

## 电子书推荐（2021 年第 3 期）

半导体所图书馆

1、

**Title: The Physics of Semiconductors: An Introduction Including Nanophysics and Applications**

Authors: Marius Grundmann

Series Title: Graduate Texts in Physics

Copyright: Springer Nature Switzerland AG 2021

**Introduction:**

The 4th edition of this highly successful textbook features copious material for a complete upper-level undergraduate or graduate course, guiding readers to the point where they can choose a specialized topic and begin supervised research. The textbook provides an integrated approach beginning from the essential principles of solid-state and semiconductor physics to their use in various classic and modern semiconductor devices for applications in electronics and photonics. The text highlights many practical aspects of semiconductors: alloys, strain, heterostructures, nanostructures, amorphous semiconductors, and noise, which are essential aspects of modern semiconductor research but often omitted in other textbooks. This textbook also covers advanced topics, such as Bragg mirrors, resonators, polarized and magnetic semiconductors, nanowires, quantum dots, multi-junction solar cells, thin film transistors, and transparent conductive oxides. The 4th edition includes many updates and chapters on 2D materials and aspects of topology. The text derives explicit formulas for many results to facilitate a better understanding of the topics. Having evolved from a highly regarded two-semester course on the topic, The Physics of Semiconductors requires little or no prior knowledge of solid-state physics. More than 2100 references guide the reader to historic and current literature including original papers, review articles and topical books, providing a go-to point of reference for experienced researchers as well.

DOI: <https://doi.org/10.1007/978-3-030-51569-0>

2、

## **Title: Fundamentals of Power Semiconductor Devices**

Authors: B. Jayant Baliga

Copyright: Springer International Publishing AG, part of Springer Nature

2019

### **Introduction:**

This textbook provides an in-depth treatment of the physics of power semiconductor devices that are commonly used by the power electronics industry. Drawing upon decades of industry and teaching experience and using numerous examples and illustrative applications, the author discusses in detail the various device performance attributes that allow practicing engineers to develop energy-efficient products. Coverage includes all types of power rectifiers and transistors and analytical models for explaining the operation of all power semiconductor devices are developed and demonstrated in each section of the book. Throughout the book, emphasis is placed on deriving simple analytical expressions that describe the underlying physics and enable representation of the device electrical characteristics. This treatment is invaluable for teaching a course on power devices because it allows the operating principles and concepts to be conveyed with quantitative analysis. The treatment focuses on silicon devices but includes the unique attributes and design requirements for emerging silicon carbide devices. This new edition also includes a chapter on the impact of power semiconductor devices on energy savings and reduction of carbon emissions.

Provides comprehensive textbook for courses on physics of power semiconductor devices;

Includes extensive analytical formulations for design and analysis of device structures;

Uses numerical simulation examples in every section to elucidate the operating physics and validate the models;

Analyzes device performance attributes that enable development of real, energy-efficient products;

Includes numerous exercises in each chapter to reinforce concepts introduced;

Includes a chapter on the impact of power semiconductor devices on energy savings and reduction of carbon emissions.

DOI: <https://doi.org/10.1007/978-3-319-93988-9>

3、

**Title : Semiconductor Optics 1 : Linear Optical Properties of**

## **Semiconductors**

Authors: Heinz Kalt, Claus F. Klingshirn

Series Title: Graduate Texts in Physics

### **Introduction:**

This revised and updated edition of the well-received book by C. Klingshirn provides an introduction to and an overview of all aspects of semiconductor optics, from IR to visible and UV. It has been split into two volumes and rearranged to offer a clearer structure of the course content. Inserts on important experimental techniques as well as sections on topical research have been added to support research-oriented teaching and learning.

Volume 1 provides an introduction to the linear optical properties of semiconductors. The mathematical treatment has been kept as elementary as possible to allow an intuitive approach to the understanding of results of semiconductor spectroscopy. Building on the phenomenological model of the Lorentz oscillator, the book describes the interaction of light with fundamental optical excitations in semiconductors (phonons, free carriers, excitons). It also offers a broad review of seminal research results augmented by concise descriptions of the relevant experimental techniques, e.g., Fourier transform IR spectroscopy, ellipsometry, modulation spectroscopy and spatially resolved methods, to name a few. Further, it picks up on hot topics in current research, like quantum structures, mono-layer semiconductors or Perovskites. The experimental aspects of semiconductor optics are complemented by an in-depth discussion of group theory in solid-state optics.

