Book Reviews

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Sol-Gel Materials

Chemistry and Applications. Gordon and Breach Science Publishers, Amsterdam 2001, x + 125 pp., hardcover, Euro 33.00, $30.00, ISBN 90-5699-326-7.

Sol-gel processing has recently received increasing attention from both the research community and industry. This is primarily because it is a very versatile method for synthesizing ceramics, organic/inorganic hybrids, and nanocomposites in the form of particles, fibers, films, or coatings, and monoliths, yielding sol-gel materials for a variety of applications in technology and industry.

This book is the fourth volume in a series of Advanced Chemistry Texts for advanced undergraduate and graduate students in the areas of chemistry, physics, and materials science. The authors have done an excellent job in providing a concise overview of the present state-of-the-art of processing and applications of sol-gel materials. In addition, this volume bridges the gap between an accessible textbook and a rich research resource.

The book provides a well-balanced treatment of sol-gel materials with its broad coverage and in-depth discussion. The eight chapters cover synthesis, characterization, and applications of sol-gel materials. The first chapter introduces some general concepts, advantages and limitations, and a brief history of sol-gel processing.

The second chapter discusses the reaction mechanisms of sol-gel processing of the silica system. Silica is the system that has been studied most extensively, and the reaction mechanisms in this system are understood the best, partly due to the slow kinetics involved. This chapter provides a detailed discussion of the processing of sol-gel silica. A comprehension of the material covered in this chapter is essential for anyone who wants to enter the sol-gel field and to achieve a good understanding of other sol-gel materials.

The third chapter extends the discussion to processing and chemistry of silicate systems. This chapter covers some of the most exciting contemporary research areas and represents the recent expansion of sol-gel materials. Inorganic/organic hybrids and nanocomposites, surfactant-templated structures, and surface functionalization through surface condensation or self-assembly are all discussed in this chapter.

The fourth chapter describes the sol-gel processing of metal oxides other than silica and silicates. Sol-gel metal oxides, particularly complex metal oxides, are very important for many applications. The reaction mechanisms of sol-gel metal oxides are different from sol-gel silica or silicates, and are difficult to monitor due partly to quick reactions. The non-hydrolytic sol-gel method for metal oxides is also included in this chapter.

The fifth chapter briefly introduces the most common chemical and physical characterization methods. Chemical characterization is focused on chemical bonding in

sol-gel materials, whereas physical characterization concentrates on structural characterization, particularly of porous structures.

The sixth and seventh chapters summarize the most important applications of various sol-gel materials. The last chapter, Chapter 8, provides information on the possible future development of sol-gel processing and sol-gel materials.

It is understood that, due to a limitation of space, it is impossible for the authors to cover all the subjects in detail, such as the stabilization mechanisms of sols, surface charge of solids in a polar solvent or an electrolyte solution, zeta potential, and processing of complex metal oxides. In addition, information on reactivity and modification of precursors is embedded in various parts of the book.

This book will meet the needs of advanced undergraduate and graduate students and will prove useful to new researchers as they enter the sol-gel field. The book will also serve as a quick research resource for established scientists and keep them abreast of the current developments in this dynamic field.

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Catalysis from A to Z

A Concise Encyclopedia. Wiley-VCH, Weinheim 2000, xviii + 640 pp., hardcover, Euro 209.00, ISBN 3-527-29855-X.

Catalysis is a central part of chemistry and biology that interlocks these disciplines through its general importance for daily life. The challenge in editing a concise encyclopedia on this topic is to present the various facets of catalysis in these two fields and to bridge the gap in areas where, sometimes, the significance of catalysis has not yet been recognized. Cornils, Herrmann, Schlögl, and Wong, four highly recognized experts in the fields of industrially applied, homogeneous, heterogeneous, and enzyme catalysis, respectively, took up such a challenge. In the course of the project they assembled 165 scientists, who explained approximately 3000 keywords in a dictionary-like style. The meanings of catalytic and catalysis-related terminology are described in a concise, scientific manner with the keywords arranged in alphabetical order. The contributions give important information on a wide range of catalytic processes, including analytical methods and techniques as well as industrial processes.

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