Electrical Engineering Materials And Semiconductor Devices

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Fundamentals and Applications
Comprehensive Basic Mechanical Engineering
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Semiconductor Material and Device Characterization
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Smart Electronic Materials
A Textbook of Electrical Engineering Materials

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SHANNON TAPIA

Science and Technology Woodhead

Publishing
Milton Ohring's Engineering Materials Science integrates the scientific nature and modern applications of all classes of engineering materials. This comprehensive, introductory textbook will provide undergraduate engineering students with the fundamental background needed to understand the science of structure-property relationships, as well as address the engineering concerns of materials selection in design, processing materials into useful products, andhow material degrade and fail in service. Specific topics include: physical and electronic structure; thermodynamics and kinetics; processing; mechanical, electrical, magnetic, and optical properties; degradation; and failure and reliability. The book offers superior coverage of electrical, optical, and magnetic materials than competing text. The author has taught introductory courses in material science and engineering both in academia and industry (AT&T Bell Laboratories) and has also written the well-received book, The Material Science of Thin Films (Academic Press). Key Features * Provides a modern treatment of materials exposing the interrelated themes of structure, properties, processing, and performance * Includes an interactive, computationally oriented, computer disk containing nine

modules dealing with structure, phase diagrams, diffusion, and mechanical and electronic properties * Fundamentals are stressed * Of particular interest to students, researchers, and professionals in the field of electronic engineering
Elsevier
A Textbook for the students of B.Sc.(Engg.), B.E., B.Tech., AMIE and Diploma Courses. A new chapter on ""Semiconductor Fabrication Technology and Miscellaneous Semiconductor Devices"" had been included and additional self-assessment questions with answers and additional worked examples had been provided at the end of the BOOK.

Harsh Environment Electronics Laxmi Publications, Ltd.
Provides in-depth knowledge on novel materials that make electronics work under high-temperature and high-pressure conditions This book reviews the state of the art in research and development of lead-free interconnect materials for electronic packaging technology. It identifies the technical barriers to the development and manufacture of high-temperature interconnect materials to investigate into the complexities introduced by harsh conditions. It teaches the techniques adopted and the possible alternatives of interconnect materials to cope with the impacts of extreme temperatures for

implementing at industrial scale. The book also examines the application of nanomaterials, current trends within the topic area, and the potential environmental impacts of material usage. Written by world-renowned experts from academia and industry, Harsh Environment Electronics: Interconnect Materials and Performance Assessment covers interconnect materials based on silver, gold, and zinc alloys as well as advanced approaches utilizing polymers and nanomaterials in the first section. The second part is devoted to the performance assessment of the different interconnect materials and their respective environmental impact. -Takes a scientific approach to analyzing and addressing the issues related to interconnect materials involved in high temperature electronics -Reviews all relevant materials used in interconnect technology as well as alternative approaches otherwise neglected in other literature - Highlights emergent research and theoretical concepts in the implementation of different materials in soldering and die-attach applications - Covers wide-bandgap semiconductor device technologies for high temperature and harsh environment applications, transient liquid phase bonding, glass frit based die attach solution for harsh environment, and more -A pivotal

reference for professionals, engineers, students, and researchers Harsh Environment Electronics: Interconnect Materials and Performance Assessment is aimed at materials scientists, electrical engineers, and semiconductor physicists, and treats this specialized topic with breadth and depth.

Electrical Engineering Materials CRC Press

The book has been written in a lucid and systematic manner with necessary mathematical derivations, illustrations, examples and practise exercises providing detailed description of the materials used in electrical and electronics engineering and their applications. Beginning with the atomic structure of the materials, the book deals with the behaviour of dielectrics and their properties under the influence of DC and AC fields. It covers the magnetic properties of materials including soft and hard magnetic materials and their applications. The text discusses fabrication techniques and the basic physics involved in the operation of the semiconductors, junction transistors and rectifiers. It includes detailed description of optical properties of the materials (optical materials), photovoltaic materials and the materials used in lasers and optical fibres. It also incorporates the latest information on the materials used for the

direct energy conversion and fuel cell technologies. This book is primarily intended for undergraduate students of electrical engineering and electrical and electronics engineering. Key features • Contains sufficient numbers of solved numerical examples. • Includes a set of review questions and a list of references at the end of each chapter. • Provides a set of numerical problems in some of the chapters, wherever required. • Contains more than 150 diagrammatic illustrations for easy understanding of the concepts.

