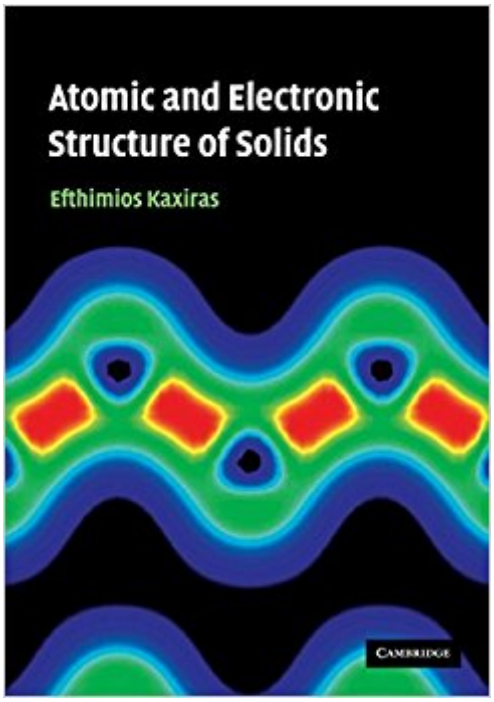
Atomic And Electronic Structure Of Solids



Synopsis

This text is a modern treatment of the theory of solids. The core of the book deals with the physics of electron and phonon states in crystals and how they determine the structure and properties of the solid. The discussion uses density functional theory as a starting point and covers electronic and optical phenomena, magnetism and superconductivity. There is also an extensive treatment of defects in solids, including point defects, dislocations, surfaces and interfaces. A number of modern topics where the theory of solids applies are also explored, including quasicrystals, amorphous solids, polymers, metal and semiconductor clusters, carbon nanotubes and biological macromolecules. Numerous examples are presented in detail and each chapter is accompanied by problems and suggested further readings. An extensive set of appendices provides all the necessary background for deriving all the results discussed in the main body of the text.

Book Information

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Customer Reviews

great book!

The book arrived excellent condition. Contains a good introduction to electron structure calculations with a large amount of interesting modern applications.

As analytical and synthesis techniques become more powerful, it is now possible to examine and fine-tune materials at the atomic scale. Likewise, continual advances in computer hardware and software have allowed more people the ability to model processes and materials at the atomic scale. Consequently, there is a growing need for good textbooks on the atomic and electronic structure of solids. Alas, most of the relevant textbooks suffer from one or more of the following drawbacks:1. There is too much math and physics for most people. In other words, there are too many equations, proofs, and derivations. This usually manifests itself in sections on quantum mechanics and ab initio modeling.2. The texts become less an educational tool and more a showcase of the latest and greatest achievements by the author(s). This negative can often be spotted by looking at the book's table of contents. If each chapter is written by a separate author, then you can be sure that the text often end up as extended reviews of that author(s)' publications.3. Not enough coverage of background information. The study of solids at the atomic level is being approached by multiple fields that usually have NO interdisciplinary overlap in education institutions. Examples include geology, electrical engineering, biochemistry, tribology, materials science, etc... Therefore, a book to serve members from all these fields should have a lot of background information in topics such as thermodynamics, quantum mechanics, crystal structure and defects, group theory, etc...4. Lack of pictorial representation. A picture is worth a thousand words; and even more so if you are trying to understand microscopic phenomena such as bonding, dislocation motion, etc... Too many textbooks have too few, well-explained pictures.This book by Kaxiras does not suffer from any of these drawbacks. I consider it the best book so far on this topic.First, it is written entirely by one author, yet I could not find a single reference to any of his publications within the book. There was absolutely no feeling that this book was trying to review someone's work, or some body of work. Instead, the book read like a well writtent textbook.Second, the topics are written for a general audience, with enough background information that undergraduate science and engineering students can understand it. Specifically, the first chapter of the book starts with the Periodic Table of Elements and explains why different elements form different types of solids. This is extremely valuable information for anyone who has never had a course in materials science, which probably means most chemists, electrical engineers, biologists, etc...3. Lots and lots of review literature is cited- WITH explanations of why it was suggested to the reader for further reading.4. I counted 1 picture per every 2 pages. That is astounding. Even though the pictures were B&W, I

understand all of them. Every one had axes labeled, a legend, a descriptive header, etc...5. Thorough and basic explanation of band structures. Too many texts spend too much time explaining the different methods of obtaining band structures (LMTO, LAPW, pseudopotential + plane waves, APW, PAW, etc...). This book instead provided a whole chapter on understanding a band diagram, correlating a band diagram with the geometry of a material, and the physical origins of band structures. This is prerequisite knowledge before any further attempts to understand the electronic properties of materials.6. Justification of each approximation, along with accompanying successes and failures. This book examined the mean-field, Born-Oppenheimer, frozen-phonon, pseudopotential, and other approximations commonly used in atomic-scale modeling, and provided thorough, well-organized justification of each one, along with a listing of their successes and failures.In all, I recommend this book to anyone as a prerequisite reading before attempting to do research on the atomic or electronic structure of materials.

for Tina , great, best product. This product has great balance and weighting to it. I was impressed with the packaging and the product itself is impressive, especially given the price. I would absolutely recommend purchasing this product to others. great .

It’s because of books like these that I’ve never had to take a formal quantum mechanics course to understand electronic structure theory. Hands down, this is one of the best theoretical solid state physics books.

This is the best book for learning solid state physics. It covers all the aspects of this exciting theme. I loved the extended appendix!

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