

## **The Physics Of Semiconductors An Introduction Inc**

*The new edition of the most detailed and comprehensive single-volume reference on major semiconductor devices The Fourth Edition of Physics of Semiconductor Devices remains the standard reference work on the fundamental physics and operational characteristics of all major bipolar, unipolar, special microwave, and optoelectronic devices. This fully updated and expanded edition includes approximately 1,000 references to original research papers and review articles, more than 650 high-quality technical illustrations, and over two dozen tables of material parameters. Divided into five parts, the text first provides a summary of semiconductor properties, covering energy band, carrier concentration, and transport properties. The second part surveys the basic building blocks of semiconductor devices, including p-n junctions, metal-semiconductor contacts, and metal-insulator-semiconductor (MIS) capacitors. Part III examines bipolar transistors, MOSFETs (MOS field-effect transistors), and other field-effect transistors such as JFETs (junction field-effect-transistors) and MESFETs (metal-semiconductor field-effect transistors). Part IV focuses on negative-resistance and power devices. The book concludes with coverage of photonic devices and sensors, including light-emitting diodes (LEDs), solar cells, and various photodetectors and semiconductor sensors. This classic volume, the standard textbook and reference in the field of semiconductor devices: Provides the practical foundation necessary for understanding the devices currently in use and evaluating the performance and limitations of future devices Offers completely updated and revised information that reflects advances in device concepts, performance, and application Features discussions of topics of contemporary interest, such as applications of photonic devices that convert optical energy to electric energy Includes numerous problem sets, real-world examples, tables, figures, and illustrations; several useful appendices; and a detailed solutions manual Explores new work on leading-edge technologies such as MODFETs, resonant-tunneling diodes, quantum-cascade lasers, single-electron transistors, real-space-transfer devices, and MOS-controlled thyristors Physics of Semiconductor Devices, Fourth Edition is an indispensable resource for design engineers, research scientists, industrial and electronics engineering managers, and graduate students in the field.*

*This textbook provides a theoretical background for contemporary trends in solid-state theory and semiconductor device physics. It discusses advanced methods of quantum mechanics and field theory and is therefore primarily intended for graduate students in theoretical and experimental physics who have already studied electrodynamics, statistical physics, and quantum mechanics. It also relates solid-state physics fundamentals to semiconductor device applications and includes auxiliary results from mathematics and quantum mechanics, making the book useful also for graduate students in electrical engineering and material science. Key Features: Explores concepts common in textbooks on semiconductors, in addition to topics not included in similar books currently available on the market, such as the topology of Hilbert space in crystals Contains the latest research and developments in the field*

*Written in an accessible yet rigorous manner*

*Electron and photon confinement in semiconductor nanostructures is one of the most active areas in solid state research. Written by leading experts in solid state physics, this book provides both a comprehensive review as well as a excellent introduction to fundamental and applied aspects of light-matter coupling in microcavities. Topics covered include parametric amplification and polariton liquids, quantum fluid and non-linear dynamical effects and parametric instabilities, polariton squeezing, Bose-Einstein condensation of microcavity polaritons, spin dynamics of exciton-polaritons, polariton correlation produced by parametric scattering, progress in III-nitride distributed Bragg reflectors using AlInN/GaN materials, high efficiency planar MCLEDs, exciton-polaritons and nanoscale cavities in photonic crystals, and MBE growth of high finesse microcavities.*

*The Proceedings of the 17th International Conference on the Physics of Semiconductors are contained in this volume. A record 1050 scientists from 40 countries participated in the Conference which was held in San Francisco August 6-10, 1984. The Conference was organized by the ICPS Committee and sponsored by the International Union of Pure and Applied Physics and other professional, government, and industrial organizations listed on the following pages. Papers representing progress in all aspects of semiconductor physics were presented. Far more abstracts (765) than could be presented in a five-day meeting were considered by the International Program Committee. A total of 350 papers, consisting of 5 plenary, 35 invited, and 310 contributed, were presented at the Conference in either oral or poster sessions. All but a few of the papers were submitted and have been included in these Proceedings. An interesting shift in subject matter, in comparison with earlier Conferences, is manifested by the large number of papers on surfaces, interfaces, and quantum wells. To facilitate the use of the Proceedings in finding closely related papers among the sometimes relatively large number of contributions within a main subject area, we chose not to arrange the papers strictly according to the Conference schedule. We have organized the book, as can be seen from the Contents, into specific subcategories and subdivisions within each major category. Plenary and invited papers have been placed together with the appropriate contributed papers.*