Elements of Electrical Engineering McGraw-Hill Companies

Introduction 2. Elementary Circuits 3. Introduction To D.C. Machines 4. Experiments On D.C. Machines 5. Introduction To Transformers 6. Experiments On Transformers 7. Introduction To Three-Phase Induction Motors 8. Experiments In Three-Phase Induction

Semiconductor Devices and Technologies for Future Ultra Low Power Electronics EOLSS Publications

The purpose of this book is to provide the reader with a self-contained treatment of fundamen tal solid state and semiconductor device physics. The material presented in the text is based upon the lecture notes of a one-year graduate course sequence taught by

this author for many years in the ·Department of Electrical Engineering of the University of Florida. It is intended as an introductory textbook for graduate students in electrical engineering. However, many students from other disciplines and backgrounds such as chemical engineering, materials science, and physics have also taken this course sequence, and will be interested in the material presented herein. This book may also serve as a general reference for device engineers in the semiconductor industry. The present volume covers a wide variety of topics on basic solid state physics and physical principles of various semiconductor devices. The main subjects covered include crystal structures, lattice dynamics, semiconductor statistics, energy band theory, excess carrier phenomena and recombination mechanisms, carrier transport and scattering mechanisms, optical properties, photoelectric effects, metal-semiconductor devices, the p--n junction diode, bipolar junction transistor, MOS devices, photonic devices, quantum effect devices, and high speed III-V semiconductor devices. The text presents a unified and balanced treatment of the physics of semiconductor materials and devices. It is intended to provide physicists and

mat erials scientists with more device backgrounds, and device engineers with a broader knowledge of fundamental solid state physics.

Fundamentals and Applications Springer Science & Business Media

Advancement in technology depends significantly on the availability of materials with desired specifications. In the book Electrical Engineering Materials, the authors have delved into the physics of materials, carefully explaining material behaviour and reaction under a variety of conditions. Upon reading, the user will develop a holistic understanding of the properties, characteristics, applications and limitations of various engineering materials. feature • Physics of materials discussed to explain material formation and characteristics • Applications of materials drawn from their inherent properties • Conceptual treatment of subject matter followed by mathematical derivations

Comprehensive Basic Mechanical Engineering Laxmi Publications, Ltd.

The book has been throughly revised.Several new articles have been added,specifically,in chapters in mortar ,Concrete ,Paint:Varnishes,Distempers and Antitermite treatmant to make the book to still more comprehensive and a

useful unit for the students preparing for the examination in the subject.

Engineering Materials

John Wiley & Sons

This is the first book to describe thoroughly the many facets of doping in compound semiconductors. Equal emphasis is given to the fundamental materials physics and to the technological aspects of doping. The author describes various doping techniques, including doping during epitaxial growth, doping by implantation, and doping by diffusion. The key characteristics of all dopants that have been employed in III-V semiconductors are discussed. In addition, general characteristics of dopants are analyzed, including the electrical activity, saturation, amphotericity, autocompensation, and maximum attainable dopant concentration. Redistribution effects are important in semiconductor microstructures. Linear and non-linear diffusion, different microscopic diffusion mechanisms, surface segregation, surface drift, surface migration, impurity-induced disordering, and the respective physical driving mechanisms are illustrated. Topics related to basic impurity theory include the hydrogenic model for shallow impurities, linear screening, density of states, classical and quantum statistics, the law of mass action, as well as many analytic approximations for the Fermi-Dirac integral for

