Electronic Materials And Devices

2D Semiconductor Materials and Devices reviews the basic science and state-of-art technology of 2D semiconductor materials and devices. Chapters discuss the basic structure and properties of 2D semiconductor materials, including both elemental (silicene, phosphorene) and compound semiconductors (transition metal dichalcogenide), the current growth and characterization methods of these 2D materials, state-of-the-art devices, and current and potential applications. Reviews a broad range of emerging 2D electronic materials beyond graphene, including silicene, phosphorene and compound semiconductors Provides an in-depth review of material properties, growth and characterization aspects--topics that could enable applications Features contributions from the leading experts in the field

It is privilege to open this National Technical Meeting of the American Society for Testing Materials, dealing with the interaction of ASTM with the electronics industry.

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

"Reliability and Failure of Electronic Materials and Devices" is a well-established and well-regarded reference work offering unique, single-source coverage of most major topics related to the performance and failure of materials used in electronic devices and electronics packaging. With a focus on statistically predicting failure and product yields, this book can help the design engineer, manufacturing engineer, and quality control engineer all better understand the common mechanisms that lead to electronics materials failures, including dielectric breakdown, hot-electron effects, and radiation damage. This new edition adds cutting-edge knowledge gained both in research labs and on the manufacturing floor, with new sections on plastics and other new packaging materials, new testing procedures, and new coverage of MEMS devices. Covers all major types of electronics materials degradation and their causes, including dielectric breakdown, hot-electron effects, electrostatic discharge, corrosion, and failure of contacts and solder jointsNew updated sections on "failure physics," on mass transport-induced failure in copper and low-k dielectrics, and on reliability of lead-free/reduced-lead solder connectionsNew chapter on testing procedures, sample handling and sample selection, and experimental designCoverage of new packaging materials, including plastics and composites

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/

"The third edition includes new topics and extended sections, such as diffusion, conduction in thin films, interconnects in microelectronics, electromigration, Stefan's radiation law, field emission from carbon nanotubes, piezoresistivity, amorphous semiconductors, solar cells, LEDs, Debye relaxation, giant magnetoresistance, magnetic data storage, Reststrahlen absorption, luminescence and white LEDs, and X-ray diffraction (Appendix). It also has a large number of new worked examples, numerous new homework problems, and many new illustrations and photographs. This text is one of the few books in the market that has the broad coverage of electronic materials and devices that today's scientists and engineers need."--Jacket.

Think like an electron Organic electronic materials have many applications and potential in low-cost electronics such as electronic barcodes and in light emitting devices, due to their easily tailored properties. While the chemical aspects and characterization have been widely studied, characterization of the electrical properties has been neglected, and classic textbook modeling has been applied. This is most striking in the analysis of thin-film transistors (TFTs) using thick “bulk” transistor (MOS-FET) descriptions. At first glance the TFTs appear to behave as regular MOS-FETs. However, upon closer examination it is clear that TFTs are unique and merit their own model. Understanding and interpreting measurements of organic devices, which are often seen as black-box measurements, is critical to developing better devices and this, therefore, has to be done with care. Electrical Characterization of Organic Electronic Materials and Devices Gives new insights into the electronic properties and measurement techniques for low-mobility electronic devices Characterizes the thin-film transistor using its own model Links the phenomena seen in different device structures and different measurement techniques Presents clearly both how to perform electrical measurements of organic and low-mobility materials and how to extract important information from these measurements Provides a much-needed theoretical foundation for organic electronics

This report was prepared by Hughes Aircraft Company, Culver City, California under Contract Number F33615-70-C-1348. The work was administered under the direc tion of the Air Force Materials Laboratory, Air Force Systems Command, Wright Patterson Air Force Base, Ohio, with Mr. B. Emrich, Project Engineer. The Electronic Properties Information Center (EPIC) is adesignated Information Analysis Center of the Department of Defense, authorized to provide information to the entire DoD community. The purpose of the Center is to provide a highly competent source of information and data on the electronic, optical and magnetic properties of materials of value to the Department of Defense. Its major function is to evaluate, compile and publish the experimental data from the world's unclassified literature concerned with the properties of materials. All materials relevant to the field of electronics are within the scope of EPIC: insulators, semiconductors, metals, super conductors, ferrites, ferroelectrics, ferromagnetics, electroluminescents, thermionic emitters and optical materials. The Center's scope includes information on over 100 basic properties of materials; information gene rally regarded as being in the area of devices and/or circuitry is excluded. Grateful acknowledgement is made for the review and comments by Dr. Victor Rehn of the U. S. Naval Ordnance Test Station at China Lake, California, as weIl as for review by staff members of the National Bureau of Standards, National Standard