*Fundamentals of Semiconductors*

*Physics of Semiconductor Devices*

*Disordered Semiconductors Second Edition*

*Compound Semiconductors*

*Introduction to Semiconductor Physics*

**The book provides an overview of the fascinating spectrum of semiconductor physics, devices and applications, presented from a historical perspective. It covers the development of the subject from its inception in the early nineteenth century to the recent millennium. Written in a lively, informal**

***style, it emphasizes the interaction between pure scientific push and commercial pull, on the one hand, and between basic physics, materials, and devices, on the other. It also sets the various device developments in the context of systems requirements and explains how such developments met wide ranging consumer demands. It is written so as to appeal to students at all levels in physics, electrical engineering, and materials science, to teachers, lecturers, and professionals working in the field, as well as to a non-specialist scientific readership.***

***Based on courses given at the Ecole Polytechnique in France, this book covers not only the fundamental physics of semiconductors, but also discusses the operation of electronic and optical devices based on semiconductors. It is aimed at students with a good background in mathematics and physics, and is equally suited for graduate-level courses in condensed-matter physics as for self-study by engineers interested in a basic understanding of semiconductor devices.***

***This textbook describes the basic physics of semiconductors, including the hierarchy of transport models, and connects the theory with the functioning of actual semiconductor devices. Details are worked out carefully and derived from the basic physical concepts, while keeping the internal coherence of the analysis and explaining the different levels of approximation. Coverage includes the main steps used in the fabrication process of integrated circuits: diffusion, thermal oxidation, epitaxy, and ion implantation. Examples are based on silicon due to its industrial importance. Several chapters are included that provide the reader with the quantum-mechanical concepts necessary for understanding the transport properties of crystals. The behavior of crystals incorporating a position-dependent impurity distribution is described, and the different hierarchical transport models for semiconductor devices are derived (from the Boltzmann transport equation to the hydrodynamic and drift-diffusion models). The transport models are then applied to a detailed description of the main semiconductor-device architectures (bipolar, MOS, CMOS), including a number of solid-state sensors. The final chapters are devoted to the measuring methods for semiconductor-device parameters, and to a brief illustration of the scaling rules and numerical methods applied to the design of semiconductor devices.***

***The 3rd edition of this successful textbook contains ample material for a comprehensive upper-level undergraduate or beginning graduate course, guiding readers to the point where they can choose a special topic and begin supervised research. The textbook provides a balance between essential aspects of solid-state and semiconductor physics, on the one hand, and the principles of various semiconductor devices and their applications in electronic and photonic devices, on the other. It***

**highlights many practical aspects of semiconductors such as alloys, strain, heterostructures, nanostructures, that are necessary in modern semiconductor research but typically omitted in textbooks. Coverage also includes additional advanced topics, such as Bragg mirrors, resonators, polarized and magnetic semiconductors, nanowires, quantum dots, multi-junction solar cells, thin film transistors, carbon-based nanostructures and transparent conductive oxides. The text derives explicit formulas for many results to support better understanding of the topics. The Physics of Semiconductors requires little or no prior knowledge of solid-state physics and evolved from a highly regarded two-semester course. In the third edition several topics are extended and treated in more depth including surfaces, disordered materials, amorphous semiconductors, polarons, thermopower and noise. More than 1800 references guide the reader to historic and current literature including original and review papers and books.**

**With Applications to Optoelectronic Devices**

**An Introduction Including Devices and Nanophysics**

**Physics of Semiconductors**

**Semiconductor Device Physics and Design**

**The Physics of Semiconductor Devices**

Beginning graduate introduction to low-dimensional systems and their applications.

Semiconductors and Modern Electronics is a brief introduction to the physics behind semiconductor technologies. Chuck Winrich, a physics professor at Babson College, explores the topic of semiconductors from a qualitative approach to understanding the theories and models used to explain semiconductor devices. Applications of semiconductors are explored and understood through the models developed in the book. The qualitative approach in this book is intended to bring the advanced ideas behind semiconductors to the broader audience of students who will not major in physics. Much of the inspiration for this book comes from Dr. Winrich's experience teaching a general electronics course to students majoring in business. The goal of that class, and this book, is to bring forward the science behind semiconductors, and then to look at how that science affects the lives of people.