Covering subjects ranging from physics to materials science and optoelectronics, this book provides a lively and comprehensive introduction to semiconductor optics. With over 120 problems, more than 480 figures, abstracts to each chapter, as well as boxed inserts and a detailed index, it is intended for use in graduate courses in physics and neighboring sciences like material science and electrical engineering. It is also a valuable reference resource for doctoral and advanced researchers.

DOI: <https://doi.org/10.1007/978-3-030-24152-0>

4、

**Title : Epitaxy of Semiconductors : Physics and Fabrication of Heterostructures**

Authors: Udo W. Pohl

Series Title: Graduate Texts in Physics

Copyright: Springer Nature Switzerland AG 2020

**Introduction:**

The extended and revised edition of this textbook provides essential information for a comprehensive upper-level graduate course on the crystalline growth of semiconductor heterostructures. Heteroepitaxy is the basis of today's advanced electronic and optoelectronic devices, and it is considered one of the most important fields in materials research and nanotechnology. The book discusses the structural and electronic properties of strained epitaxial layers, the thermodynamics and kinetics of layer growth, and it describes the major growth techniques: metalorganic vapor-phase epitaxy, molecular-beam epitaxy, and liquid-phase epitaxy. It also examines in detail cubic and hexagonal semiconductors, strain relaxation by misfit dislocations, strain and confinement effects on electronic states, surface structures, and processes during nucleation and growth. Requiring only minimal knowledge of solid-state physics, it provides natural sciences, materials science and electrical engineering students and their lecturers elementary introductions to the theory and practice of epitaxial growth, supported by references and over 300 detailed illustrations.

DOI: <https://doi.org/10.1007/978-3-030-43869-2>

5、

**Title: Scanning Probe Microscopy: The Lab on a Tip**

Authors: Ernst Meyer, Roland Bennewitz, Hans J. Hug

Series Title: Graduate Texts in Physics

Copyright: Springer Nature Switzerland AG 2021

**Introduction:**

Written by three leading experts in the field, this book describes and explains all essential aspects of scanning probe microscopy. Emphasis is placed on the experimental design and procedures required to optimize the performance of the various methods described. The book covers not only the physical principles behind this popular technique, but also tackles questions on instrument design, the basic features of the different imaging modes, and recurring artifacts. Novel applications and the latest research results are presented, and the book closes with a look at the future prospects of scanning probe microscopy, while also discussing related

techniques in the field of nanoscience.

This second edition includes essential scientific updates reflecting the latest research, as well as coverage of new breakthroughs in techniques such as submolecular imaging by atomic force microscopy (AFM), multifrequency AFM, high-speed imaging of biological matter, scanning x-ray microscopy, and tip-enhanced Raman scattering.

The book serves as a general, hands-on guide for all types of classes that address scanning probe microscopy. It is ideally suited for graduate and advanced undergraduate students, either for self-study or as a textbook for a dedicated course on the topic. Furthermore, it is an essential component of any scanning probe microscopy laboratory course and a valuable resource for practicing researchers developing and using scanning probe techniques.

DOI: <https://doi.org/10.1007/978-3-030-37089-3>

6、

**Title : III–V Compound Semiconductors and Devices : An Introduction to Fundamentals**

Authors: Keh Yung Cheng

Series Title: Graduate Texts in Physics

**Introduction:**

This textbook gives a complete and fundamental introduction to the properties of III-V compound semiconductor devices, highlighting the theoretical and practical aspects of their device physics. Beginning with an introduction to the basics of semiconductor physics, it presents an overview of the physics and preparation of compound semiconductor materials, as well as a detailed look at the electrical and optical properties of compound semiconductor heterostructures. The book concludes with chapters dedicated to a number of heterostructure electronic and photonic devices, including the high-electron-mobility transistor, the heterojunction bipolar transistor, lasers, unipolar photonic devices, and integrated optoelectronic devices.

Featuring chapter-end problems, suggested references for further reading, as well as clear, didactic schematics accompanied by six information-rich appendices, this textbook is ideal for graduate students in the areas of semiconductor physics or electrical engineering. In addition, up-to-date results from published research make this textbook especially well-suited as a self-study and reference guide for engineers and researchers in related industries.

