

Catalyst Preparation: Science and Engineering

By John R. Regalbuto. CRC Press, Taylor & Francis Group, 2007.

The molecular design of improved and advanced heterogeneous catalysts requires an intimate knowledge of catalyst synthesis (the birth of the catalyst and its architecture). The aim of this book is to develop a fundamental understanding of the genesis of catalyst structure from a preparation-structure relationship. This collection of chapters by leading researchers does an outstanding job of covering almost all the different catalyst preparation methods practiced in the heterogeneous catalysis community (academic and industrial). Even after practicing heterogeneous catalysis for over three decades in industry and academia, I still was able to learn some new catalyst synthesis details that I had not been previously exposed to prior to reviewing this book. Thus, I highly recommend this handy book for all scientists and engineers involved with heterogeneous catalyst development, since it provides a nice and detailed overview of the catalyst preparation

methods now being practiced by the heterogeneous catalysis community.

The first section of the book focuses on the synthesis of bulk materials that are either unsupported or may find use as supports for the active catalytic components: flame hydrolysis of oxides, amine-assisted synthesis of aluminum oxide, aerogel synthesis, functionalized mesoporous silica, heteropolyacids and metal colloids. The second section covers the preparation of heterogeneous catalysts: nanolayer carbides and nitrides, sol-gel synthesis of supported metals, supported metal catalysts from dendrimer-metal precursors, synthesis with organometallic precursors, supported metal oxides, solid-state ion-exchange of zeolites, strong electrostatic adsorption of metals onto supports, deposition precipitation of supported metals, and production of supported catalysts by impregnation and viscous drying. The final section of the book addresses catalyst finishing: drying of supported catalysts, effects of finishing and operating conditions and needed preparation advances for new catalytic applications.

As with all books where the chapters are written by different authors, the chapters are not uniformly written with the same quality and there is also some redundancy. For example,

the chapters on aerogel synthesis and sol-gel synthesis of supported metals could easily have been combined into one chapter. Similarly, the chapters on preparation of supported metal oxides and solid-state ion-exchange of zeolites could also have been combined into one chapter. The quality of the book could have been further enhanced if there was more emphasis on catalyst synthesis-structure relationships with the latter requiring more detailed characterization. A chapter on the preparation of bulk mixed metal oxides, however, was not included in the book. An annoying aspect of the book is the use of different notations for the same items by the various authors. Although this is a book on catalyst preparation, it was surprising to find that quite a few of the authors tended to refer to other publications for the synthesis details. Despite these minor shortcomings, this book is a must read for practitioners of heterogeneous catalysts who want to familiarize themselves with the different preparation methods, to obtain a fundamental understanding of the genesis of catalyst structure, and to design improved and advanced heterogeneous catalysts.

AiChE Journal, Vol. 55, 284 (2009)

© 2008 American Institute of Chemical Engineers

DOI 10.1002/aic.11686

Published online November 10, 2008 in Wiley InterScience (www.interscience.wiley.com).

Israel E. Wachs
Operando Molecular Spectroscopy
& Catalysis Laboratory
Chemical Engineering Dept.
Lehigh University
Bethlehem, PA 18015
E-mail: iew0@lehigh.edu