This book provides an overview of compound semiconductor materials and their technology. After presenting a theoretical background, it describes the relevant material preparation technologies for bulk and thin-layer epitaxial growth. It then briefly discusses the electrical, optical, and structural properties of semiconductors, complemented by a description of the most popular characterization tools, before more complex hetero- and low-dimensional structures are discussed. A special chapter is devoted to GaN and related materials, owing to their huge importance in modern optoelectronic and electronic devices, on the one hand, and their particular properties compared to other compound semiconductors, on the other. In the last part of the book, the physics and functionality of optoelectronic and electronic device structures (LEDs, laser diodes, solar cells, field-effect and heterojunction bipolar transistors) are discussed on the basis of the specific properties of compound

semiconductors presented in the preceding chapters of the book. Compound semiconductors form the back-bone of all opto-electronic and electronic devices besides the classical Si electronics. Currently the most important field is solid state lighting with highly efficient LEDs emitting visible light. Also laser diodes of all wavelength ranges between mid-infrared and near ultraviolet have been the enabler for a huge number of unprecedented applications like CDs and DVDs for entertainment and data storage, not to speak about the internet, which would be impossible without optical data communications with infrared laser diodes as key elements. This book provides a concise overview over this class of materials, including the most important technological aspects for their fabrication and characterisation, also covering the most relevant devices based on compound semiconductors. It presents therefore an excellent introduction into this subject not only for students, but also for engineers and scientist who intend to put their focus on this field of science.

Semiconductors are at the heart of modern living. Almost everything we do, be it work, travel, communication, or entertainment, all depend on some feature of semiconductor technology. Comprehensive Semiconductor Science and Technology captures the breadth of this important field, and presents it in a single source to the large audience who study, make, and exploit semiconductors. Previous attempts at this achievement have been abbreviated, and have omitted important topics. Written and Edited by a truly international team of experts, this work delivers an objective yet cohesive global review of the semiconductor world. The work is divided into three sections. The first section is concerned with the fundamental physics of semiconductors, showing how the electronic features and the lattice dynamics change drastically when systems vary from bulk to a low-dimensional structure and further to a nanometer size. Throughout this section there is an emphasis on the full understanding of the underlying physics. The second section deals largely with the transformation of the conceptual framework of solid state physics into devices and systems which require the growth of extremely high purity, nearly defect-free bulk and epitaxial materials. The last section is devoted to exploitation of the knowledge described in the previous sections to highlight the spectrum of devices we see all around us. Provides a comprehensive global picture of the semiconductor world Each of the work's three sections presents a complete description of one aspect of the whole Written and Edited by a truly international team of experts

Introductory Semiconductor Device Physics

Semiconductors and Modern Electronics

17th International Workshop on the Physics of Semiconductor Devices 2013

Physics, Technology, and Device Concepts

Spin Physics in Semiconductors

This book disseminates the current knowledge of semiconductor physics and its applications across the scientific community. It is based on a biennial workshop that provides the participating research groups with a stimulating platform for interaction and collaboration with colleagues from the same scientific community. The book discusses the latest developments in the field of III-nitrides; materials & devices, compound semiconductors, VLSI technology, optoelectronics, sensors, photovoltaics, crystal growth,

epitaxy and characterization, graphene and other 2D materials and organic semiconductors. Devices based on disordered semiconductors have wide applications. It is difficult to imagine modern life without printers and copiers, LCD monitors and TVs, optical disks, economical solar cells, and many other devices based on disordered semiconductors. However, nowadays books that discuss disordered (amorphous, nanocrystalline, microcrystalline)

Physics of Semiconductor Devices covers both basic classic topics such as energy band theory and the gradual-channel model of the MOSFET as well as advanced concepts and devices such as MOSFET short-channel effects, low-dimensional devices and single-electron transistors. Concepts are introduced to the reader in a simple way, often using comparisons to everyday-life experiences such as simple fluid mechanics. They are then explained in depth and mathematical developments are fully described. Physics of Semiconductor Devices contains a list of problems that can be used as homework assignments or can be solved in class to exemplify the theory. Many of these problems make use of Matlab and are aimed at illustrating theoretical concepts in a graphical manner.

