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KEY=PHYSICS - KADENCE HULL

The Physics of Low-dimensional Semiconductors

An Introduction

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

Low-dimensional Semiconductors

Materials, Physics, Technology, Devices

Clarendon Press This text is a first attempt to pull together the whole of semiconductor science and technology since 1970 in so far as semiconductor multilayers are concerned. Material, technology, physics and device issues are described with approximately equal emphasis, and form a single coherant point of view. The subject matter is the concern of over half of today's active semiconductor scientists and technologists, the remainder working on bulk semiconductors and

devices. It is now routine to design and the prepare semiconductor multilayers at a time, with independent control over the dropping and composition in each layer. In turn these multilayers can be patterned with features that as a small as a few atomic layers in lateral extent. The resulting structures open up many new ares of exciting solid state and quantum physics. They have also led to whole new generations of electronic and optoelectronic devices whose superior performance relates back to the multilayer structures. The principles established in the field have several decades to go, advancing towards the ultimate of materials engineering, the design and preparation of solids atom by atom. The book should appeal equally to physicists, electronic engineers and materials scientists.

Modern Semiconductor Quantum Physics

World Scientific 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. Contents:The Energy Band Theory of a Perfect CrystalOptical Properties of SemiconductorsElectronic States at Defects and ImpuritiesSemiconductor SurfacesLow-Dimensional Semiconductor StructuresAppendices Readership: Condensed matter physicists, solid-state chemists, materials scientists, engineers and electronic engineers. keywords:Semiconductor;Physics;Quantum;Energy Bands;Optical Properties;Defects;Surfaces;Low Dimensional Semiconductors

Low-Dimensional Semiconductor Structures

Fundamentals and Device Applications

Cambridge University Press Low-Dimensional Semiconductor Structures provides a seamless, atoms-to-devices introduction to the latest quantum heterostructures. It covers their fabrication, their electronic, optical, and transport properties, their role in exploring new physical phenomena, and their utilization in devices. The authors begin with a detailed description of the epitaxial growth of semiconductors. They then deal with the physical behaviour of electrons and phonons in low-dimensional structures. A discussion of localization effects and quantum transport phenomena is followed by coverage of the optical properties of quantum wells. They then go on to discuss nonlinear optics in quantum heterostructures. The final chapters deal with semiconductor lasers, mesoscopic devices, and high-speed heterostructure devices. The book contains many exercises and comprehensive references. It is suitable as a textbook for graduate-level courses in electrical engineering and applied physics. It will also be of interest to engineers involved in the development of new semiconductor devices.

Excitons in Low-Dimensional Semiconductors

Theory Numerical Methods Applications

Springer Science & Business Media The author develops the effective-mass theory of excitons in low-dimensional semiconductors and describes numerical methods for calculating the optical absorption including Coulomb interaction, geometry, and external fields. The theory is applied to Fano resonances in low-dimensional semiconductors and the Zener breakdown in superlattices. Comparing theoretical results with experiments, the book is essentially self-contained; it is a hands-on approach with detailed derivations, worked examples, illustrative figures, and computer programs. The book is clearly structured and will be valuable as an advanced-level self-study or course book for graduate students, lecturers, and researchers.

Physics of Semiconductors and Nanostructures

CRC Press 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.

Luminescence Spectroscopy of Semiconductors

Oxford University Press Semiconductor luminescence has been a rapidly expanding field over the last 50 years. This text reviews the whole subject of semiconductor luminescence in one volume.

Introduction to Semiconductor Physics

World Scientific Publishing Company 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.

