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PALLAB BHATTACHARYA is Professor of Electrical Engineering and Computer Science and Director of the Solid State Electronics Laboratory at the University of Michigan, Ann Arbor. His teaching and research interests include liquid-phase and molecular beam epitaxy of elemental and III–V compound semiconductors, materials characterization, electronic and optoelectronic devices and optoelectronic integrated circuits.

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Professor Bhattacharya was an Editor of the IEEE Transactions on Electron Devices and Editor-in-Chief of Journal of Physics D. He has edited Properties of Lattice-Matched and Strained InGaAs (UK: INSPEC, 1993) and Properties of III-V Quantum Wells and Superlattices (UK: INSPEC, 1996).

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The first true "introduction" to semiconductor optoelectronic devices, this book provides an accessible, well-organized overview of optoelectronic devices that emphasizes basic principles. Coverage begins with an optional review of key concepts— such as properties of compound semiconductor, quantum mechanics, semiconductor statistics, carrier transport properties, optical processes, and junction theory— then progress gradually through more advanced topics. The "Second Edition" has been both updated and expanded to include the recent developments in the field.

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Optoelectronics has become an important part of our lives. Wherever light is used to transmit information, tiny semiconductor devices are needed to transfer electrical current into optical signals and vice versa. Examples include light emitting diodes in radios and other appliances, photodetectors in elevator doors and digital cameras, and laser diodes that transmit phone calls through glass fibers. Such optoelectronic devices take advantage of sophisticated interactions between electrons and light. Nanometer scale semiconductor structures are often at the heart of modern optoelectronic devices. Their shrinking size and increasing complexity make computer simulation an important tool to design better devices that meet ever rising performance requirements. The current need to apply advanced design software in optoelectronics follows the trend observed in the 1980's with simulation software for silicon devices. Today, software for technology computer-aided design (TCAD) and electronic design automation (EDA) represents a fundamental part of the silicon industry. In optoelectronics, advanced commercial device software has emerged recently and it is expected to play an increasingly important role in the near future. This book will enable students, device engineers, and researchers to more effectively use advanced design software in optoelectronics. Provides fundamental knowledge in semiconductor physics and in electromagnetics, while helping to understand and use advanced device simulation software Demonstrates the combination of measurements and simulations in order to obtain realistic results and provides data on all required material parameters Gives deep insight into the physics of state-of-the-art devices and helps to design and analyze of modern optoelectronic devices

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Optoelectronic devices operating in the mid-infrared wavelength range offer applications in a variety of areas from environmental gas monitoring around oil rigs to the detection of narcotics. They could also be used for free-space optical communications, thermal imaging applications and the development of "homeland security" measures. Mid-infrared Semiconductor Optoelectronics is an overview of the current status and technological development in this rapidly emerging area; the basic physics, some of the problems facing the design engineer and a comparison of possible solutions are laid out; the different lasers used as sources for mid-infrared technology are considered; recent work in detectors is reviewed; the last part of the book is concerned with applications. With a world-wide authorship of experts working in many mid-infrared-related fields this book will be an invaluable reference for researchers and graduate students drawn from physics, electronic and electrical engineering and materials science.

A graduate textbook presenting the underlying physics behind devices that drive today's technologies. The book covers important details of structural properties, bandstructure, transport, optical and magnetic properties of semiconductor structures. Effects of low-dimensional physics and strain - two important driving forces in modern device technology - are also discussed. In addition to conventional semiconductor physics the book discusses self-assembled structures, mesoscopic structures and the developing field of spintronics. The book utilizes carefully chosen solved examples to convey important concepts and has over 250 figures and 200 homework exercises. Real-world applications are highlighted throughout the book, stressing the links between physical principles and actual devices. Electronic and

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Optoelectronic Properties of Semiconductor Structures provides engineering and physics students and practitioners with complete and coherent coverage of key modern semiconductor concepts. A solutions manual and set of viewgraphs for use in lectures are available for instructors, from solutions@cambridge.org.

This book is devoted to optical semiconductor devices and their numerous applications in telecommunications, optoelectronics, and consumer electronics-areas where signal processing or the transmission of signals across fiber optic cables is paramount. It introduces a new generation of devices that includes optical modulators, quantum well (QW) lasers, and photodiodes and explores new applications of more established devices such as semiconductor lasers, light-emitting diodes, and photodiodes. Mitsuo Fukuda examines the material properties, operation principles, fabrication, packaging, reliability, and applications of each device and offers a unique industrial perspective, discussing everything engineers and scientists need to know at different phases of research, development, and production. This guide to the state-of-the-art of optical semiconductor devices: * Helps you choose the right device for a given application. * Covers important performance data such as temperature and optical feedback noise in lasers. * Highlights epitaxial growth techniques and fabrication for each device. * Features one hundred figures and an extensive bibliography. * Provides a clear and concise treatment, unencumbered by excessive theory Optical Semiconductor Devices is an essential resource for engineers and researchers in telecommunications and optoelectronics, equipment designers and manufacturers, and graduate students and scholars interested in this rapidly evolving field.

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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

Covers both the fundamentals and the state-of-the-art technology used for MBE Written by expert researchers working on the frontlines of the field, this book covers fundamentals of

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Molecular Beam Epitaxy (MBE) technology and science, as well as state-of-the-art MBE technology for electronic and optoelectronic device applications. MBE applications to magnetic semiconductor materials are also included for future magnetic and spintronic device applications. Molecular Beam Epitaxy: Materials and Applications for Electronics and Optoelectronics is presented in five parts: Fundamentals of MBE; MBE technology for electronic devices application; MBE for optoelectronic devices; Magnetic semiconductors and spintronics devices; and Challenge of MBE to new materials and new researches. The book offers chapters covering the history of MBE; principles of MBE and fundamental mechanism of MBE growth; migration enhanced epitaxy and its application; quantum dot formation and selective area growth by MBE; MBE of III-nitride semiconductors for electronic devices; MBE for Tunnel-FETs; applications of III-V semiconductor quantum dots in optoelectronic devices; MBE of III-V and III-nitride heterostructures for optoelectronic devices with emission wavelengths from THz to ultraviolet; MBE of III-V semiconductors for mid-infrared photodetectors and solar cells; dilute magnetic semiconductor materials and ferromagnet/semiconductor heterostructures and their application to spintronic devices; applications of bismuth-containing III-V semiconductors in devices; MBE growth and device applications of Ga₂O₃; Heterovalent semiconductor structures and their device applications; and more. Includes chapters on the fundamentals of MBE Covers new challenging researches in MBE and new technologies Edited by two pioneers in the field of MBE with contributions from well-known MBE authors including three AI Cho MBE Award winners Part of the Materials for Electronic and Optoelectronic Applications series Molecular Beam Epitaxy: Materials and Applications for Electronics and Optoelectronics will appeal to graduate students, researchers

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in academia and industry, and others interested in the area of epitaxial growth.

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