

Nanotechnology

This book by Jeremy J. Ramsden gives an introduction to the concepts of nanotechnology, which is regarded as one of the key technologies of the 21st century. The areas of nanoscience and nanotechnology have experienced a tremendous growth during the past two decades, and they still continue to grow. Smaller and smaller structures are of increasing technological and economic importance. The areas of application range from car paints, catalysts, and high-performance materials and coatings to medical applications, and from data storage devices to micro- and nanoelectronics, to mention just a few.

The rapid progress of nanotechnology is driven by two developments. On the one hand, scientific progress in the area makes it possible to develop completely new products, processes, and technologies for industrial applications. On the other hand, further progress in the development of existing technologies and products is increasingly dependent on the understanding and control of functional structures on the nanometer scale. There is now a need for research to be increased and to provide the necessary know-how. Nanotechnology is regarded as an interdisciplinary technology, and not only for successful research but also for transferring the newly gained knowledge to industrial applications, a multidisciplinary approach is needed, connecting classical disciplines such as physics, chemistry, life sciences, materials sciences, and engineering.

The book by Jeremy J. Ramsden is based on exactly this approach. As there is already an enormous variety of existing literature on nanotechnology, the author's intention is not just to add another book on this field. Instead, his aim is to explain the basic ideas and concepts of nanotechnology to a wide and multidisciplinary readership with a background in natural sciences and engineering. The author deliberately avoids giving a wide-ranging description of the individual areas and their applications. Instead, the book explains very clearly why nanostructures and nanostructured and nanoscale components, systems, and materials are not only "just small", but that they are "different". Thus—as people often emphasize when explaining the nanotechnology approach—"small is different".

In 12 chapters, the book gives a well-balanced overview of key areas and concepts of the broad field of nanotechnology. The topics are well selected. The first three chapters give an introduction to the basics, such as the definition of nano-

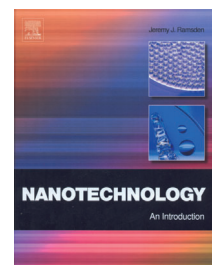
technology, the specific properties on the nano-scale, and the interaction forces that are relevant on this scale of distances. Following this introduction, Chapters 4 and 5 focus on the nano/bio interface and on nanometrology—an area which, especially with the development of scanning probe methods, has provided the basis for the rapid development of nanotechnology. Chapters 6–8 deal with nanomaterials and their production, and with nanodevices and their fabrication. Chapter 9 is devoted to carbon-based nanomaterials and devices, structures that—in the form of fullerenes, carbon nanotubes, and graphene and its derivatives—have attracted much scientific and technological interest. Chapter 10 deals with nanosystems and their design. Chapter 11 is devoted to bionanotechnology, an area that includes key topics such as biological motors and DNA as a constructional material. Finally, Chapter 12 focuses on the many implications of nanotechnology for science, technology, industry, and society, including the areas of energy and health—and even discusses the potential impact on individual psychology.

This book certainly does not attempt to replace existing literature. Instead, it allows the many different sub-divisions of nanotechnology—and even the field of nanotechnology as a whole—to be viewed within a larger context. It enables readers to obtain a realistic estimate of its tremendous potential, but also of its limitations. Short summaries at the ends of the chapters allow even the hurried reader to get a quick overview, and the literature references help one to find more information where needed. Tables of neologisms and abbreviations that are commonly used in nanotechnology are given at the end of the book. Unfortunately, while following its concept-based fundamental approach, the book does not contain descriptions of key experiments of nanotechnology, and it completely lacks color illustrations, presenting all images in medium-quality black-and-white print.

To conclude, the aim of the book to give an introduction that explains the basic concepts of nanotechnology, rather than attempting to cover selected details or sub-areas of nanotechnology, is fully achieved. Newcomers to the field of nanotechnology get a good introduction, and even scientists already working in the area may find interesting insights and ideas in this easily readable book.

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