The materials-related concepts in the second part start from the seventh chapter where the most used solar-cell material—silicon—is discussed. In the eighth chapter, III–V semiconductor solar-cell materials are investigated. Their epitaxial growth and tandem solar cells are outlined, followed by the ninth chapter, which exclusively discusses thin-film solar cells. This includes transparent conducting oxides, amorphous and microcrystalline silicon, chalcopyrites (e.g., CIGS) and kesterites (e.g., CZTS), and the widely exploited CdTe solar cells. The final chapter introduces solar cells from a nanotechnology point of view. Here, quantum dots, organic and dye-sensitized solar cells, perovskite-sensitized solid-state solar cells, charge transport, and nanowire arrangements of solar cells are briefly surveyed.

The book is of good pedagogical value. Students as well as teachers can make use of this either as a main textbook or as a support for their lessons. However, this book deals with charge transport and band structures as well as other concepts in physics, and therefore targets mainly readers with a physics background. In general, the book is well written and provides a solid basis for studying solar cells.

***Reviewer: Protima Rauwel**, the Institute of Physics, University of Tartu, Estonia.*

Nanomaterials and Devices

Donglu Shi, Zizheng Guo, and Nick Bedford

Elsevier, 2014
372 pages, $110.49
ISBN 978-1-4557-7754-9

The primary aim of this book is to provide introductory material on nanomaterials and nanotechnology for students at the college level. A secondary goal is to explore concepts of nanotechnology in teaching and research. The major focus is on nanodevices, which is meant to instill in researchers a motivation for developing practical applications. In addition to the text in the book, the authors provide online resources for probing further into the topics.

The book is divided into 12 chapters. Chapter 1 focuses on basic properties of nanomaterials. It contains three sections: a brief history of nanoscience and nanotechnology, characteristics of nanomaterials, and physical principles of nanoscale effects. Chapter 2 is aimed at characterization and analysis of nanomaterials, detailing scanning probe microscopy and atomic force microscopy. Other methods of characterization such as particle size and various properties are also briefly introduced. Chapter 3 covers carbon nanotubes, starting with allotropes of carbon and other structures (including graphene), followed by the types and nature, preparation, and applications of carbon nanotubes. Chapter 4 focuses on semiconductor quantum dots. In the four sections here, the authors describe the physical basis of the semiconductors, preparation of semiconductor quantum dots, laser devices based on quantum dots, and single photon sources.

The next chapter's focus is on nanomagnetic materials and is exhaustive in discussing the types, characteristics, examples, and preparation. The chapter concludes with giant magnetoresistance materials with applications in sensing devices. Chapter 6 covers nanoscale titanium oxide as a photocatalytic material and its applications. Chapter 7 discusses the electro-optical, optoelectronic, and piezoelectric applications of zinc oxide. Superconducting nanomaterials are discussed in chapter 8. After a brief introduction to superconductivity, there is discussion on physical principles, classification of superconductors, nano-superconductors, and their applications. Chapter 9 discusses nanobiological materials with detailed coverage of nanobiological, nanomedical, and magnetic particles in medicine, bioanalysis, and quantum dots in biological and medical applications. It concludes with a discussion of research progress in hypothermia. Chapter 10 covers nanoenergy materials, limiting coverage to nanostorage materials related to fuel cells and dye-sensitized solar cells. Chapter 11 focuses on nanocomposites. It starts with concepts, including surface modification, and concludes with core–shell structures of composites. The last chapter covers the basics of DNA and its nanotechnology with molecular motors.

However, the book contains pictures that are poor in quality (all black and white with no clarity). Also, there are a number of errors that can be corrected: some quantities are not presented with the correct units, data in some tables are not cited adequately, and it would be useful to explain the relationships between entities in some equations. Some of these problems can be attributed to typographical errors, but some of them will cause confusion for beginners, to whom the book is directed. The order of the chapters is somewhat disorganized. Chapter 12 would fit better after chapter 9; chapter 6 could follow chapter 10. The book is adequate reading material as a supplementary book for inspiring beginners in the field, rather than as a text for beginners. Readers should be cautioned regarding the errors and thus the book should not stand alone as one's go-to reference.

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https://doi.org/10.1557/mrs.2015.135 Published online by Cambridge University Press