three-, two- and one dimensional systems. The timely topic of highly doped semiconductors, including band tails, impurity bands, bandgap renormalization, the Mott transition, and the Burstein-Moss shift, is discussed as well. Doping is essential in many semiconductor heterostructures including high-mobility selectively doped heterostructures, quantum well and quantum barrier structures, doping superlattice structures and d-doping structures. Technologically important deep levels are summarized, including Fe, Cr, and the DX-center, the EL2 defect, and rare-earth impurities. The properties of deep levels are presented phenomenologically, including emission, capture, Shockley-Read recombination, the Poole-Frenkel effect, lattice relaxation, and other effects. The final chapter is dedicated to the experimental characterization of impurities. This book will be of interest to graduate students, researchers and development engineers in the fields of electrical engineering, materials science, physics, and chemistry working on semiconductors. The book may also be used as a text for graduate courses in electrical engineering and materials science.

Wide Bandgap Semiconductor Power Devices John Wiley & Sons

This book covers the fundamentals and significance of 2-D materials and related semiconductor transistor technologies for the next-generation ultra low power applications. It provides comprehensive coverage on advanced low power transistors such as NCFETs, FinFETs, TFETs, and flexible transistors for future ultra low power applications owing to their better subthreshold swing and scalability. In addition, the text examines the use of field-effect transistors for biosensing applications and covers design considerations and compact modeling of advanced low power transistors such as NCFETs, FinFETs, and TFETs. TCAD simulation examples are also provided. FEATURES Discusses the latest updates in the field of ultra low power semiconductor transistors Provides both experimental and analytical solutions for TFETs and NCFETs Presents synthesis and fabrication processes for FinFETs Reviews details on 2-D materials and 2-D transistors Explores the application of FETs for biosensing in the healthcare field This book is aimed at researchers, professionals, and graduate students in electrical engineering, electronics and communication engineering, electron devices, nanoelectronics and nanotechnology, microelectronics, and solid-state circuits.

Interconnect Materials and Performance Assessment CRC Press
The Guide to Semiconductor Engineering is concerned with semiconductor materials, devices and process technologies which in combination constitute an enabling force behind the growth of our technical civilization. This book was conceived and written keeping in mind those who need to learn about semiconductors, who are professionally associated with select aspects of this technical domain and want to see it in a broader context, or for those who are simply interested in state-of-the-art semiconductor engineering. In its coverage of semiconductor properties, materials, devices, manufacturing technology, and characterization methods, this Guide departs from textbook-style, monothematic in-depth discussions of each topic. Instead, it considers the entire broad field of semiconductor technology and identifies synergistic interactions within various areas in one concise volume. It is a holistic approach to the coverage of semiconductor engineering which distinguishes this Guide among other books concerned with semiconductors related issues.
Electrical Engineering Materials John Wiley & Sons
Problems after each chapter
Library of Congress

Subject Headings
Artech House Fundamentals of Electrical Engineering is an excellent introduction into the areas of electricity, electronic devices and electrochemistry. The book covers aspects of electrical science including Ohm and Kirkoff's laws, P-N junctions, semiconductors, circuit diagrams, magnetic fields, electrochemistry, and devices such as DC motors. This text is useful for students of electrical, chemical, materials, and mechanical engineering.
Electrical Engineering - Volume II Firewall Media
Semiconductor Materials presents physico-chemical, electronic, electrical, elastic, mechanical, magnetic, optical, and other properties of a vast group of elemental, binary, and ternary inorganic semiconductors and their solid solutions. It also discusses the properties of organic semiconductors. Descriptions are given of the most commonly used semiconductor devices-charge-coupled devices, field-effect transistors, unijunction transistors, thyristors, Zener and avalanche diodes, and photodiodes and lasers. The current trend of transitioning from silicon technology to gallium arsenide technology in field-effect-based electronic devices is a special feature that is also covered. More than 300 figures and 100

tables highlight discussions in the text, and more than 2,000 references guide you to further sources on specific topics. Semiconductor Materials is a relatively compact book containing vast information on semiconductor material properties. Readers can compare results of the property measurements that have been reported by different authors and critically compare the data using the reference information contained in the book. Engineers who design and improve semiconductor devices, researchers in physics and chemistry, and students of materials science and electronics will find this a valuable guide.

