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(Physicist, Great Britain) - 2001

Electrons and Phonons - J.M. Ziman - 2001-02
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Electrons and Phonons - John M. Ziman - 1960

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Electrons and Phonons - Ziman - 1979

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Electrons and Phonons - John Michael Ziman (Physicist, Great Britain) - 2001

Electrons and Phonons - John Michael Ziman

Electrons and phonons the theory of transport phenomena in solids - M. Ziman - 1967

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Quantum Kinetic Theory and Applications - Fedir T. Vasko - 2006-06-08
Physicalkineticsisthe?nalsectionofthecourseoftheoreticalphysicsinitsstandardpresentation. It stays at the boundary between general theories and their applications (solid state theory, theory of gases, plasma, and so on), because the treatment of kinetic phenomena always depends on specific structural features of materials. On the other hand, the physical kinetics as a part of the quantum theory of macroscopic systems is far from being complete. A number of its fundamental issues, such as the problem of irreversibility and mechanisms of chaotic responses, are now attracting considerable attention. Other important sections, for example, kinetic phenomena in disordered and/or strongly non-equilibrium systems and, in particular, phase transitions in these systems, are currently under investigation. The quantum theory of m-
which the student needs to learn first in solid actively developing in the last decade are based on the quantum kinetic theory. Because a deductive theoretical exposition of the subject is not convenient, the authors restrict themselves to a lecture-style presentation. Now the physical kinetics seems to be at the stage of development when, according to Newton, studying examples is more instructive than learning rules. In view of these circumstances, the methods of the kinetic theory are presented here not in a general form but as applications for description of specific systems and treatment of particular kinetic phenomena. The quantum features of kinetic phenomena can arise for several reasons.

Quantum Kinetic Theory and Applications - Fedir T. Vasko - 2006-06-08
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Introduction to Phonons and Electrons - Liang-fu Lou - 2003
This book focuses on phonons and electrons, which the student needs to learn first in solid state physics. The required quantum theory and statistical physics are derived from scratch. Systematic in structure and tutorial in style, the treatment is filled with detailed mathematical steps and physical interpretations. This approach ensures a self-sufficient content for easier teaching and learning. The objective is to introduce the concepts of phonons and electrons in a more rigorous and yet clearer way, so that the student does not need to relearn them in more advanced courses. Examples are the transition from lattice vibrations to phonons and from free electrons to energy bands. The book can be used as the beginning module of a one-year introductory course on solid state physics, and the instructor will have a chance to choose additional topics. Alternatively, it can be taught as a stand-alone text for building the most-needed foundation in just one semester.

Electrons and Phonons - J. M. Ziman - 1996
Quantum Theory of the Solid State, Part B describes the concepts and methods of the central problems of the quantum theory of solids. This book discusses the developed machinery
Theoretical Modelling of Semiconductor Surfaces - G. P. Srivastava - 1999
The state-of-the-art theoretical studies of ground state properties, electronic states and atomic vibrations for bulk semiconductors and their surfaces by the application of the pseudopotential method are discussed. Studies of bulk and surface phonon modes have been extended by the application of the phenomenological bond charge model. The coverage of the material, especially of the rapidly growing and technologically important topics of surface reconstruction and chemisorption, is up-to-date and beyond what is currently available in book form. Although theoretical in nature, the book provides a good deal of discussion of available experimental results. Each chapter provides an adequate list of references, relevant for both theoretical and experimental studies. The presentation is coherent and self-contained, and is aimed at the postgraduate and postdoctoral levels.

Field Theory of Electrons and Phonons - David Alan Simkin - 1963
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A second edition with four new chapters for graduate students and researchers in semiconductor physics.

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Electron Phonon Interactions - Albert Rose - 1989
This monograph is a radical departure from the conventional quantum mechanical approach to electron-phonon interactions. It translates the customary quantum mechanical analysis of the electron-phonon interactions carried out in Fourier space into a predominantly classical analysis carried out in real space. Various electron-phonon interactions such as the polar and nonpolar optical phonons, acoustic phonons that interact via deformation potential and via the piezoelectric effect and phonons in metals, are treated in this monograph by a single,
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Electrons and Disorder in Solids - V.F. Gantmakher - 2005-08-25
Written for those studying solid state physics, this work contains modern concepts about the physics of electrons in solids. The emphasis is laid on various physical models aimed at stimulating creative thinking.


