

Synthesis of Solid Catalysts

The synthesis of solid catalysts is a well-established field of research, but one that might sometimes seem from the outside to be heterogeneous and somewhat unstructured. The manufacture of solid catalysts uses methods from synthetic solid state chemistry, colloid science, inorganic coordination chemistry, metal-organic synthesis, and chemical engineering. Additional specialty methods include the shaping of catalyst powders and high-throughput catalyst synthesis. *Synthesis of Solid Catalysts*, edited by Krijn P. de Jong, arranges these subjects in a clear structure so that newcomers can navigate this field successfully. In particular, the book describes the scientific basis of the preparation of high-performance catalysts, which in most cases has not yet reached the stage of rational design, and is often incorrectly depicted as an art rather than a science.

The book is divided into two parts and contains 17 chapters written by different authors. In the first part, the principles of the areas of synthetic chemistry mentioned above that are relevant to catalyst synthesis are covered. The second part illustrates the application of these principles by presenting case studies. This concept proves to be very effective for connecting fundamentals with applications. The well-balanced coexistence of these two aspects in the book is also reflected in the inclusion of chapters by authors who are active in industrial research or have experience in industry-related areas. All the chapters can be read independently of each other, which gives the book its special character as a combination of a handbook, a textbook in step with actual practice, and a guide-book for work in the laboratory. Unfortunately, this concept also leads to a number of repetitions, which is particularly noticeable if the whole book is read page by page. By differentiating more consistently between fundamentals and case studies and by replacing repeated parts with detailed cross-referencing between the sub-chapters, the book could have been made to appear more “all of a piece”. For example, the protolysis of surface hydroxyl groups in aqueous solutions is described at several places in the book, sometimes using similar figures.

The first part starts with a general introduction by the editor, emphasizing the enormous and growing economic and ecological importance of heterogeneous catalysis, and the important role of catalyst synthesis and optimization. Impregnation of prefabricated supports in aqueous solutions is a major topic in the book and is discussed in the following three chapters. The distribution of differ-

ent aspects between these chapters seems somewhat arbitrary at first sight, but the authors present quite different yet complementary views. Further chapters are devoted to sol-gel chemistry, deposition and co-precipitation, and the immobilizing of metal-organic clusters. This first part also contains valuable introductions to the fundamentals of high-throughput synthesis and catalyst shaping. The latter topic is complemented by a chapter about characterization of catalyst bodies. The special requirements of catalyst synthesis towards reproducibility and scalability are mentioned at several points in the book, but are not focused upon explicitly.

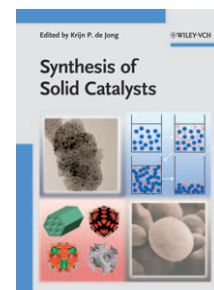
The contributions in the second part of the book provide comprehensive insights into the synthesis of some traditional and more recently developed catalyst systems, and represent the current status of research in these areas. Regrettably, only three of the eleven important applied systems that were mentioned in a table in the introductory chapter are treated in detail here: zeolites and catalysts for hydrotreating and methanol synthesis. In addition, materials with ordered mesopores, as well as catalysts based on gold and other noble metals, are covered. The claim to be a “practical book” is stated on the back cover, and in general the contributions live up to that promise. Particular strengths are found in those sections where precise recipes are described, followed by a discussion of the effects of relevant synthesis parameters on the properties of the resulting catalyst, leading to conclusions about a more general synthesis strategy.

In their book, Krijn de Jong and his contributors strike a good balance between basic principles and recent results, between the interests of academic research and industrial application, and between detail and conciseness. The book provides a very good up-to-date overview of the field of solid catalyst synthesis and contains many relevant references from the open and the patent literature. It focuses on the important methods applied in technological practice, and can be recommended as a guide for all newcomers to this field. Also experienced catalysis scientists will find much useful information.

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DOI: 10.1002/anie.200907333



Synthesis of Solid Catalysts
Edited by Krijn P. de Jong.
Wiley-VCH, Weinheim 2009.
402 pp., hardcover
€ 139.00.—ISBN 978-3527320400