Electrical Engineering Materials Wiley-Interscience

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.

Electrical Engineering

Materials Firewall Media
A one-stop resource on all aspects of semiconductor wafer bonding for materials scientists and electrical engineers
Semiconductor Wafer Bonding addresses the entire spectrum of mainstream and likely future applications of wafer bonding. It examines all of the important issues surrounding this technology, including basic interactions between flat surfaces, the influence of particles, surface steps and cavities, surface preparation and room-temperature wafer bonding, thermal treatment of bonded wafer pairs, and much more. This unique, one-stop resource consolidates information previously available only by time-consuming searches through technical journals, proceedings, and book chapters for more than 1,000 published articles on wafer bonding. It covers all materials used for wafer bonding-including silicon, III-V compounds, fused and crystalline quartz, glass, silicon carbide, sapphire, ferroelectrics, and many others. For materials scientists and electrical engineers who need to exploit the potential of this flourishing technology, Semiconductor Wafer Bonding is a convenient one-stop resource for answers to many common questions. It is also an excellent text/reference for

graduate students eager to learn about this interdisciplinary field, which spans surface chemistry, solid-state physics, materials science, and electrical engineering.

An Introduction to Electrical Engineering Materials New Academic Science This graduate text explains the physical properties and applications of a wide range of smart materials.

The Materials Science of Semiconductors Tata McGraw-Hill Education This text offers comprehensive discussions of topics which are important to both electrical engineering and materials science students. The chapters are designed so that instructors can teach out of sequence or skip topics if desired.

Electrical Engineering Materials And Semiconductor Devices Cambridge University Press Electricity is an integral part of life in modern society. It is one form of energy and can be transported and converted into other forms. Throughout the world electricity is used to light homes and streets, cook meals, power computers and run industrial plants. Electricity is so integrated with our way of living that electricity consumption per person is used to measure the levels of economic development of countries. Any disruptions to electricity supply or blackouts will lead to huge financial loss and

threats to lives well-being in the community. Electrical engineering is the profession and study of generating, transmitting, controlling and using electrical energy. It offers a wide range of exciting opportunities to those looking for a fulfilling, challenging and professional career. Electrical engineers are the designers of modern electrical machinery, power systems, transportation and communication systems. They work in various sectors of the community as well including the building industry, the manufacturing industry, the construction industry, consultancy services, technology development, education services as well as government. In these volumes, the essential aspects and fundamentals of electrical engineering are presented. In depth knowledge of various areas of electrical engineering are disseminated by learned scholars in their fields. It is hoped that readers will find all the writings comprehensive, informative and interesting. It is further hoped that these fundamentals will assist the readers to study advanced topics in electrical engineering. If the readers are electrical engineers themselves, it is hoped that the articles will broaden their horizon in electrical engineering and provide them with the necessary

knowledge to further their profession as electrical engineers.

Laboratory Courses in Electrical Engineering

Walter de Gruyter GmbH & Co KG

An advanced level textbook covering geometric, chemical, and electronic structure of electronic materials, and their applications to devices based on semiconductor surfaces, metal-semiconductor interfaces, and semiconductor heterojunctions. Starting with the fundamentals of electrical measurements on semiconductor interfaces, it then describes the importance of controlling macroscopic electrical properties by atomic-scale techniques. Subsequent chapters present the wide range of surface and interface techniques available to characterize electronic, optical, chemical, and structural properties of electronic materials, including semiconductors, insulators, nanostructures, and organics. The essential physics and chemistry underlying each technique is described in sufficient depth with references to the most authoritative sources for more exhaustive discussions, while numerous examples are provided throughout to illustrate the applications of each technique. With its general reading lists, extensive citations to the text, and problem sets

appended to all chapters, this is ideal for students of electrical engineering, physics and materials science. It equally serves as a reference for physicists, material science and electrical and electronic engineers involved in surface and interface science, semiconductor processing, and device modeling and design. This is a coproduction of Wiley and IEEE * Free solutions manual available for lecturers at www.wiley-vch.de/supplements/