Nanoscale Electronic Devices and Their Applications

CRC Press Nanoscale Electronic Devices and Their Applications helps readers acquire a thorough understanding of the fundamentals of solids at the nanoscale level in addition to their applications including operation and properties of recent nanoscale devices. This book includes seven chapters that give an overview of electrons in solids, carbon nanotube devices and their applications, doping techniques, construction and operational details of channel-engineered MOSFETs, and spintronic devices and their applications. Structural and operational features of phase-change memory (PCM), memristor, and resistive random-access memory (ReRAM) are also discussed. In addition, some applications of these phase-change devices to logic designs have been presented. Aimed at senior undergraduate students in electrical engineering, micro-electronics engineering, physics, and device physics, this book: Covers a wide area of nanoscale devices while explaining the fundamental physics in these devices Reviews information on CNT two- and three-probe devices, spintronic devices, CNT interconnects, CNT memories, and NDR in CNT FETs Discusses spin-controlled devices and their applications, multi-material devices, and gates in addition to phase-change devices Includes rigorous mathematical derivations of the semiconductor physics Illustrates major concepts thorough discussions and various diagrams

Semiconductor Materials

An Introduction to Basic Principles

Springer Science & Business Media The technological progress is closely related to the developments of various materials and tools made of those materials. Even the different ages have been defined in relation to the materials used. Some of the major attributes of the present-day age (i.e., the electronic materials' age) are such common tools as computers and fiber-optic telecommunication systems, in which semiconductor materials provide vital components for various mic- electronic and optoelectronic devices in applications such as computing, memory storage, and communication. The field of semiconductors encompasses a variety of disciplines. This book is not intended to provide a comprehensive description of a wide range of semiconductor properties or of a continually increasing number of the semiconductor device applications. Rather, the main purpose of this book is to provide an introductory perspective on the basic principles of semiconductor materials and their applications that are described in a relatively concise format in a single volume. Thus, this book should especially be suitable as an introductory text for a single course on semiconductor materials that may be taken by both undergraduate and graduate engineering students. This book should also be useful, as a concise reference on semiconductor materials, for researchers working in a wide variety of

fields in physical and engineering sciences.

Transport Equations for Semiconductors

Springer Semiconductor devices are ubiquitous in the modern computer and telecommunications industry. A precise knowledge of the transport equations for electron flow in semiconductors when a voltage is applied is therefore of paramount importance for further technological breakthroughs. In the present work, the author tackles their derivation in a systematic and rigorous way, depending on certain key parameters such as the number of free electrons in the device, the mean free path of the carriers, the device dimensions and the ambient temperature. Accordingly a hierarchy of models is examined which is reflected in the structure of the book: first the microscopic and macroscopic semi-classical approaches followed by their quantum-mechanical counterparts.

Correlation Effects in Low-Dimensional Electron Systems

Proceedings of the 16th Taniguchi Symposium Kashikojima, Japan, October 25–29, 1993

Springer Science & Business Media Correlation Effects in Low-Dimensional Electron Systems describes recent developments in theoretical condensed-matter physics, emphasizing exact solutions in one dimension including conformal-field theoretical approaches, the application of quantum groups, and numerical diagonalization techniques. Various key properties are presented for two-dimensional, highly correlated electron systems.

Nanotechnology for Microelectronics and Optoelectronics

Elsevier When solids are reduced to the nanometer scale, they exibit new and exciting behaviours which constitute the basis for a new generation of electronic devices. Nanotechnology for Microelectronics and Optoelectronics outlines in detail

the fundamental solid-state physics concepts that explain the new properties of matter caused by this reduction of solids to the nanometer scale. Applications of these electronic properties is also explored, helping students and researchers to appreciate the current status and future potential of nanotechnology as applied to the electronics industry. Explains the behavioural changes which occur in solids at the nanoscale, making them the basis of a new generation of electronic devices Laid out in text-reference style: a cohesive and specialised introduction to the fundamentals of nanoelectronics and nanophotonics for students and researchers alike

Comprehensive Semiconductor Science and Technology

Newnes 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

Theory of Semiconductor Quantum Devices

Microscopic Modeling and

Simulation Strategies

Springer Science & Business Media Primary goal of this book is to provide a cohesive description of the vast field of semiconductor quantum devices, with special emphasis on basic quantum-mechanical phenomena governing the electro-optical response of new-generation nanomaterials. The book will cover within a common language different types of optoelectronic nanodevices, including quantum-cascade laser sources and detectors, few-electron/exciton quantum devices, and semiconductor-based quantum logic gates. The distinguishing feature of the present volume is a unified microscopic treatment of quantum-transport and coherent-optics phenomena on ultrasmall space- and time-scales, as well as of their semiclassical counterparts.