Filling the gap in the literature currently available, this book presents an overview of our knowledge of the physics behind organic semiconductor devices. Contributions from 18 international research groups cover various aspects of this field, ranging from the growth of organic layers and crystals, their electronic properties at interfaces, their photophysics and electrical transport properties to the application of these materials in such different devices as organic field-effect transistors, photovoltaic cells and organic light-emitting diodes. From the contents: \* Excitation Dynamics in Organic Semiconductors \* Organic Field-Effect Transistors \* Spectroscopy of Organic Semiconductors \* Interfaces between Organic Semiconductors and Metals \* Analysis and Modeling of Devices \* Exciton Formation and Energy Transfer in Organic Light Emitting Diodes \* Deposition and Characterization

The Physics of Low-dimensional Semiconductors

Semiconductor Physics And Devices

San Francisco, California, USA August 6-10, 1984

Physics and Materials Properties

Physics of Organic Semiconductors

***The Third Edition of the standard textbook and reference in the field of semiconductor devices***

***This classic book has set the standard for advanced study and reference in the semiconductor***

*device field. Now completely updated and reorganized to reflect the tremendous advances in device concepts and performance, this Third Edition remains the most detailed and exhaustive single source of information on the most important semiconductor devices. It gives readers immediate access to detailed descriptions of the underlying physics and performance characteristics of all major bipolar, field-effect, microwave, photonic, and sensor devices. Designed for graduate textbook adoptions and reference needs, this new edition includes: A complete update of the latest developments New devices such as three-dimensional MOSFETs, MODFETs, resonant-tunneling diodes, semiconductor sensors, quantum-cascade lasers, single-electron transistors, real-space transfer devices, and more Materials completely reorganized Problem sets at the end of each chapter All figures reproduced at the highest quality Physics of Semiconductor Devices, Third Edition offers engineers, research scientists, faculty, and students a practical basis for understanding the most important devices in use today and for evaluating future device performance and limitations. A Solutions Manual is available from the editorial department.*

*Introduction to Semiconductor Device Physics is a popular and established text that offers a thorough introduction to the underlying physics of semiconductor devices. It begins with a review of basic solid state physics, then goes on to describe the properties of semiconductors including energy bands, the concept of effective mass, carrier concentration, and conduction in more detail. Thereafter the book is concerned with the principles of operation of specific devices, beginning with the Gunn Diode and the p-n junction. The remaining chapters cover the on specific devices, including the LED, the bipolar transistor, the field-effect transistor, and the semiconductor laser. The book concludes with a chapter providing a brief introduction to quantum theory. Not overtly mathematical, Introduction to Semiconductor Device Physics introduces only those physical concepts required for an understanding of the semiconductor devices being considered. The author's intuitive style, coupled with an extensive set of worked problems, make this the ideal introductory text for those concerned with understanding electrical and electronic engineering, applied physics, and related subjects.*

*This book describes semiconductors from a materials science perspective rather than from condensed matter physics or electrical engineering viewpoints. It includes discussion of current approaches to organic materials for electronic devices. It further describes the fundamental aspects of thin film nucleation and growth, and the most common physical and*

*chemical vapor deposition techniques. Examples of the application of the concepts in each chapter to specific problems or situations are included, along with recommended readings and homework problems.*

*A detailed description of the basic physics of semiconductors. All the important equations describing the properties of these materials are derived without the help of other textbooks. The reader is assumed to have only a basic command of mathematics and some elementary semiconductor physics. The text covers a wide range of important semiconductor phenomena, from the simple to the advanced.*

*Proceedings of the 17th International Conference on the Physics of Semiconductors  
Comprehensive Semiconductor Science and Technology*

*The Materials Science of Semiconductors*

*Physics of Semiconductor Microcavities*

*Physics and Applications*

Narrow gap semiconductors are the most important materials for the preparation of advanced modern infrared systems. They often operate at the extremes of the rules of semiconductor science. This book offers clear descriptions of crystal growth and the fundamental structure and properties of these unique materials. Topics covered include band structure, optical and transport properties, and lattice vibrations and spectra. A thorough treatment of the properties of low-dimensional systems and their relation to infrared applications is provided.

This book covers the physics of semiconductors on an introductory level, assuming that the reader already has some knowledge of condensed matter physics. Crystal structure, band structure, carrier transport, phonons, scattering processes and optical properties are presented for typical semiconductors such as silicon, but III–V and II–VI compounds are also included. In view of the increasing importance of wide-gap semiconductors, the electronic and optical properties of these materials are dealt with too.

