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# Band Theory And Electronic Properties Of Solids Ox

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Optical Properties of Solids

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Band Theory and Electronic Properties of Solids

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## TREVINO BRENDA

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### **Graphene Photonics** OUP Oxford

It is quite satisfying for an author to learn that his brainchild has been favorably accepted by students as well as by professors and thus seems to serve some useful purpose. This horizontally integrated text on the electronic properties of metals, alloys, semiconductors, insulators, ceramics, and polymeric materials has been adopted by many universities in the United States as well as abroad, probably because of the relative ease with which the material can be understood. The book has now gone through several re printing cycles (among them a few pirate prints in

Asian countries). I am grateful to all readers for their acceptance and for the many encouraging comments which have been received. I have thought very carefully about possible changes for the second edition. There is, of course, always room for improvement. Thus, some rewording, deletions, and additions have been made here and there. I withstood, how ever, the temptation to expand considerably the book by adding completely new subjects. Nevertheless, a few pages on recent developments needed to be inserted. Among them are, naturally, the discussion of ceramic (high-tempera ture) superconductors, and certain elements of the rapidly expanding field of optoelectronics. Further, I felt that the readers might be interested in learning some more practical applications which result from the physical concepts which have been treated here.

Optical Properties of Solids World Scientific

This textbook presents the basic elements needed to understand and engage in research in semiconductor physics. It deals with elementary excitations in bulk and low-dimensional semiconductors, including quantum wells, quantum wires and quantum dots. The basic principles underlying optical nonlinearities are developed, including excitonic and many-body plasma effects. The fundamentals of optical bistability, semiconductor lasers, femtosecond excitation, optical Stark effect, semiconductor photon echo, magneto-optic effects, as well as bulk and quantum-confined Franz-Keldysh effects are covered. The material is presented in sufficient detail for graduate students and researchers who have a general background in quantum mechanics.

Polymer Electronics Courier Corporation

This book about electrical, electronic and magnetic properties of solids gives guidance to understand the electrical conduction processes and magnetism in a whole range of solids: ionic solids, metals, semiconductors, fast-ion conductors and superconductors. The experimental discussion is enriched by related theories like the free electron theory and the band theory of solids. A large spectrum of topics is presented in this book: Hall effect, magnetoresistance, physics of semiconductors, functioning of semiconductor devices, fast-ion conduction, classical and modern aspects of superconductivity. The book explains the magnetic properties of solids and theoretical and experimental aspects of the various manifestations of magnetism, dia-, para-, ferro-, antiferro- and ferri-magnetism. The consideration of magnetic symmetry, magnetic structures and

their experimental determination completes the spectrum of the book. Theories, techniques and applications of NMR and ESR complete the analytical spectrum presented. Some of these topics are not represented in standard books. Each topic is thoroughly treated. There are historical remarks and a discussion of the role of symmetry in the book. The book lays great emphasis on principles and concepts and is written in a comprehensive way. It contains much new information. This book complements an earlier book by the same authors (*Atomistic properties of solids* - Springer, 2011).

*Magnetism in Condensed Matter* Cambridge University Press  
Graduate-level textbook for physicists, chemists and materials scientists.

*Band Theory and Electronic Properties of Solids* Springer Science & Business Media

This book originated out of a desire to provide students with an instrument which might lead them from knowledge of elementary classical and quantum physics to modern theoretical techniques for the analysis of electron transport in semiconductors. The book is basically a textbook for students of physics, material science, and electronics. Rather than a monograph on detailed advanced research in a specific area, it intends to introduce the reader to the fascinating field of electron dynamics in semiconductors, a field that, through its applications to electronics, greatly contributed to the transformation of all our lives in the second half of the twentieth century, and continues to provide surprises and new challenges. The field is so extensive that it has been necessary to leave aside many subjects, while others could be dealt with only in terms of their basic principles. The book is

divided into five major parts. Part I moves from a survey of the fundamentals of classical and quantum physics to a brief review of basic semiconductor physics. Its purpose is to establish a common platform of language and symbols, and to make the entire treatment, as far as possible, self-contained. Parts II and III, respectively, develop transport theory in bulk semiconductors in semiclassical and quantum frames. Part IV is devoted to semiconductor structures, including devices and mesoscopic coherent systems. Finally, Part V develops the basic theoretical tools of transport theory within the modern nonequilibrium Green-function formulation, starting from an introduction to second-quantization formalism.

An Effective-mass Theory of the Electronic Properties of Semiconductor Heterostructures Springer Science & Business Media

This book describes how the arrangement and movement of atoms in a solid are related to the forces between atoms, and how they affect the behaviour and properties of materials. The book is intended for final year undergraduate students and graduate students in physics and materials science.