Low Dimensional Semiconductor Structures

Characterization, Modeling and Applications

Springer Science & Business Media Starting with the first transistor in 1949, the world has experienced a technological revolution which has permeated most aspects of modern life, particularly over the last generation. Yet another such revolution looms up before us with the newly developed capability to control matter on the nanometer scale. A truly extraordinary research effort, by scientists, engineers, technologists of all disciplines, in nations large and small throughout the world, is directed and vigorously pressed to develop a full understanding of the properties of matter at the nanoscale and its possible applications, to bring to fruition the promise of nanostructures to introduce a new generation of electronic and optical devices. The physics of low dimensional semiconductor structures, including heterostructures, superlattices, quantum wells, wires and dots is reviewed and their modeling is discussed in detail. The truly exceptional material, Graphene, is reviewed; its functionalization and Van der Waals interactions are included here. Recent research on optical studies of quantum dots and on the physical properties of one-dimensional quantum wires is also reported. Chapters on fabrication of nanowire – based nanogap devices by the dielectrophoretic assembly approach. The broad spectrum of research reported here incorporates chapters on nanoengineering and nanophysics. In its presentation of tutorial chapters as well as advanced research on nanostructures, this book is ideally suited to meet the needs of newcomers to the field as well as experienced researchers interested in viewing colleagues' recent advances.

Nanoscale Science and Technology

John Wiley & Sons Nanotechnology is a vital new area of research and development addressing the control, modification and fabrication of materials, structures and devices with nanometre precision and the synthesis of such structures into systems of micro- and macroscopic dimensions. Future applications of nanoscale science and technology include motors smaller than the diameter of a human hair and single-celled organisms programmed to fabricate materials with nanometer precision. Miniaturisation has revolutionised the semiconductor industry by making possible inexpensive integrated electronic circuits comprised of devices and wires with sub-micrometer dimensions. These integrated circuits are now ubiquitous, controlling everything from cars to toasters. The next level of miniaturisation, beyond sub-micrometer dimensions into nanoscale dimensions (invisible to the unaided human eye) is a booming area of research and development. This is a very hot area of research with large amounts of venture capital and government funding being invested worldwide, as such Nanoscale Science and Technology has a broad appeal based upon an interdisciplinary approach, covering aspects of physics, chemistry, biology, materials science and electronic engineering. Kelsall et al present a coherent approach to nanoscale sciences, which will be invaluable to graduate level students and researchers and practising engineers and product designers.

Transport of Information-Carriers in Semiconductors and Nanodevices

IGI Global Rapid developments in technology have led to enhanced electronic systems and applications. When utilized correctly, these can have significant impacts on communication and computer systems. Transport of Information-Carriers in Semiconductors and Nanodevices is an innovative source of academic material on transport modelling in semiconductor material and nanoscale devices. Including a range of perspectives on relevant topics such as charge carriers, semiclassical transport theory, and organic semiconductors, this is an ideal publication for engineers, researchers, academics, professionals, and practitioners interested in emerging developments on transport equations that govern information carriers.

Semiconductor Nanophotonics

Oxford University Press Nanometre sized structures made of semiconductors, insulators, and metals and grown by modern growth technologies or by chemical synthesis exhibit novel electronic and optical phenomena due to the confinement of electrons and photons. Strong interactions between electrons and photons in narrow regions lead to inhibited spontaneous emission, thresholdless laser operation, and Bose-Einstein condensation of exciton-polaritons in microcavities. Generation of sub-wavelength radiation by surface plasmon-polaritons at metal-semiconductor

interfaces, creation of photonic band gaps in dielectrics, and realization of nanometer sized semiconductor or insulator structures with negative permittivity and permeability, known as metamaterials, are further examples in the area of Nanophotonics. The studies help develop spasers and plasmonic nanolasers of subwavelength dimensions, paving the way to use plasmonics in future data centres and high-speed computers working at THz bandwidth with less than a few fJ/bit dissipation. The present book is aimed at graduate students and researchers providing them with an introductory textbook on Semiconductor Nanophotonics. It gives an introduction to electron-photon interactions in Quantum Wells, Wires, and Dots and then discusses the processes in microcavities, photonic band gap materials, metamaterials, and related applications. The phenomena and device applications under strong light-matter interactions are discussed, mostly by using classical and semi-classical theories. Numerous examples and problems accompany each chapter.

