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BOOK REVIEWS

Molecular Sieves: Science and Technology. Volume 3. Postsynthesis Modification I. Edited by Hellmut G. Karge (Fritz Haber Institute of the Max Planck Society) and Jens Weitkamp (University of Stuttgart). Springer-Verlag: Berlin, Heidelberg, New York. 2002. xii + 442 pp. $219.00. ISBN 3-540-64334-6.

This book is the third volume of the newly established series of monographs *Molecular Sieves: Science and Technology*, which so far includes Vol. 1 (1998) on the synthesis of molecular sieves and Vol. 2 (1999) on structures and structure determination. In this volume, three major topics concerning postsynthesis modification of molecular sieves are covered: ion exchange, dealumination, and formation of clusters. Other important topics, such as ship-in-the-bottle synthesis, incorporation of dyes and other organic molecules, and modification of mesoporous materials, will be covered in one of the subsequent volumes.

The field of molecular sieves has grown dramatically during the past 50 years, which is reflected by discoveries of numerous zeolite structures in the 0.3−2 nm pore range and by the growing importance of these materials in industry and everyday life. The discovery about 10 years ago of the self-assembly of organic and inorganic species has led to a wide variety of ordered inorganic, organic, and hybrid mesostructures with tailored framework compositions, pore structures, pore sizes (from 2 to about 30 nm), morphologies, and surface properties. Another breakthrough in materials science was initiated by the successful use of ordered mesoporous materials and colloidal crystals as templates, which allowed tailoring pore sizes in the range of mesopores and macropores. Thus, there is a great demand for a comprehensive overview of the science and technology of zeolite molecular sieves and related mesoporous materials that have been newly discovered. Because this area of materials science is growing at a remarkable pace, this series is timely and needed. Its goal, according to the preface, is to cover all aspects of the science and application of molecular sieves, such as zeolites and related nanoporous materials.

This volume, as with previous volumes, includes well-chosen reviews from experts in the area of molecular sieves and covers postsynthesis modification via conventional and solid-state ion exchange, dealumination, and incorporation of metal, ionic, and other clusters. The volume starts with an extensive review by Townsend and Harjula on conventional ion exchange, which is a very popular postsynthesis modification of zeolites in an aqueous suspension containing cations to be introduced into the particles. The next chapter, by Hellmut and Beyer, reviews the concepts of solid-state ion exchange in microporous and mesoporous sieves and describes the procedures and techniques for monitoring the exchange. Another chapter by Beyer reviews postsynthesis modification of zeolites via alteration of the aluminum content in the framework. Although special emphasis is given to dealumination of zeolites by hydrothermal treatment or isomorphous substitution, the reverse process, that is, introduction of aluminum and removal of silica from the framework, is also briefly discussed.

The last three chapters focus on the formation of extraframework nanoclusters inside the pores of zeolites, which is of great importance for applications in catalysis. The two reviews by Gallezot and Anderson cover, respectively, the incorporation of metal and ionic clusters into zeolites. The formation of oxide, sulfide, and chalcogenide clusters in molecular sieves is then thoroughly reviewed by Weitkamp et al. All of these chapters review the formation of clusters inside porous structures, their characterization, as well as their applications in catalysis, sensing, electronics, etc.

Overall, this book contains well-selected chapters that cover the most important issues of postsynthesis modification of molecular sieves. This series of monographs, including the current volume, should serve as a valuable handbook for advanced researchers as well as a useful guide for newcomers to the world of ordered nanoporous materials, which are of great importance for nanoscience and nanotechnology.

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