Introduction to Solid-State Theory - Otfried Madelung - 2012-12-06
Introduction to Solid-State Theory is a textbook for graduate students of physics and materials science. It also provides the theoretical background needed by physicists doing research in pure solid-state physics and its applications to electrical engineering. The fundamentals of solid-state theory are based on a description by delocalized and localized states and - within the concept of delocalized states - by elementary excitations. The development of solid-state theory within the last ten years has shown that by a systematic introduction of these concepts, large parts of the theory can be described in a unified way. This form of description gives a "pictorial" formulation of many elementary processes in solids, which facilitates their understanding.

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**Phonons in Low Dimensional Structures** - Vasilios N. Stavrou - 2018-12-12

The field of low-dimensional structures has been experiencing rapid development in both theoretical and experimental research. Phonons in Low Dimensional Structures is a collection of chapters related to the properties of solid-state structures dependent on lattice vibrations. The book is divided into two parts. In the first part, research topics such as interface phonons and polaron states, carrier-phonon non-equilibrium dynamics, directional projection of elastic waves in parallel array of N elastically coupled waveguides, collective dynamics for longitudinal and transverse phonon modes, and elastic properties for bulk metallic glasses are related to semiconductor devices and metallic glasses devices. The second part of the book contains, among others, topics related to superconductor, phononic crystal carbon nanotube devices such as phonon dispersion calculations using density functional theory for a range of superconducting materials, phononic crystal-based MEMS resonators, absorption of acoustic phonons in the hyper-sound regime in fluorine-modified carbon nanotubes and single-walled nanotubes, phonon transport in carbon nanotubes, quantization of phonon thermal conductance, and phonon Anderson localization.


An accessible overview of the concepts and tools essential to the physics of materials, with applications, exercises, and color figures.

**Quantum Probability Communications** - S Attal - 2003

Lecture notes from a Summer School on Quantum Probability held at the University of Grenoble are collected in these two volumes of the QP-PQ series. The articles have been refereed and extensively revised for publication. It is hoped that both current and future students of quantum probability will be engaged, informed and inspired by the contents of these two volumes. An extensive bibliography containing the references from all the lectures is included in Volume 12.
Hybrid Phonons in Nanostructures - Brian K. Ridley - 2017-02-02
The book provides a technical account of the basic physics of nanostructures, which are the foundation of the hardware found in all manner of computers. It will be of interest to semiconductor physicists and electronic engineers and advanced research students. Crystalline nanostructures have special properties associated with electrons and lattice vibrations and their interaction. The result of spatial confinement of electrons is indicated in the nomenclature of nanostructures: quantum wells, quantum wires, quantum dots. Confinement also has a profound effect on lattice vibrations. The documentation of the confinement of acoustic modes goes back to Lord Rayleigh’s work in the late nineteenth century, but no such documentation exists for optical modes. It is only comparatively recently that any theory of the elastic properties of optical modes exists, and a comprehensive account is given in this book. A model of the lattice dynamics of the diamond lattice is given that reveals the quantitative distinction between acoustic and optical modes and the difference of connection rules that must apply at an interface. The presence of interfaces in nanostructures forces the hybridization of longitudinally and transversely polarized modes, along with, in polar material, electromagnetic modes. Hybrid acoustic and optical modes are described, with an emphasis on polar-optical phonons and their interaction with electrons. Scattering rates in single heterostructures, quantum wells and quantum wires are described and the anharmonic interaction in quantum dots discussed. A description is given of the effects of dynamic screening of hybrid polar modes and the production of hot phonons.