*Electronic Structure* OUP Oxford

The Actinides: Electronic Structure and Related Properties, Volume II presents a comprehensive review of the pertinent information and the existing body of knowledge on the electronic structure of the actinide elements, compounds, and alloys. This book discusses the behavior of actinides in detail. Organized into eight chapters, this volume begins with an overview of how electronic band-structure calculations have contributed to the basic understanding of diverse physical properties of the AX

compounds. This text then describes the concept of magnetism in the metals, intermetallic compounds, and dilute alloys. Other chapters consider the optical experiments to obtain mappings of the occupied and empty electronic density of states. This book includes as well a comprehensive list of compounds, as well as a description and classification of crystal-structure data. The final chapter deals with the important improvements in the experimental methods for studying surfaces and surface reactions. This book is a valuable resource for physicists and materials scientists.

*Polymers and Small Molecules* World Scientific

Electronic materials provide the basis for many high tech industries that have changed rapidly in recent years. In this fully revised and updated second edition, the author discusses the range of available materials and their technological applications. Introduction to the Electronic Properties of Materials, 2nd Edition presents the principles of the behavior of electrons in materials and develops a basic understanding with minimal technical detail. Broadly based, it touches on all of the key issues in the field and offers a multidisciplinary approach spanning physics, electrical engineering, and materials science. It provides an understanding of the behavior of electrons within materials, how electrons determine the magnetic thermal, optical and electrical properties of materials, and how electronic properties are controlled for use in technological applications. Although some mathematics is essential in this area, the mathematics that is used is easy to follow and kept to an appropriate level for the reader. An excellent introductory text for undergraduate students, this book is a broad introduction to the topic and

provides a careful balance of information that will be appropriate for physicists, materials scientists, and electrical engineers.

*Electronic Properties of Materials* World Scientific

For final year undergraduates and graduate students in physics, this book offers an up-to-date treatment of the optical properties of solid state materials.

*Electronic Properties of Organic Conductors* Springer

Electron theory of metals textbook for advanced undergraduate students of condensed-matter physics and related disciplines.

### **Introduction to the Electronic Properties of Materials**

World Scientific

Optical Properties of Solids covers the important concepts of intrinsic optical properties and photoelectric emission. The book starts by providing an introduction to the fundamental optical spectra of solids. The text then discusses Maxwell's equations and the dielectric function; absorption and dispersion; and the theory of free-electron metals. The quantum mechanical theory of direct and indirect transitions between bands; the applications of dispersion relations; and the derivation of an expression for the dielectric function in the self-consistent field approximation are also encompassed. The book further tackles current-current correlations; the fluctuation-dissipation theorem; and the effect of surface plasmons on optical properties and photoemission.

People involved in the study of the optical properties of solids will find the book invaluable.

*Memorial Volume For Shoucheng Zhang* Academic Press

Polymer electronics is the science behind many important new developments in technology, such as the flexible electronic display (e-ink) and many new developments in transistor

technology. Solar cells, light-emitting diodes, and transistors are all areas where plastic electronics is likely to, or is already having, a serious impact on our daily lives. With polymer transistors and light-emitting diodes now being commercialised, there is a clear need for a pedagogic text that discusses the subject in a clear and concise fashion suitable for senior undergraduate and graduate students. The content builds on what has been learnt in an elementary (core) course in solid state physics and electronic behaviour, but care has been taken to ensure that important aspects such as the synthesis of these polymers are not overlooked. The chemistry is treated in a manner appropriate to students of physics. Polymer Electronics presents a thorough discussion of the physics and chemistry behind this new and important area of science, appealing to all physical scientists with an interest in the field.

Optical Properties of Solids OUP Oxford

This invaluable textbook presents the basic elements needed to understand and research into semiconductor physics. It deals with elementary excitations in bulk and low-dimensional semiconductors, including quantum wells, quantum wires and quantum dots. This fifth edition includes an additional chapter on `Quantum Optical Effects' where the theory of quantum optical effects in semiconductors is detailed. Besides deriving the `semiconductor luminescence equations' and the expression for the stationary luminescence spectrum, results are presented to show the importance of Coulombic effects on the semiconductor luminescence and to elucidate the role of excitonic populations. Solid-State Physics for Electronics Band Theory and Electronic Properties of Solids

An informal and highly accessible writing style, a simple treatment of mathematics, and clear guide to applications, have made this book a classic text in electrical and electronic engineering. Students will find it both readable and comprehensive. The fundamental ideas relevant to the understanding of the electrical properties of materials are emphasized; in addition, topics are selected in order to explain the operation of devices having applications (or possible future applications) in engineering. The mathematics, kept deliberately to a minimum, is well within the grasp of a second-year student. This is achieved by choosing the simplest model that can display the essential properties of a phenomenon, and then examining the difference between the ideal and the actual behaviour. The whole text is designed as an undergraduate course. However most individual sections are self contained and can be used as background reading in graduate courses, and for interested persons who want to explore advances in microelectronics, lasers, nanotechnology and several other topics that impinge on modern life.

