

BOOK REVIEW

Basics of Nanotechnology

Horst-Gunter Rubahn, 226 pages, ISBN 978-3-527-40363-9, Wiley-VCH Verlag, Weinheim, Germany (2008), \$60.00, soft cover.

Reviewed by Osama O. Awadelkarim, Center for Nanotechnology Education and Utilization, Department of Engineering Science and Mechanics, Pennsylvania State University, University Park, Pennsylvania 16802, USA.
<http://www.cneu.psu.edu>.

The term nanotechnology was coined towards the end of the last century; nonetheless, the technology is still in its infancy stage and very rapidly growing. It is a diverse scientific and technological discipline with significant learner interest but with still very little integrated instructional materials. The foundations of the subject span a wide range of sciences from chemistry to material physics to biology, and the applications are even broader with implications in human health and development, energy, agriculture and food industries, environment, communication, and entertainment. As a result, preparing an account of basic nanotechnology which is appealing and accessible to readers from all these disciplines is a critical task for an author; Dr Rubahn did rather well in this respect.

The book begins with a description of the physics at the nanoscale and introduces the reader to basic concepts about the electronic and optical properties of matter, classification of matter into metals, semiconductors and insulators, and the particle-wave duality of objects and electromagnetic radiation. Subsequently, the book describes top-down and bottom-up processes employed in the creation and manipulation of nanostructures (Chapter 3). In Chapter 4 the book discusses several of the nano-characterization methods, followed by nano-architecture in Chapter 5. The last chapter of the book is devoted to the utilization of nanotechnology in different engineering applications. These applications touch on optics and photonics, electronics, information technology, communication, and biology. Only an overview of the applications in different fields is presented in a manner that can be appreciated by a non-specialized reader.

The book meets the goal of providing an accessible introduction to a very diverse group of readers. It is not a systematic treatise; its strengths lie in the presentation of various aspects of nanotechnology and the inclusion of some basic concepts. As there are not many books introducing nanotechnology at this level, this type of contribution to the literature is welcome. It is a recommended reading for scientists and engineers who would like to be introduced broadly to nanoscience and nanotechnology.

The author does not specify the level at which this textbook should be taught or the science and engineering background required for the prospective reader. However, this book may not be appropriate for a reader who had junior-level courses in mathematical sciences or engineering: the book lacks the necessary depth and details for such a reader. On the other hand, a great deal of the material presented in the book is accessible to readers with little mathematical and physics backgrounds.

Most chapters in the book include introductory material where applicable and a small number of exercise problems that assist the reader with learning more about the topics discussed in the chapters. The illustrations are adequate and well referenced. Some of the

chapters contain historical accounts of the different development stages of the theories, processes, or applications, as well as ideas on the future of the technologies involved.

The book includes an excellent compilation of references on nanofabrication, nano-characterization and applications. These references make up an exhaustive list of additional readings to readers interested to know more details in the subject.

Overall, I highly recommend this textbook for the reader's library reference shelf; however the lack of depth in many topics, as well as the lack of adequate homework exercises and solved examples, precludes its use in a graduate or an undergraduate science and/or engineering course.