Phonons: Theory and Experiments II - Peter Brüesch - 2012-12-06
The first part of this three-volume treatment, Phonons: Theory and Experiments I, has been devoted to the basic concepts of the physics of phonons and to a study of models of interatomic forces. The present second volume, Phonons: Theory and Experiments II, contains a thorough study of experimental techniques and the interpretation of experimental results. In a third volume we shall treat a number of phenomena which are directly related to lattice dynamics. The aim of this treatment is to bridge the gap between theory and experiment. Both experimental aspects and theoretical concepts necessary for an interpretation of experimental data are discussed. An attempt has been made to present the descriptive as well as the analytical aspects of the topics. Although emphasis is placed on the experimental and theoretical study of the dynamics of atoms in solids, most chapters also contain a general introduction to the
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Introduction to the Electron Theory of Metals - Uichiro Mizutani - 2001-06-14
Electron theory of metals textbook for advanced undergraduate students of condensed-matter physics and related disciplines.

Electrons and Phonons in Layered Crystal Structures - T.J. Wieting - 2012-12-06
This volume is devoted to the electron and phonon energy states of inorganic layered crystals. The distinctive feature of these low-dimensional materials is their easy mechanical cleavage along planes parallel to the layers. This feature implies that the chemical binding within each layer is much stronger than the binding between layers and that some, but not necessarily all, physical properties of layered crystals have two-dimensional character. In Wyckoff's Crystal Structures, SiC and related compounds are regarded as layered structures, because their atomic layers are alternately stacked according to the requirements of cubic and hexagonal close-packing. However, the uniform (tetrahedral) coordination of the atoms in these compounds excludes the kind of structural anisotropy that is fundamental to the materials discussed in this volume. An individual layer of a layered crystal may be composed of either a single sheet of atoms, as in graphite, or a set of up to five atomic sheets, as in Bi2Te3. A layer may also have more complicated arrangements of the atoms, as we find for example in Sb2S3. But the unique feature common to all these materials is the structural anisotropy, which directly affects their electronic and vibrational properties. The nature of the weak interlayer coupling is not very well understood, despite the frequent attribution of the coupling in the literature to van der Waals forces. Two main facts, however, have emerged from all studies.

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There have been few books devoted to the study of phonons, a major area of condensed matter physics. The Physics of Phonons is a comprehensive theoretical discussion of the most important topics, including some topics not previously presented in book form. Although primarily theoretical in approach, the author refers to experimental results wherever possible, ensuring an ideal book for both experimental and theoretical researchers. The author begins with an introduction to crystal symmetry and continues with a discussion of lattice dynamics in the harmonic approximation, including the traditional phenomenological approach and the more recent ab initio approach, detailed for the first time in this book. A discussion of anharmonicity is followed by the theory of lattice thermal conductivity, presented at a level far beyond that available in any other book. The chapter on phonon interactions is likewise more comprehensive than any similar discussion elsewhere. The sections on phonons in superlattices, impure and mixed crystals, quasicrystals, phonon spectroscopy, Kapitza resistance, and quantum evaporation also contain material appearing in book form for the first time. The book is complemented by numerous diagrams that aid understanding and is comprehensively referenced for further study. With its unprecedented wide coverage of the field, The Physics of Phonons will be indispensable to all postgraduates, advanced undergraduates, and researchers working on condensed matter physics.


When I was contacted by Kluwer Academic Publishers in the Fall of 200 I, inviting me to edit a volume of papers on the issue of electron transport in quantum dots, I was excited by what I saw as an ideal opportunity to provide an overview of a field of research that has made significant contributions in recent years, both to our understanding of fundamental physics, and to the development of novel nanoelectronic technologies. The need for such a volume seemed to be made more pressing by the fact that few
of the statistical properties of phonons, electrons, appeared in the literature, in spite of the vast activity in this area over the course of the last decade or so. With this motivation, I set out to try to compile a volume that would fairly reflect the wide range of opinions that has emerged in the study of electron transport in quantum dots. Indeed, there has been no effort on my part to ensure any consistency between the different chapters, since I would prefer that this volume instead serve as a useful forum for the debate of critical issues in this still developing field. In this matter, I have been assisted greatly by the excellent series of articles provided by the different authors, who are widely recognized as some of the leaders in this vital area of research.