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Quickly becoming the hottest topic of the new millennium (2.4 billion dollars funding in US alone) Current status and future trends of micro and nanoelectronics research Written by leading experts in the corresponding research areas Excellent tutorial for graduate students and reference for "gurus" Provides a broad overlook and fundamentals of nanoscience and nanotechnology from chemistry to electronic devices Electronic Materials & Dev 3E SieTata McGraw-Hill EducationPrinciples of Electronic Materials and Devices

Reliability and Failure of Electronic Materials and Devices is a well-established and well-regarded reference work offering unique, single-source coverage of most major topics related to the performance and failure of materials used in electronic devices and electronics packaging. With a focus on statistically predicting failure and product yields, this book can help the design engineer, manufacturing engineer, and quality control engineer all better understand the common mechanisms that lead to electronics materials failures, including dielectric breakdown, hot-electron effects, and radiation damage. This new edition adds cutting-edge knowledge gained both in research labs and on the manufacturing floor, with new sections on plastics and other new packaging materials, new testing procedures, and new coverage of MEMS devices. Covers all major types of electronics materials degradation and their causes, including dielectric breakdown, hot-electron effects, electrostatic discharge, corrosion, and failure of contacts and solder joints New updated sections on "failure physics," on mass transport-induced failure in copper and low-k dielectrics, and on reliability of lead-free/reduced-lead solder connections New chapter on testing procedures, sample handling and sample selection, and experimental design Coverage of new packaging materials, including plastics and composites

The third edition of this highly respected market study provides a detailed insight into the global developments of the GaAs industry to 2004, and the implications for both suppliers and users of GaAs technology. The report has been completely revised and updated with a new chapter added on competitive technologies. The report also supplies market analysis by component type and application sectors. For a PDF version of the report please call Tina Enright on +44 (0) 1865 843008 for price details.

According to Nalwa (founder and editor-in-chief of the Journal of Nanoscience and Nanotechnology), organic materials and polymers offer a range of advantages in electronic and photonic applications, including a higher degree of tailoring and versatility in the manipulation of their physical properties, ease of modification and functionalization, ease of processing and fabrication, low-cost mass production, environmental stability, and biocompatibility. He presents a three-volume handbook covering the synthesis and electrical properties of these materials, as well as a range of applications. The first volume, on electronic materials and devices, includes 13 chapters discussing such topics as synthetic approaches to band gap control in conjugated polymeric materials; synthesis, characteristics, and applications of conducting polymer nanotubes, nanowires, and nanocomposites; charge transport and morphology in conjugated polymers; nano/microfabrication techniques for organic electronics

and photonics, self-assembled supramolecular structures for organic electronics and photonics; organic thin-film transistor fundamentals and applications; electropolymers for mechtronics and artificial muscles; and biologically inspired large contraction conducting polymer actuators. The second volume switches focus towards photonic materials and devices and includes 12 chapters discussing such topics as organic nonlinear optical crystals and single-crystalline thin films, organic semiconducting thin films, organic random lasers, nonlinear optical properties of organometallic and metalloorganic compounds, nonlinear optical responses and photoinduced electron transfer process in phthalocyanines and related compounds, liquid crystal diffractive optical elements, magnetoresistance and spin effects in organic light-emitting diodes, and photoinduced transfer between electron donors and fullerenes as unique electron acceptors. The final volume is concerned with devices and includes 10 chapters on such topics single-molecule transistors; nanostructured arrays as suitable materials for batteries, sensors, and electrochromic devices; organic field-effect transistors; flexible display applications in organic electronics and photonics; physics and technology and organic light emitting diodes; organic and polymeric solar cells; luminescent lanthanide complexes for advanced photonic applications; and DNA based biosensors.

