organosilicon Compounds containing Group 15 and 16 Elements' (D.A. Armitage). Last but not least, two chapters (with the largest appendix) summarize the chemistry of 'Transition-metal Silyl Derivatives' (T. D. Tilley).

The book fulfills a strong need for a literature survey particularly in the fast growing areas of transition-metal silicon and hypervalent silicon compounds. In some cases, the material has been presented somewhat from the point of view of the particular author. However, all chapters give an almost complete and actual coverage of the current literature (including author and subject index). The book has also been produced extremely rapidly (literature coverage until mid-1991, appearance early 1992) but nevertheless with high quality, which makes this volume a valuable source of information for any reader who is interested in the actual state of organosilicon chemistry. *The Silicon Heteroatom Bond* is a further volume of a standard book series which belongs in every library and on the bookshelf of any research chemist who is active in organosilicon and organometallic chemistry.

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