Semiconductor Optics

Springer Science & Business Media The updated and enlarged new edition of this book provides an introduction to and an overview of semiconductor optics from the IR through the visible to the UV. It includes coverage of linear and nonlinear optical properties, dynamics, magneto- and electrooptics, high-excitation effects, some applications, experimental techniques and group theory. The mathematics is kept as elementary as possible. The subjects covered extend from physics to materials science and optoelectronics. New or updated chapters add coverage of current topics, while the chapters on bulk materials have been revised and updated.

Strain Effect in Semiconductors

Theory and Device Applications

Springer Science & Business Media Strain Effect in Semiconductors: Theory and Device Applications presents the fundamentals and applications of strain in semiconductors and semiconductor devices that is relevant for strain-enhanced advanced CMOS technology and strain-based piezoresistive MEMS transducers. Discusses relevant applications of strain while also focusing on the fundamental physics pertaining to bulk, planar, and scaled nano-devices. Hence, this book is relevant for current strained Si logic technology as well as for understanding the physics and scaling for future strained nano-scale devices.

Physics and Applications of Semiconductor Quantum Structures

CRC Press Written by international experts, Physics and Applications of Semiconductor Quantum Structures covers the most important recent advances in

the field. Beginning with a review of the evolution of semiconductor superlattices and quantum nanostructures, the book explores fabrication and characterization techniques, transport, optical, and spin-dependent properties, and concludes with a section devoted to new device applications. The book allows those who already have some familiarity with semiconductor devices to expand their knowledge into new developing topics involving semiconductor quantum structures.

Silicon Quantum Integrated Circuits

Silicon-Germanium Heterostructure Devices: Basics and Realisations

Springer Science & Business Media Quantum size effects are becoming increasingly important in microelectronics, as the dimensions of the structures shrink laterally towards 100 nm and vertically towards 10 nm. Advanced device concepts will exploit these effects for integrated circuits with novel or improved properties. Keeping in mind the trend towards systems on chip, this book deals with silicon-based quantum devices and focuses on room-temperature operation. The basic physical principles, materials, technological aspects, and fundamental device operation are discussed in an interdisciplinary manner. It is shown that silicon-germanium (SiGe) heterostructure devices will play a key role in realizing silicon-based quantum electronics.

Physics Of Semiconductors, The - Proceedings Of The 22nd International Conference (In 3 Volumes)

World Scientific These proceedings review the progress in most aspects of semiconductor physics, including those related to materials, processing and devices. The conference continues the tradition of the ICPS series and these volumes include state-of-the-art lectures. The plenary and invited papers address areas of major interest.These volumes will serve as excellent material for researchers in semiconductor physics and related fields.

Low Dimensional Properties Of

Solids: Nobel Jubilee Symposium - Proceedings Of The Nobel Jubilee Symposium

World Scientific

Optical Properties of Low-dimensional Materials

World Scientific This book surveys recent theoretical and experimental studies of optical properties of low-dimensional materials. As an extended version of Optical Properties of Low-Dimensional Materials (Volume 1, published in 1995 by World Scientific), Volume 2 covers a wide range of interesting low-dimensional materials including both inorganic and organic systems, such as disordered polymers, deformable molecular crystals, dilute magnetic semiconductors, SiGe/Si short-period superlattices, GaAs quantum wires, semiconductor microcavities, and photonic crystals. There are excellent review articles by promising researchers in each field. All the materials introduced in this book yield new optical phenomena originating from their mesoscopic and low-dimensional electronic characters and electron-lattice couplings, which offer a new research field of materials science as well as condensed-matter and optical physics. Volumes 1 and 2 are interrelated but can be read independently. They are pitched at the level of graduate students and are useful to both students and scientists.