**From Basic Principles to Molecular Electronics** Oxford University Press

Modern Semiconductor Quantum Physics has the following constituents: (1) energy band theory: pseudopotential method (empirical and ab initio); density functional theory; quasi-particles; LCAO method; k.p method; spin-orbit splitting; effective mass and Luttinger parameters; strain effects and deformation potentials; temperature effects. (2) Optical properties: absorption and exciton effect; modulation spectroscopy; photoluminescence and photoluminescence excitation; Raman scattering and

polaritons; photoionization. (3) Defects and Impurities: effective mass theory and shallow impurity states; deep state cluster method, super cell method, Green's function method; carrier recombination kinetics; trapping transient measurements; electron spin resonance; electron lattice interaction and lattice relaxation effects; multi-phonon nonradiative recombination; negative U center, DX center and EL2 Defects. (4) Semiconductor surfaces: two dimensional periodicity and surface reconstruction; surface electronic states; photo-electron spectroscopy; LEED, STM and other experimental methods. (5) Low-dimensional structures: Heterojunctions, quantum wells; superlattices, quantum-confined Stark effect and Wannier-Stark ladder effects; resonant tunneling, quantum Hall effect, quantum wires and quantum dots. This book can be used as an advanced textbook on semiconductor physics for graduate students in physics and electrical engineering departments. It is also useful as a research reference for solid state scientists and semiconductor device engineers.

Theory of Electron Transport in Semiconductors OUP Oxford

The purpose of this book is to provide the reader with a self-contained treatment of fundamental solid state and semiconductor device physics. The material presented in the text is based upon the lecture notes of a one-year graduate course sequence taught by this author for many years in the Department of Electrical Engineering of the University of Florida. It is intended as an introductory textbook for graduate students in electrical engineering. However, many students from other disciplines and backgrounds such as chemical engineering, materials science, and physics have also taken this course

sequence, and will be interested in the material presented herein. This book may also serve as a general reference for device engineers in the semiconductor industry. The present volume covers a wide variety of topics on basic solid state physics and physical principles of various semiconductor devices. The main subjects covered include crystal structures, lattice dynamics, semiconductor statistics, energy band theory, excess carrier phenomena and recombination mechanisms, carrier transport and scattering mechanisms, optical properties, photoelectric effects, metal-semiconductor devices, the p-n junction diode, bipolar junction transistor, MOS devices, photonic devices, quantum effect devices, and high speed III-V semiconductor devices. The text presents a unified and balanced treatment of the physics of semiconductor materials and devices. It is intended to provide physicists and materials scientists with more device backgrounds, and device engineers with a broader knowledge of fundamental solid state physics.

*The Oxford Solid State Basics* Oxford University Press

Band Theory and Electronic Properties of Solids Oxford University Press

*Electrical Properties of Materials* Academic Press

This book provides an introduction to band theory and the electronic properties of materials at a level suitable for final-year undergraduates or first-year graduate students. It sets out to provide the vocabulary and quantum-mechanical training necessary to understand the electronic, optical and structural properties of the materials met in science and technology and describes some of the experimental techniques which are used to study band structure today. In order to leave space for recent

developments, the Drude model and the introduction of quantum statistics are treated synoptically. However, Bloch's theorem and two tractable limits, a very weak periodic potential and the tight-binding model, are developed rigorously and in three dimensions. Having introduced the ideas of bands, effective masses and holes, semiconductor and metals are treated in some detail, along with the newer ideas of artificial structures such as superlattices and quantum wells, layered organic substances and oxides. Some recent 'hot topics' in research are covered, e.g. the fractional Quantum Hall Effect and nano-devices, which can be understood using the techniques developed in the book. In illustrating examples of e.g. the de Haas-van Alphen effect, the book focuses on recent experimental data, showing that the field is a vibrant and exciting one. References to many recent review articles are provided, so that the student can conduct research into a chosen topic at a deeper level. Several appendices treating topics such as phonons and crystal structure make the book self-contained introduction to the fundamentals of band theory and electronic properties in condensed matter physics today.

**Solid State Theory** Morgan & Claypool Publishers

DIVThorough, modern study of solid state physics; solid types and symmetry, electron states, electronic properties and cooperative phenomena. /div

**Solid State Physics** Springer

Band theory is evident all around us and yet is one of the most stringent tests of quantum mechanics. This textbook, one of the first in the new Oxford Master Series in Physics, attempts to reveal in a quantitative and fairly rigorous fashion how band theory leads to the everyday properties of materials. The book is

suitable for final-year undergraduate and first-year graduate students in physics and materials science.