Graduate text with comprehensive treatment of semiconductor device physics and engineering, and descriptions of real optoelectronic devices.

This graduate-level textbook offers a comprehensive treatment of the underlying physics behind modern semiconductor devices, with applications to specific modern solid-state devices throughout. Modular in organization, it should be suitable for a range of courses in solid state physics and devices in both physics and electrical engineering departments.

An Introduction

## Semiconductor Physics

Modern Semiconductor Quantum Physics

Noise Research in Semiconductor Physics

The Story of Semiconductors

This book is a comprehensive text on the physics of semiconductors and nanostructures for a large spectrum of students at the final undergraduate level studying physics, material science and electronics engineering. It offers introductory and advanced courses on solid state and semiconductor physics on one hand and the physics of low dimensional semiconductor structures on the other in a single text book. Key Features Presents basic concepts of quantum theory, solid state physics, semiconductors, and quantum nanostructures such as quantum well, quantum wire, quantum dot and superlattice In depth description of semiconductor heterojunctions, lattice strain and modulation doping technique Covers transport in nanostructures under an electric and magnetic field with the topics: quantized conductance, Coulomb blockade, and integer and fractional quantum Hall effect Presents the optical processes in nanostructures under a magnetic field Includes illustrative problems with hints for solutions in each chapter Physics of Semiconductors and Nanostructures will be helpful to students initiating PhD work in the field of semiconductor nanostructures and devices. It follows a unique tutorial approach meeting the requirements of students who find learning the concepts difficult and want to study from a physical perspective.

The first edition of "Semiconductor Physics" was published in 1973 by Springer-Verlag Wien-New York as a paperback in the Springer Study Edition. In 1977, a Russian translation by Professor Yu. K. Pozhela and coworkers at Vilnius/USSR was published by Izdatelstvo "MIR", Moscow. Since then new ideas have been developed in the field of semiconductors such as electron hole droplets, dangling bond saturation in amorphous silicon by hydrogen, or the determination of the fine structure constant from surface quantization in inversion layers. New techniques such as molecular beam epitaxy which has made the realization of the Esaki superlattice possible, deep level transient spectroscopy, and refined a. c. Hall techniques have evolved. Now that the Viennese edition is about to go out of print, Springer-Verlag, Berlin-Heidelberg-New York is giving me the opportunity to include these new subjects in a monograph to appear in the Solid-State Sciences series. Again it has been the intention to cover the field of semiconductor physics comprehensively, although some chapters such as diffusion of hot carriers and their galvanomagnetic phenomena, as well as superconducting degenerate semiconductors and the appendices, had to go for commercial reasons. The emphasis is more on physics than on device aspects.

This handbook gives a complete survey of the important topics and results in semiconductor physics. It

addresses every fundamental principle and most research topics and areas of application in the field of semiconductor physics. Comprehensive information is provided on crystalline bulk and low-dimensional as well as amorphous semiconductors, including optical, transport, and dynamic properties.

The purpose of this collective book is to present a non-exhaustive survey of  $sp$ -related phenomena in semiconductors with a focus on recent research. In some sense it may be regarded as an updated version of the *Optical Orientation* book, which was entirely devoted to spin physics in bulk semiconductors. During the 24 years that have elapsed, we have witnessed, on the one hand, an extraordinary development in the wonderful semiconductor physics in two dimensions with the accompanying revolutionary applications. On the other hand, during the last maybe 15 years there was a strong revival in the interest in spin phenomena, in particular in low-dimensional semiconductor structures. While in the 1970s and 1980s the entire world population of researchers in the field never exceeded 20 persons, now it can be counted by the hundreds and the number of publications by the thousands. This explosive growth is stimulated, to a large extent, by the hopes that the electron and/or nuclear spins in a semiconductor will help to accomplish the dream of factorizing large numbers by quantum computing and eventually to develop a new spin-based electronics, or "spintronics". Whether any of this will happen or not, still remains to be seen. Anyway, these ideas have resulted in a large body of interesting and exciting research, which is a good thing by itself. The field of spin physics in semiconductors is extremely rich and interesting with many spectacular effects in optics and transport.

