

Rogers, Ben; Pennathur, Sumita; Adams, Jesse

Nanotechnology. Understanding small systems. (English) Zbl 1185.82001

Mechanical Engineering. Boca Raton, FL: CRC Press (ISBN 978-0-8493-8207-9/hbk). xvii, 398 p. (2008).

The book is devoted to nanotechnology. It is written in an easily understandable manner, not requiring deep knowledge in the related topics of physics and mathematics from the reader before reading this book. It uncovers the most important things about nanotechnology explained in a very illustrative manner with many simple examples, figures, and “back-of-the-envelope” calculations so that the reader can get a good feeling for the numbers of nanotechnology. The aim of this book is to give readers tools to dig deeper by themselves.

It starts with an overview of nanotechnology, with special emphasis on the history, key personalities, and early milestones. In a comprehensive introduction (Chapter 1), the issues, promises, and fundamentals of nanotechnology are discussed. It includes a discussion of the effects this new industry could have on human life, careers, education, and the environment. Further on (Chapter 2), scaling laws are discussed, giving an intuition about physical ramifications of miniaturization. In particular, different size scales are illustrated by examples from physics and biology, giving scaling laws, e.g., for surface-to-volume ratio, strength and weight, strength-to-weight ratio, etc. Scaling laws in geometry, mechanics, electricity and electromagnetism, optics, heat transfer, fluid mechanics, and biology are discussed. In the following (Chapter 3), an introduction to nanoscale physics is given. It includes an explanation of some basic things such as electromagnetic waves, atomic spectra and discreteness, photoelectric effect, quantum mechanics and wave-particle duality, the uncertainty principle, quantum-mechanical description of a particle in a well, etc. In the rest of the book (Chapters 4 to 10), seven main disciplines are tackled: nonomaterials, nanomechanics, nanoelectronics, nanoscale heat transfer, nanophotonics, nanoscale fluid mechanics, and nanobiotechnology.

Reviewer: [J. Kaupužs \(Riga\)](#)

MSC:

- [82-01](#) Introductory exposition (textbooks, tutorial papers, etc.) pertaining to statistical mechanics Cited in 1 Document
- [74A30](#) Nonsimple materials
- [81-01](#) Introductory exposition (textbooks, tutorial papers, etc.) pertaining to quantum theory
- [74E99](#) Material properties given special treatment

Keywords:

[nanotechnology](#); [nanostructures](#); [nanomaterials](#)