Nanostructures and Mesoscopic systems

Academic Press Nanostructures and Mesoscopic Systems presents the proceedings of the International Symposium held in Santa Fe, New Mexico on May 20-24, 1991. The book discusses nanostructure physics; nanostructures in motion; and advances in nanostructure fabrication. The text also describes ballistic transport and coherence; low-dimensional tunneling; and electron correlation and coulomb blockade. Banostructure arrays and collective effects; the theory and modeling of nanostructures; and mesoscopic systems are also encompassed. The book further tackles the optical properties of nanostructures.

Physics of Semiconductors and

Nanostructures

CRC Press 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.

Optical Spectroscopy of Semiconductor Nanostructures

Alpha Science Int'l Ltd. This volume looks at optical spectroscopy of semiconductir nanostructures. Some of the topics it covers include: kingdom of nanostructures; quantum confinement in low-dimensional systems; resonant light reflection; and transmission and absorption.

Growth and Optical Properties of Wide-Gap II–VI Low-Dimensional Semiconductors

Springer This volume contains the Proceedings of the NATO Advanced Research Workshop on "Growth and Optical Properties of Wide Gap II-VI Low Dimensional Semiconductors", held from 2 - 6 August 1988 in Regensburg, Federal Republic of Germany, under the auspices of the NATO International Scientific Exchange Programme. Semiconducting compounds formed by combining an element from column II of the periodic table with an element from column VI (so called II-VI Semiconductors) have long promised many optoelectronic devices operating in the visible region of the spectrum. However, these materials have encountered numerous problems including: large number of defects and difficulties in obtaining p-

and n-type doping. Advances in new methods of material preparation may hold the key to unlocking the unfulfilled promises. During the workshop a full session was taken up covering the prospects for wide-gap II-VI Semiconductor devices, particularly light emitting ones. The growth of bulk materials was reviewed with the view of considering II-VI substrates for the novel epitaxial techniques such as MOCVD, MBE, ALE, MOMBE and ALE-MBE. The controlled introduction of impurities during non-equilibrium growth to provide control of the doping type and conductivity was emphasized.

Silicon Carbide

Recent Major Advances

Springer Science & Business Media Since the 1997 publication of "Silicon Carbide - A Review of Fundamental Questions and Applications to Current Device Technology" edited by Choyke, et al., there has been impressive progress in both the fundamental and developmental aspects of the SiC field. So there is a growing need to update the scientific community on the important events in research and development since then. The editors have again gathered an outstanding team of the world's leading SiC researchers and design engineers to write on the most recent developments in SiC.

Micronic Integrated Sensors

Elsevier Progress in material research, recent developments in growth techniques, as well as in processing technology and modelling, have had a great impact on sensors. The contributions in this volume will be of interest to all those who wish to keep abreast of recent developments in the interdisciplinary field of sensor research.

Introductory Semiconductor Device Physics

CRC Press 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.

Introduction to Semiconductor Device Modelling

World Scientific This book deals mainly with physical device models which are developed from the carrier transport physics and device geometry considerations. The text concentrates on silicon and gallium arsenide devices and includes models of silicon bipolar junction transistors, junction field effect transistors (JFETs), MESFETs, silicon and GaAs MESFETs, transferred electron devices, pn junction diodes and Schottky varactor diodes. The modelling techniques of more recent devices such as the heterojunction bipolar transistors (HBT) and the high electron mobility transistors are discussed. This book contains details of models for both equilibrium and non-equilibrium transport conditions. The modelling Technique of Small-scale devices is discussed and techniques applicable to submicron-dimensioned devices are included. A section on modern quantum transport analysis techniques is included. Details of essential numerical schemes are given and a variety of device models are used to illustrate the application of these techniques in various fields. Contents:IntroductionSemiconductor Carrier Transport EquationsSolution of the Semiconductor Equations Closed-Form Analytical ModelsNumerical Solution of the Semiconductor Equations the Finite Difference MethodNumerical solution of the Semiconductor Equation Finite-Element MethodsSemiclassical Transport Equations Hot Electron EffectsSimulation of Heterojunction DevicesThe Monte Carlo MethodQuantum Mechanical Effects an Introduction to Quantum Transport TheoryAppendix: Numerical Solution of the Current Continuity EquationIndex Readership: Solid state physicists, electronic engineers, micro-wave engineers, device designers and others. Keywords:Equivalent Circuit Models;Physical Circuit Models;Carrier Transport;Numerical Simulation

