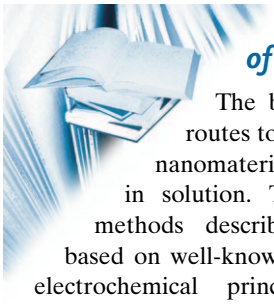

Solution Processing of Inorganic Materials

The book describes different routes to obtain new materials or nanomaterials by chemical synthesis in solution. The inorganic chemical methods described, which are partly based on well-known sol–gel chemistry and electrochemical principles, have attracted increasing attention from materials scientists during the past few years as techniques to synthesize nanostructures for electronic applications or for sustainable energy conversion, for example, by solar cells. Thus, a book that reviews and compares modern solution-based synthetic routes leading to inorganic materials is long overdue and fulfills an urgent need.

David Mitzi has solved the difficult task of presenting and summarizing the many diverse methods by asking experts in the particular fields to review recent developments. This approach suffers a bit from the fact that the book cannot be read as a whole, since the 14 chapters each differ slightly in style. But on the other hand it was only in this way that the necessary up-to-date quality of the contributions in the fast developing fields could be ensured. All the chapters include literature references up to the year 2007.

Importantly, Chapters 1 and 2 function to connect and summarize various aspects of the field. Chapter 1 demonstrates that the aim of achieving improvements of some types of microelectronic and optoelectronic devices depends crucially on the development of new methods for synthesizing inorganic materials by using reactions in solution; this material provides the background for later chapters of the book. Chapter 2 introduces the different synthetic routes and describes their basic principles. This chapter of 35 pages provides a good summary, but of course it cannot cover all important aspects of the methods; however, the long list of references enables the reader to find more advanced literature.

Chapters 3–5 introduce chalcogenides, oxides, and silicon, all of which are important inorganic materials for the development of electronic devices and components. The chapters not only describe the techniques for their deposition but also include basic information about applications. Chapters 6–8 are devoted to techniques for depositing thin films of the materials, focusing on chemical vapor deposition, deposition from electrochemical baths, and layer-by-layer deposition from ionic solutions. Chapters 9–11 then describe ways to additionally achieve a high degree of order within the deposited layers. Chapter 9 concentrates on important methods based on chemical self-organization, leading to oxides with ordered porosity. It is possible to introduce other chemical compounds into the pores, which have diameters of about 10 nm, either by a catalytic reaction or by deposition as an additional component to give hybrid materials. If in future work the processes in the pores can be controlled more efficiently, the development of high-performance solar cells might be possible. Chapter 10 concentrates on the two- and three-dimensional order of nanoparticulate structures. Such structures, having a high degree of long-range order, offer attractive possibilities for the development of optoelectronic devices based, for example, on photonic crystals. Chapter 11 continues with the theme of high order, by discussing examples such as the possibility of developing nanotransistors based on nanowires. Modern techniques for printing electronic circuits are described in Chapter 12, and Chapter 13 describes methods to produce electronic devices that operate reliably even on flexible substrates.

Chapter 14 considers prospects for applications of materials in next-generation devices that might become feasible if the chemical preparation routes can be further optimized. However, this chapter presents only a few examples, and the reader will be disappointed that a number of ideas already discussed in very recent original papers are not included.

In summary, it can be stated that the book offers an excellent overview on the state of the art of different techniques for the tailored deposition of inorganic materials. The authors have succeeded in extracting the most important findings and aspects out of a huge amount of information that is available in the literature. Moreover, the well-organized index makes it easy to find individual topics of interest.

The book affords very rewarding reading for every chemist interested in inorganic materials. The book also contains some information and insights which should be included in the modern teaching of chemistry, materials science, and electrical engineering.

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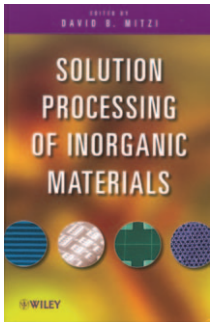

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