**Electron Transport in Quantum Dots**
Jonathan P. Bird - 2013-11-27
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**Statistical Physics of Crystals and Liquids**
Duane C Wallace - 2003-01-13
This important book presents a unified formulation from first principles of the Hamiltonian and statistical mechanics of metallic and insulating crystals, amorphous solids, and liquids. Extensive comparison of theory and experiment provides an accurate understanding and phonon-phonon and electron-phonon interactions in elemental crystals and liquids. Questions are posed along the following lines: What is the “best” theory for a given property? How accurate is a good theory? What information is gained by a comparison of theory and experiment? How accurate is a good experiment?

Contents:
- Condensed Matter Hamiltonian
- Statistical Mechanics
- Lattice Dynamics
- Statistical Mechanics of Crystals
- Liquid Dynamics
- Statistical Mechanics of Phase Transitions and Nonequilibrium Processes

Readership: Researchers, academics and graduate students in condensed matter physics.

Keywords: Condensed Matter Hamiltonian; Statistical Mechanics; Lattice Dynamics; Crystals; Liquid Dynamics; Phase Transitions; Metastable States

Reviews: This is a valuable and clearly written book in an important area of condensed matter theory. There is extensive contact between theoretical predictions and experiments. For both students and young research workers there are useful collections of problems which lead to further insight into the area covered. Quantitative equations of state are given prominence. “Norman H. March, Oxford University “This is an authoritative account of the physics and thermodynamics behind an understanding of the equation of state. It concentrates on elements and the use of pseudopotential perturbation theory for the simple metals provides insight and a basis for computer simulations. The account combines careful theoretical analyses, and Local-Density-Theory results, with interpretation of the best experimental data available and may be unique in incorporating the liquid, as well as the crystalline state. The very complete set of problems included would make it very appropriate as the text for a general course on the equation of state.” Walt Harrison, Stanford University “Whatever the author does, he does it first class. His book is something we use to gauge excellence in the field, and I have no doubt that this one will be no exception. But this book is different from other books he wrote. It is more personal in that he has not hesitated to express his personal views strongly, but in a scholarly fashion.” Y Horie, Los Alamos National Laboratory “This is a book of condensed matter physics that gives equal emphasis to solids and liquids. The author focuses on the equation of state of the simple elements and reviews the methods for...
and phonon-phonon and electron-phonon mechanics to the equation of state of the solid and liquid and the computation of the melting curve. For the reader who wants an introduction to the capability of modern statistical physics for accurate prediction of thermodynamic functions, this is the book."David Young Lawrence Livermore National Laboratory "This book, in my mind, represents an extremely powerful resource to any researcher working in condensed matter physics and especially equation of state theory. It is clear from 'Statistical Physics of Crystals and Liquids' that Dr Wallace has a special gift of taking complex physics concepts and explaining them with the greatest of clarity. His ability clearly distinguishes this book from those written by more novice authors ... In summary, I believe this book should be highly marketed as I expect that there is a large condensed matter community that would benefit from reading it."Brad Clements Los Alamos National Laboratory "The three investigated subjects, only fragments of which are covered in other textbooks and research treatises, make this book a very useful one for specialists in statistical mechanics and structure of matter."Zentralblatt MATH "... the book comprises a brisk overview of solids that reaches timely topics of nonequilibrium processes ... its structure lends itself well to being used as an instructional text in either an advanced undergraduate course or a graduate treatment of the subject ... The review of statistical mechanics is straightforward to anyone with prior exposure to the subject, and is nearly complete ... Wallace has done an excellent job of achieving the goals set out in the introduction of the book in a format that is clean and easy to read with a notation that is not confusing."MRS Bulletin "This book covers 'equation of state' but also atomic dynamics. In these fields it offers a useful summary of methods and results, which prove how successful modern computational methods have become."Contemporary Physics