DOI: <https://doi.org/10.1007/978-3-030-51903-2>

7、

**Title: Green Photocatalytic Semiconductors: Recent Advances and Applications**

Editors: Seema Garg, Amrish Chandra

Copyright : The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2022

**Introduction:**

This book comprises a detailed overview on the role of photocatalysts for environmental remediation, hydrogen production and carbon dioxide reduction. Effective ways to enhance the photocatalytic activity of the material via doping, hybrid material, laser light and nanocomposites have been discussed in this book. The book also further elaborates the role of metal nanoparticles, rare earth doping, sensitizers, surface oxygen vacancy, interface engineering and band gap engineering for enhancing the photocatalytic activity. An approach to recover the photocatalytic material via immobilization is also presented. This book brings to light much of the recent research in the development of such semiconductor photocatalytic systems. The book will thus be of relevance to researchers in the field of: material science, environmental science & technology, photocatalytic applications, newer methods of energy generation & conversion and industrial applications.

DOI: <https://doi.org/10.1007/978-3-030-77371-7>

8、

**Title : Amorphous Chalcogenide Semiconductors and Related Materials**

Authors: Keiji Tanaka, Koichi Shimakawa

**Introduction**

This book provides introductory, comprehensive, and concise descriptions of amorphous chalcogenide semiconductors and related materials. It includes

comparative portraits of the chalcogenide and related materials including amorphous hydrogenated Si, oxide and halide glasses, and organic polymers. It also describes effects of non-equilibrium disorder, in comparison with those in crystalline semiconductors.

Provides introductory and concise descriptions to the field of Amorphous Chalcogenide Semiconductors, or Chalcogenide Glassy Semiconductors;

Includes comparisons of crystalline and non-crystalline semiconductors, descriptions of fundamental features of amorphous semiconductors, and clear indications of still controversial problems;

Explains the principles underlying practical applications such as DVD (digital versatile disk), x-ray imager, avalanche vidicon, infrared devices, so forth. Also, it includes growing future applications such as neuro-morphic devices and non-linear optical components.

Copyright: The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2021

DOI: <https://doi.org/10.1007/978-3-030-69598-9>

9、

## **Title: Advances in Terahertz Technology and Its Applications**

Editors: Sudipta Das, N. Anveshkumar, Joydeep Dutta, Arindam Biswas

Copyright : The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. 2021

### **Introduction:**

This book highlights the growing applications of THz technology and various modules used for their successful realization. The enormous advantages of THz devices like higher resolution, spatial directivity, high-speed communication, greater bandwidth, non-ionizing signal nature and compactness make them useful in various applications like communication, sensing, security, safety, spectroscopy, manufacturing, bio-medical, agriculture, imaging, etc. Since the THz radiation covers frequencies from 0.1THz to around 10THz and highly attenuated by atmospheric gases, they are used in short-distance applications only. The book focuses on recent advances and different research issues in terahertz technology and presents theoretical, methodological, well-established and validated empirical works dealing with the different topics.

DOI: <https://doi.org/10.1007/978-981-16-5731-3>

## **Title : Fundamentals of High Frequency CMOS Analog Integrated Circuits**

**Authors:** Duran Leblebici, Yusuf Leblebici

**Copyright :** The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2021

### **Introduction:**

This textbook is ideal for senior undergraduate and graduate courses in RF CMOS circuits, RF circuit design, and high-frequency analog circuit design. It is aimed at electronics engineering students, as well as IC design engineers in the field, who wish to gain a deeper understanding of circuit fundamentals and go beyond the widely-used automated design procedures. A design-centric approach is adopted in order to bridge the gap between fundamental analog electronic circuits textbooks and more advanced RF IC design texts. The structure and operation of the building blocks of high-frequency ICs are introduced in a systematic manner, with an emphasis on transistor-level operation, the influence of device characteristics and parasitic effects, and input-output behavior in the time and frequency domains.

This second edition has been revised extensively to expand and clarify some of the key topics and to provide a wide range of design examples and problems. New material has been added for basic coverage of core topics, such as wide-band LNAs, noise feedback concept and noise cancellation, inductive-compensated band widening techniques for flat-gain or flat-delay characteristics, and basic communication system concepts that exploit the convergence and co-existence of Analog and Digital building blocks in RF systems. A new chapter (Chapter 5) has been added on Noise and Linearity, addressing key topics in a comprehensive manner. All of the other chapters have also been revised and largely re-written, with the addition of numerous solved design examples and exercise problems.

Designed for senior undergraduate and graduate courses in RF CMOS circuits, RF circuit design, and high-frequency analog circuit design;

Uses simple circuit models to enable a robust understanding of high-frequency design fundamentals;

Employs solved design examples to familiarize the reader with the design flow, starting with knowledge-based and model-based hand-design and progressing to SPICE simulations;

Introduces fine-tuning procedures in circuit design with an emphasis on key



trade-offs;

Demonstrates key criteria and parameters that are used to describe system-level performance.

DOI: <https://doi.org/10.1007/978-3-030-63658-6>