



Chapter 8 is devoted to shape-memory materials, which now include not only NiTi but also polymers and magnetic materials. In order to improve bonding, nanomaterials can be used to synthesize implants with surface roughness similar to that of natural tissues. Chapter 9 is devoted to different surface treatments for Ti-based nanomaterials, such as anodic oxidation to improve the bioactivity of titanium and improve the corrosion resistance of porous titanium and its alloys. The use of carbon in various forms—nanoparticles, nanofibers, nanotubes, and thin films—is discussed next with emphasis on the microstructure and

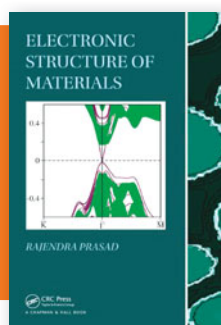
properties of these materials, their implant applications, and their interaction with subcutaneous tissues.

Nanomaterials can be used in preventive dentistry and therefore can reduce the amount of dental treatment that is necessary to maintain a healthy mouth as argued in chapter 11. In a subsequent chapter, the author explains osseointegration (i.e., direct bone-to-metal interface) from a biological point of view and early tissue response. The mechanism of the interaction between the implanted materials with the cellular protein in the tissues is described. The last chapter discusses the application of new nanostructured

materials in permanent and bioresorbable implants, nanosurface dental implants, and nanostructured dental composite restorative materials.

This book not only focuses on nanomaterials but also on nanoengineering to achieve the best results in dentistry. It is recommended to anyone interested in nanomaterials and their applications in dental science. People with a background in materials, chemistry, physics, and biology will benefit from it.

Reviewer: Walid M. Daoush of Helwan University, Cairo, Egypt.



Electronic Structure of Materials Rajendra Prasad

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447 pages, \$89.95
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This book gives an excellent introduction to the electronic structure of materials for newcomers to the field. Electronic structure plays a fundamental role in determining the properties of materials. In this book, the author takes a microscopic view of materials as composed of interacting electrons and nuclei, aiming at explaining the properties of materials. It will not be outdated for a long time, as it is written from the point of view of the basics.

The book comprises 20 chapters and 447 pages, divided into two parts. The first part (chapters 1–10) is concerned with the fundamentals and methods of electronic structure; the second part (chapters 11–20) deals with the applications of these methods. The exercises and important references are given at the end of chapters. A relatively long list of references is given at the end of the book. The author skillfully fuses these parts into a cohesive whole.

Chapter 1 gives a historical introduction and an overview of the electronic

structure field. Chapter 2 explains quantum description of matter in terms of electrons and nuclei. Chapter 3 is devoted to density functional theory, which is the foundation for first-principles calculations. Chapter 4 introduces the basic energy-band theory. The following three chapters explain various methods of electronic structure calculations, such as pseudopotential, the Korringa–Kohn–Rostoker method, and augmented plane wave methods. Chapter 8 illustrates disordered alloys with approximations such as virtual crystal approximation, average t -matrix approximation, and so on. Chapter 9 provides first-principles molecular dynamics, and chapter 10 discusses several general principles associated with materials design.

Chapters 11–20 cover several applications of electronic structure. Chapter 11 discusses amorphous materials and Anderson localization. The next three chapters go into low-dimensional systems, including atomic clusters and nanowires (chapter 12); surfaces, interfaces, and

superlattices (chapter 13); and graphene and nanotubes (chapter 14). Chapter 15 discusses quantum Hall effects and topological insulators. In chapters 16–20, the author discusses ferroelectrics and multiferroic materials, high-temperature superconductors, spintronic materials, battery materials, and materials in extreme environments, respectively.

This book provides a concise and comprehensive introduction to electronic structure of materials, from basic theories to research on specific materials. It is neither too advanced nor too simple, so it is very useful as a source of fundamental knowledge for theoretical calculations. As the author states, “it is aimed at the advanced undergraduate and graduate students who want to gain some understanding of electronic structure methods or want to use these tools in their research.” The author has succeeded in doing this.

This book is written in a clear manner, can be well understood, and there are few errors in the text. I can recommend this book without hesitation to all interested in electronic structure of materials, particularly to those entering the field. It is written at a level appropriate to advanced undergraduate and graduate students. Also, it is a good book for researchers with a chemistry, physics, or materials background.

Reviewer: Jianguo Lu is an Associate Professor at Zhejiang University, China.