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"This is an authoritative account of the physics and thermodynamics behind an understanding of the equation of state. It concentrates on elements and the use of pseudopotential perturbation theory for the simple metals provides insight and a basis for computer simulations. The account combines careful theoretical analyses, and Local-Density-Theory results, with interpretation of the best experimental data available and may be unique in incorporating the liquid, as well as the crystalline state. The very complete set of problems included would make it very appropriate as the text for a general course on the equation of state."Walt Harrison Stanford University

"Whatever the author does, he does it first class. His book is something we use to gauge excellence in the field, and I have no doubt that this one will be no exception. But this book is different from other books he wrote. It is more personal in that he has not hesitated to express his personal views strongly, but in a scholarly fashion."Y Horie Los Alamos National Laboratory

"This is a book of condensed matter physics that gives equal emphasis to solids and liquids. The author focuses on the equation of state of the simple elements and reviews the methods for passing from the Hamiltonian through statistical..."
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Theory of Electron Transport in Semiconductors - Carlo Jacoboni - 2010-09-05
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...
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**Solid-State Physics** - James D. Patterson - 2019-02-20

While the standard solid state topics are covered, the basic ones often have more detailed derivations than is customary (with an emphasis on crystalline solids). Several recent topics are introduced, as are some subjects normally included only in condensed matter physics. Lattice vibrations, electrons, interactions, and spin effects (mostly in magnetism) are discussed the most comprehensively. Many problems are included whose level is from "fill in the steps" to long and challenging, and the text is equipped with references and several comments about experiments with figures and tables.

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This is a first undergraduate textbook in Solid State Physics or Condensed Matter Physics. While most textbooks on the subject are extremely dry, this book is written to be much more exciting, inspiring, and entertaining.

**Field Theories in Condensed Matter Physics** - Sumathi Rao - 2019-04-24

The application of field theoretic techniques to problems in condensed matter physics has generated an array of concepts and mathematical techniques to attack a range of problems such as the theory of quantum phase transitions, the quantum Hall effect, and quantum wires. While concepts such as the renormalization group, topology, and bosonization h

**Mosaic** - 1987

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**Introduction to Phonons and Electrons** - Liang-fu Lou - 2003-08-12

This book focuses on phonons and electrons, which the student needs to learn first in solid state physics. The required quantum theory and statistical physics are derived from scratch. Systematic in structure and tutorial in style, the treatment is filled with detailed mathematical steps and physical interpretations. This approach ensures a self-sufficient content for easier teaching and learning. The objective is to introduce the concepts of phonons and electrons in a more rigorous and yet clearer way, so that the student does not need to relearn them in more advanced courses. Examples are the transition from lattice vibrations to phonons and from free electrons to energy bands. The book can be used as the beginning module of a one-year introductory course on solid state physics, and the instructor will have a chance to choose additional topics. Alternatively, it can be taught as a stand-alone text for building the most-needed foundation in just one semester. Contents: Crystal Structure, Reciprocal Lattice and
focused, rigorous, and self sufficient. It is filled with meticulous details. I am pleased to see that many questions the students may have when learning these subjects are answered in this book... I strongly recommend it to both the teacher and students." J J Chang Professor of Physics Wayne State University "The presentation is done well and the author has an easy-to-read style that is almost chatty... Overall, I think that the author has succeeded in providing a book for a niche where the beginning student of solid-state physics wants a self-contained book without having to go to another textbook." MRS Bulletin

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Liang-fu Lou - 2003-08-12

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- Free Electron Fermi Gas
- Electron Energy Bands

Readership: Undergraduates, graduate students and researchers in physics, materials science and electronic devices.