Trends in Quantum Dots Research

Nova Publishers A quantum dot is a particle of matter so small that the addition or removal of an electron changes its properties in some useful way. All atoms are quantum dots, but multi-molecular combinations can have this characteristic. In biochemistry, quantum dots are called redox groups. In nanotechnology, they are called quantum bits or qubits. Quantum dots typically have dimensions measured in nanometres, where one nanometre is 10-9 meter or a millionth of a millimetre. The fields of biology, chemistry, computer science, and electronics are all of interest to researchers in nanotechnology. Other applications of quantum dots include nanomachines, neural networks, and high-density memory or storage media. Research is being carried out on nano-crystals, self-assembled dots, and gated structures. This book presents leading-edge research from around the world.

Physics and Properties of Narrow Gap Semiconductors

Springer Science & Business Media 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.

Semiconductor Physics

An Introduction

Springer Science & Business Media 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", Mo scow. Since then new ideas have been developed in the field of semi conductors such as electron hole droplets, dangling bond saturation in amorphous silicon by hydrogen, or the determination of the fine struc ture constant from surface quantization in inversion layers. New tech niques 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 super conducting degenerate semiconductors and the appendices, had to go for commercial reasons. The emphasis is more on physics than on device as pects.

Introduction to Condensed Matter Physics

Volume 1

World Scientific Publishing Company This is volume 1 of two-volume book that presents an excellent, comprehensive exposition of the multi-faceted subjects of modern condensed matter physics, unified within an original and coherent

conceptual framework. Traditional subjects such as band theory and lattice dynamics are tightly organized in this framework, while many new developments emerge spontaneously from it. In this volume, • Basic concepts are emphasized; usually they are intuitively introduced, then more precisely formulated, and compared with correlated concepts. • A plethora of new topics, such as quasicrystals, photonic crystals, GMR, TMR, CMR, high Tc superconductors, Bose–Einstein condensation, etc., are presented with sharp physical insights. • Bond and band approaches are discussed in parallel, breaking the barrier between physics and chemistry. • A highly accessible chapter is included on correlated electronic states — rarely found in an introductory text. • Introductory chapters on tunneling, mesoscopic phenomena, and quantum-confined nanostructures constitute a sound foundation for nanoscience and nanotechnology. • The text is profusely illustrated with about 500 figures.

Rare Earth and Transition Metal Doping of Semiconductor Materials

Synthesis, Magnetic Properties and Room Temperature Spintronics

Woodhead Publishing Rare Earth and Transition Metal Doping of Semiconductor Material explores traditional semiconductor devices that are based on control of the electron’s electric charge. This book looks at the semiconductor materials used for spintronics applications, in particular focusing on wide band-gap semiconductors doped with transition metals and rare earths. These materials are of particular commercial interest because their spin can be controlled at room temperature, a clear opposition to the most previous research on Gallium Arsenide, which allowed for control of spins at supercold temperatures. Part One of the book explains the theory of magnetism in semiconductors, while Part Two covers the growth of semiconductors for spintronics. Finally, Part Three looks at the characterization and properties of semiconductors for spintronics, with Part Four exploring the devices and the future direction of spintronics. Examines materials which are of commercial interest for producing smaller, faster, and more power-efficient computers and other devices Analyzes the theory behind magnetism in semiconductors and the growth of semiconductors for spintronics Details the properties of semiconductors for spintronics

Solid State Theory

An Introduction

Springer Science & Business Media "Solid-State Theory - An Introduction" is a textbook for graduate students of physics and material sciences. Whilst covering the traditional topics of older textbooks, it also takes up new developments in theoretical concepts and materials that are connected with such breakthroughs as the quantum-Hall effects, the high-Tc superconductors, and the low-dimensional systems realized in solids. Thus besides providing the fundamental concepts to describe the physics of the electrons and ions comprising the solid, including their interactions, the book casts a bridge to the experimental facts and gives the reader an excellent insight into current research fields. A compilation of problems makes the book especially valuable to both students and teachers.