Compound Semiconductor Device Physics

Proceedings of IWPSD 2017

17th International Conference : Papers

From Fundamentals to Nanoscale Devices

Physics of Semiconductors and Their Heterostructures

*This book covers the physics of semiconductors on an introductory level, assuming that the reader already has some knowledge of condensed matter physics. Crystal structure, band structure, carrier transport, phonons, scattering processes and optical properties are presented for typical semiconductors such as silicon, but III-V and II-VI compounds are also included. In view of the increasing importance of wide-gap semiconductors, the electronic and optical properties of these materials are dealt with too. This book provides one of the most rigorous treatments of compound semiconductor device physics yet published. A complete understanding of modern devices requires a working knowledge of low-dimensional physics, the use of statistical methods, and the use of one-, two-, and three-dimensional analytical and numerical analysis techniques. With its systematic and detailed\*\*discussion of these topics, this book is ideal for both the researcher and the student. Although the emphasis of this text is on compound semiconductor devices, many of the principles discussed will also be useful to those interested in*

*silicon devices. Each chapter ends with exercises that have been designed to reinforce concepts, to complement arguments or derivations, and to emphasize the nature of approximations by critically evaluating realistic conditions. One of the most rigorous treatments of compound semiconductor device physics yet published\*\*Essential reading for a complete understanding of modern devices\*\*Includes chapter-ending exercises to facilitate understanding*

*This book demonstrates the role and abilities of fluctuation in semiconductor physics, and shows what kinds of physical information are involved in the noise characteristics of semiconductor materials and devices, how this information may be decoded and which advantages are inherent to the noise methods. The text provides a comprehensive account of current results, addressing problems which have not previously been covered in Western literature, including the excess noise of tunnel-recombination currents and photocurrents in diodes, fluctuation phenomena in a real photoconductor with different recombination centers, and methods of noise spectroscopy of levels in a wide range of materials and devices.*

*Semiconductor Device Physics and Design teaches readers how to approach device design from the point of view of someone who wants to improve devices and can see the opportunity and challenges. It begins with coverage of basic physics concepts, including the physics behind polar heterostructures and strained heterostructures. The book then details the important devices ranging from p-n diodes to bipolar and field effect devices. By relating device design to device performance and then relating device needs to system use the student can see how device design works in the real world.*

*Physics of Semiconductors and Nanostructures*

*The Physics of Semiconductors*

*Basic Semiconductor Physics*

*An Introduction Including Nanophysics and Applications*

*Modern Semiconductor Physics and Device Applications*

The purpose of this workshop is to spread the vast amount of information available on semiconductor physics to every possible field throughout the scientific community. As a result, the latest findings, research and discoveries can be quickly disseminated. This workshop provides all participating research groups with an excellent platform for interaction and collaboration with other members of their respective scientific community. This workshop's technical sessions include various current and significant topics for applications and scientific developments, including • Optoelectronics • VLSI & ULSI Technology • Photovoltaics • MEMS & Sensors • Device Modeling and Simulation • High Frequency/ Power Devices • Nanotechnology and Emerging Areas • Organic Electronics • Displays and Lighting Many eminent scientists from various national and international organizations are actively participating with their latest research works and also equally supporting this mega event by joining the various organizing committees.

Brings the reader to an overview of the subject as a whole and to the point where they can specialize and enter supervised laboratory research Provides a balance between aspects of solid state and semiconductor physics and the concepts of various semiconductor devices and their applications in electric and photonic devices. Proffers explicit formulas (with the help of Mathematica) for as many as possible

results, going beyond current textbook equations, thus makes easier to understand for undergrads.

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; effect mass and Luttinger parameters; strain effects and deformation potentials; temperature effects. (2) Optical properties: absorption and exciton effect; modulation spectroscopy; photo luminescence and photo luminescence 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.

Excellent bridge between general solid-state physics textbook and research articles packed with providing detailed explanations of the electronic, vibrational, transport, and optical properties of semiconductors "The most striking feature of the book is its modern outlook ... provides a wonderful foundation. The most wonderful feature is its efficient style of exposition ... an excellent book." Physics Today "Presents the theoretical derivations carefully and in detail and gives thorough discussions of the experimental results it presents. This makes it an excellent textbook both for learners and for more experienced researchers wishing to check facts. I have enjoyed reading it and strongly recommend it as a text for anyone working with semiconductors ... I know of no better text ... I am sure most semiconductor physicists will find this book useful and I recommend it to them." Contemporary Physics Offers much new material: an extensive appendix about the important and by now well-established, deep center known as the DX center, additional problems and the solutions to over fifty of the problems at the end of the various chapters.

Physics and Properties of Narrow Gap Semiconductors