The field of organic electronics promises exciting new technologies based on inexpensive and mechanically flexible electronic devices, and is now seeing the beginning of commercial success. On the sidelines of this increasingly well-established field are several emerging technologies with innovative mechanisms and functions that utilize the mixed ionic/electronic conducting character of conjugated organic materials. Iontronics: Ionic Carriers in Organic Electronic Materials and Devices explores the potential of these materials, which can endow electronic devices with unique functionalities. Fundamental science and applications With contributions from a community of experts, the book focuses on the use of ionic functions to define the principle of operation in polymer devices. It begins by reviewing the scientific understanding and important scientific discoveries in the electrochemistry of conjugated polymers. It examines the known effects of ion incorporation, including the theory and modulation of electrochemistry in polymer films, and it explores the coupling of electronic and ionic transport in polymer films. The authors also describe applications that use this technology, including polymer electrochromic devices, artificial muscles, light-emitting electrochemical cells, and biosensors, and they discuss the fundamental technological hurdles in these areas. The changes in materials properties and device characteristics due to ionic conductivity and electrochemical doping in electrically conductive organic materials, as well as the importance of these processes in a number of different and exciting technologies, point to a large untapped potential in the development of new applications and novel device architecture. This volume captures the state of the science in this burgeoning field.

This book provides the knowledge and understanding necessary to comprehend the operation of individual electronic devices that are found in modern micro-electronics. As a textbook, it is aimed at the third-year undergraduate curriculum in electrical engineering, in which the physical electronic properties are used to develop an introductory understanding to the semiconductor devices used in modern micro-electronics. The emphasis of the book is on providing detailed physical insight into the microscopic mechanisms that form the cornerstone for these technologies. Mathematical treatments are therefore kept to the minimum level necessary to achieve suitable rigor. * Covers crystalline structure * Thorough introduction to the key principles of quantum mechanics * Semiconductor statistics, impurities, and controlled doping * Detailed analysis of the operation of semiconductor devices, including p-n junctions, field-effect transistors, metal-semiconductor junctions and bipolar junction transistors * Discussion of optoelectronic devices such as light-emitting diodes (LEDs) and lasers * Chapters on the device applications of dielectrics, magnetic materials, and superconductors

The MATERIALS IN ACTION series has been produced by the Materials Engineering

Department of the Open University's Technology Faculty as an undergraduate-level text. Its publication in book format brings the Open University's highly regarded texts and teaching methods to a wider audience. The series comprises four books:Materials Principles and PracticeManufacturing with MaterialsStructural MaterialsElectronic MaterialsEach book is self-contained and is based on an industrial context.Electronic Materials is about materials that are used for their electrical and magnetic properties, rather than their mechanical properties. Exploiting electronic properties in many products calls for careful manipulation of materials' structures at the atomic and microstructural levels. The book explains the scientific models needed to guide those manipulations and describes how they are commercially exploited inside electronic devices.Printed, hybrid and integrated circuit technologies are discussed together with ways of providing circuit components at each scale. Electronic and magnetic transducers, magnetic components (such as transformer cores and memory systems), optoelectronics, visual-display technologies and semiconductor memory systems are examined. A study of the interplay among the development, manufacture and marketing of innovative high-temperature superconductors puts these topics into an entrepreneurial context.

With information on the subject of dielectric materials, this volume brings important updates to electronic device engineers and researchers in the area of ferroelectric materials. Topics include materials, processes, properties, and electronic devices based on these materials and systems. Proceedings of the symposium held at the 103rd Annual Meeting of The American Ceramic Society, April 22-25, 2001, in Indiana; Ceramic Transactions, Volume 131.

This outstanding textbook provides an introduction to electronic materials and device concepts for the major areas of current and future information technology. On about 1,000 pages, it collects the fundamental concepts and key technologies related to advanced electronic materials and devices. The obvious strength of the book is its encyclopedic character, providing adequate background material instead of just reviewing current trends. It focuses on the underlying principles which are illustrated by contemporary examples. The third edition now holds 47 chapters grouped into eight sections. The first two sections are devoted to principles, materials processing and characterization methods. Following sections hold contributions to relevant materials and various devices, computational concepts, storage systems, data transmission, imaging systems and displays. Each subject area is opened by a tutorial introduction, written by the editor and giving a rich list of references. The following chapters provide a concise yet in-depth description in a given topic. Primarily aimed at graduate students of physics, electrical engineering and information technology as well as material science, this book is equally of interest to professionals looking for a broader overview. Experts might appreciate the book for having quick access to principles as well as a source for getting insight into related fields.