

BOOK REVIEW

Zeolite Catalysis: Principles and Applications. By SUBHASH BHATIA. CRC Press, Boca Raton, 1990. x + 291 pp. \$165.00.

Zeolite Catalysis: Principles and Applications is a review of zeolite catalysis for newcomers to the field. It is not aimed at providing a comprehensive thesis of the subject matter for experts. Rather, it is a readable presentation for anyone familiar with basic chemical concepts.

Chapters 1 through 3 concentrate on zeolite structures and synthesis. Although the information necessary for comprehension of the basic concepts in synthesis and zeolite structures is available within these chapters, they are somewhat outdated for a text published in 1990. For example, zeolites such as ZSM-5, ZSM-11, and ZSM-12 are considered *new*, and there is little to no discussion on phosphate-based materials which have been in existence since 1982. In defense of the author, since the phosphate materials have not as yet been used as commercial catalysts, this omission does not really hinder the presentations on catalytic applications.

Chapter 4 reviews diffusion in zeolites. The various techniques for measuring diffusion coefficients are presented and many examples containing real data are provided.

Chapters 5, 6, and 7 contain very readable coverage of acid, supported metal, and shape-selective zeolite catalysis, respectively. Basic principles are illustrated well and many examples are provided. In general, most of the types of zeolite catalysis used commercially are covered. However, I feel that ex-

panded coverage of the methanol to gasoline reaction and the inclusion of the *n*-hexane aromatization reaction by platinum-containing zeolite L and the titanosilicate (TS-1)-mediated partial oxidation reactions would have significantly enhanced Chapters 6 and 7.

Chapter 8 is concerned with the characterization of zeolite catalysts. Most of the experimental techniques used by practitioners are illustrated with one significant absence. Solid state NMR is not described, yet over the last decade has evolved into one of the most useful tools for characterizing zeolites. Readers will be left with the false impression that NMR has not contributed to the study of zeolite catalysts.

Chapter 9 deals with catalyst deactivation and emphasizes coking. The chapter is readable, although those not familiar with the reaction engineering concepts of the effectiveness factor may not appreciate the mathematical relationships presented. However, the concepts of catalyst deactivation do come through clearly in spite of the mathematical formalism.

The book closes (Chapter 10) with a survey of the major industrial applications of zeolites as catalysts. Most of the major industrial conversions are briefly discussed and the reader should obtain an impression of how zeolite catalysis has impacted the petrochemical industry.

In total, the text does provide a good overview of zeolite catalysts for newcomers to the area. The presentations are slanted toward reaction chemistries and therefore are most applicable to chemists and chemical engineers. Those wishing to obtain more of the materials aspects of zeolites and molecular sieves should look elsewhere.

MARK DAVIS

Virginia Polytechnic Institute and State University