Keywords:
- Crystal Symmetries
- Lattice Vibrations
- Phonons
- Free Electrons
- X-Ray Diffraction

Reviews: "The book is focused, rigorous, and self sufficient. It is filled with meticulous details. I am pleased to see that many questions the students may have when learning these subjects are answered in this book... I strongly recommend it to both the teacher and students." J J Chang Professor of Physics Wayne State University "The presentation is done well and the author has an easy-to-read style that is almost chatty... Overall, I think that the author has succeeded in providing a book for a niche where the beginning student of solid-state physics wants a self-contained book without having to go to another textbook." MRS Bulletin

**Phonons: Theory and Experiments III** - Peter Brüesch - 2012-12-06

The first volume of this treatment, Phonons: Theory and Experiments I, was devoted to the basic concepts of the physics of phonons and to a study of models for interatomic forces. The second volume, Phonons: Theory and Experiments II, contains a study of experimental techniques and the interpretation of experimental results. In the present third volume we treat a number of phenomena which are directly related to phonons. The aim of this book is to bridge the gap between theory and experiment. An attempt has been made to present the descriptive as well as the analytical aspects of the topics. Although emphasis is placed on the role of phonons in the different topics, most chapters also contain a general introduction into the specific subject. The book is addressed to experimentalists and to theoreticians working in the vast field of dynamical properties of solids. It will also prove useful to graduate students starting research in this or related fields. The choice of the topics treated was partly determined by the author's own activity in these areas. This is particularly the case for the chapters dealing with phonons in one-dimensional metals, disordered systems, super ionic conductors and certain newer aspects of ferroelectricity and melting. I am very grateful to my colleagues J. Bernasconi, V.T. Hochli and 1.

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Condensed Matter Field Theory - Alexander Altland - 2010-03-11
Modern experimental developments in condensed matter and ultracold atom physics present formidable challenges to theorists. This book provides a pedagogical introduction to quantum field theory in many-particle physics, emphasizing the applicability of the formalism to concrete problems. This second edition contains two new chapters developing path integral approaches to classical and quantum nonequilibrium phenomena. Other chapters cover a range of topics, from the introduction of many-body techniques and functional integration, to renormalization group methods, the theory of response functions, and topology. Conceptual aspects and formal methodology are emphasized, but the discussion focuses on practical experimental applications drawn largely from condensed matter physics and neighboring fields. Extended and challenging problems with fully worked solutions provide a bridge between formal manipulations and research-oriented thinking. Aimed at elevating graduate students to a level where they can engage in independent research, this book complements graduate level courses on many-particle theory.

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Cooperative Phenomena - H. Haken - 2012-12-06
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Thermoelectrics and its Energy Harvesting, 2-Volume Set - David Michael Rowe - 2018-10-03
Comprising two volumes, Thermoelectrics and Its Energy Harvesting reviews the vast improvements in technology and application of thermoelectric energy with a specific intention to reduce and reuse waste heat and improve novel techniques for the efficient acquisition and use of energy. Materials, Preparation, and Characterization in Thermoelectrics

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Solid-State Physics for Electronics - Andre Moliton - 2013-03-01
Describing the fundamental physical properties of materials used in electronics, the thorough coverage of this book will facilitate an understanding of the technological processes used in the fabrication of electronic and photonic devices. The book opens with an introduction to the basic applied physics of simple electronic states and energy levels. Silicon and copper, the building blocks for many electronic devices, are used as examples. Next, more advanced theories are developed to better account for the electronic and optical behavior of ordered materials, such as diamond, and disordered materials, such as amorphous silicon. Finally, the principal quasi-particles (phonons, polarons, excitons, plasmons, and polaritons) that are fundamental to explaining phenomena such as component aging (phonons) and optical performance in terms of yield (excitons) or communication speed (polarons) are discussed.
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Simulation of Transport in Nanodevices - Francois Triozon - 2016-12-27
Linear current-voltage pattern, has been and continues to be the basis for characterizing, evaluating performance, and designing integrated circuits, but is shown not to hold its supremacy as channel lengths are being scaled down. In a nanoscale circuit with reduced dimensionality in one or more of the three Cartesian directions, quantum effects transform the carrier statistics. In the high electric field, the collision free ballistic transform is predicted, while in low electric field the transport remains predominantly scattering-limited. In a micro/nano-circuit, even a low logic voltage of 1 V is above the critical voltage triggering nonohmic behavior that results in ballistic current saturation. A quantum emission may lower this ballistic velocity.