Microelectronic Materials

As recognized, adventure as competently as experience not quite lesson, amusement, as competently as concurrence can be gotten by just checking out a books Microelectronic Materials along with it is not directly done, you could recognize even more as regards this life, roughly speaking the world.

We provide you this proper as with ease as simple mannerism to acquire those all. We present Microelectronic Materials and numerous book collections from fictions to scientific research in any way. accompanied by them is this Microelectronic Materials that can be your partner.

Study of Stress in Microelectronic Materials by Hancheng Liang 1996
Chemical Perspectives of Microelectronic Materials: Mihal E. Gross 2014-06-05 The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.
Biomedical Microsystems Ellis Meng 2010-09-29 Poised to dramatically impact human health, biomedical Microsystems (bioMEMS) technologies incorporate various aspects from materials science, biology, chemistry, physics, medicine, and engineering. Reflecting the highly interdisciplinary nature of this area, Biomedical Microsystems covers the fundamentals of miniaturization, biomaterials, microfabrication, and nanotechnology, along with relevant applications. Written by an active researcher who was recently named one of Technology Review’s Young Innovators Under 35, the book begins with an introduction to the benefits of miniaturization. It then introduces materials, fabrication technology, and the necessary components of all bioMEMS. The author also covers fundamental principles and building blocks, including microfluidic concepts, lab-on-a-chip systems, and sensing and detection methods. The final chapters explore several important applications of bioMEMS, such as microdialysis, catheter-based sensors, MEMS implants, neural probes, and tissue engineering. For readers with a limited background in MEMS and bioMEMS, this book provides a practical introduction to the technology used to make these devices, the principles that govern their operation, and examples of their application. It offers a starting point for understanding advanced topics and encourages readers to begin to formulate their own ideas about the design of novel bioMEMS. A solutions manual is available for instructors who want to convert this reference to classroom use.
Microelectronic Materials C. R. M. Grovenor 1998 "This practical book shows how an understanding of structure, thermodynamics, and electrical properties can explain some of the choices of materials used in microelectronics, and can assist in the design of new materials for specific applications. It emphasizes the importance of the phase chemistry of semiconductor and metal systems for ensuring the long-term stability of new devices. The book discusses single-crystal and polycrystalline silicon, aluminium- and gold-based metallisation schemes, packaging semiconductor devices, failure analysis, and the suitability of various materials for optoelectronic devices and solar cells. It has been designed for senior undergraduates, graduates, and researchers in physics, electronic engineering, and materials science."--Provided by publisher.
Reliability and Failure of Electronic Materials and Devices Milton Ohring 2014-11-03 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.
Molecular Modeling and Multiscale Issues for Electronic Material Applications Nancy Iwamoto 2011-12-29 Molecular Modeling and Multiscale Issues for Electronic Material Applications provides a snapshot on the progression of molecular modeling in the electronics industry and how molecular modeling is currently being used to understand material performance to solve relevant issues in this field. This book is intended to introduce the reader to the evolving role of molecular modeling, especially seen through the eyes of the IEEE community involved in material modeling for electronic applications. Part I presents the role that quantum mechanics can play in performance prediction, such as properties dependent upon electronic structure, but also shows examples how molecular models may be used in performance diagnostics, especially when chemistry is part of the performance issue. Part II gives examples of large-scale atomistic methods in material failure and shows several examples of transitioning between grain boundary simulations (on the atomistic level) and large-scale models including an example of the use of quasi-continuum methods that are being used to address multiscale issues. Part III is a more specific look at molecular dynamics in the determination of the thermal conductivity of carbon-nanotubes. Part IV covers the many aspects of molecular modeling needed to understand the relationship between the molecular structure and mechanical performance of materials. Finally, Part V discusses the transitional topic of multiscale modeling and recent developments to reach the submicron scale using mesoscale models, including examples of direct scaling and parameterization from the atomistic to the coarse-grained particle level.
Micro and Near-field Optical Characterisation of Microelectronic Materials Emiliano Bonera 2002
Chemical Perspectives of Microelectronic Materials II: Volume 204 L. H. Dubois 1991-04-23 The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.
SEM Conductive Mode Analysis of Microelectronic Materials Geoffrey Alan Hungerford 1988
Defects in Microelectronic Materials and Devices Daniel M. Fleetwood 2008-11-19 Uncover the Defects that Compromise Performance and Reliability As microelectronics features and devices become smaller and more complex, it is critical that engineers and technologists completely understand how components can be damaged during the increasingly complicated fabrication processes required to produce them. A comprehensive survey of defects that occur in silicon-based metal-oxide semiconductor field-effect transistor (MOSFET) technologies, this book also discusses flaws in linear bipolar technologies, silicon carbide-based devices, and gallium arsenide materials and devices. These defects can profoundly affect the yield, performance, long-term reliability, and radiation response of microelectronic devices and integrated circuits (ICs). Organizing the material to build understanding of the problems and provide a
quick reference for scientists, engineers and technologists, this text reviews yield- and performance-limiting defects and impurities in the device silicon layer, in the gate insulator, and/or at the critical Si/SiO2 interface. It then examines defects that impact production yield and long-term reliability, including: Vacancies, interstitials, and impurities (especially hydrogen) Negative bias temperature instabilities Defects in ultrathin oxides (SiO2 and silicon oxynitride) Take A Proactive Approach The authors condense decades of experience and perspectives of noted experimentalists and theorists to characterize defect properties and their impact on microelectronic devices. They identify the defects, offering solutions to avoid them and methods to detect them. These include the use of 3-D imaging, as well as electrical, analytical, computational, spectroscopic, and state-of-the-art microscopic methods. This book is a valuable look at challenges that promise to energize research in semiconductor devices and high-mobility substrates being developed to replace SiO2 as the preferred gate dielectric material, and high-mobility substrates.

Chemical Mechanical Planarization of Microelectronic Materials Joseph M. Steigerwald 1997 The concluding chapter describes post-CMP cleaning techniques, and most chapters feature problem sets to assist readers in developing a more practical understanding of CMP. The only comprehensive reference to one of the fastest growing integrated circuit manufacturing technologies, Chemical Mechanical Planarization of Microelectronic Materials is an important resource for research scientists and engineers working in the microelectronics industry.

Women in Microelectronics Alice Cline Parker 2020-07-16 This book contains stories of women engineers’ paths through the golden age of microelectronics, stemming from the invention of the transistor in 1947. These stories, like the biographies of Marie Curie and the National Geographic’s stories of Jane Goodall’s research that inspired the authors will inspire and guide readers along unconventional pathways to contributions to microelectronics that we can only begin to imagine. The book explores why and how the women writing here chose their career paths and how they navigated their careers. This topic is of interest to a vast audience, from students to professionals to university advisers to industry CEOs, who can imagine the advantages of a future with a diverse work force. Provides insight into women’s early contributions to the field of microelectronics and celebrates the challenges they overcame; Presents compelling innovations from academia, research, and industry into advances, applications, and the future of microelectronics; Includes a fascinating look into topics such as nanotechnologies, video games, analog electronics, design automation, and neuromorphic circuits.

Reliability of Organic Compounds in Microelectronics and Optoelectronics Willem Dirk van Driel 2022 This book aims to provide a comprehensive reference into the critical subject of failure and degradation in organic materials, used in optoelectronics and microelectronics systems and devices. Readers in different industrial sectors, including microelectronics, automotive, lighting, oil/gas, and petrochemical will benefit from this book. Several case studies and examples are discussed, which readers will find useful to assess and mitigate similar failures in their projects. The book presents methodologies and useful approaches in analyzing a failure and in relating a failure to the reliability of materials and systems. Presents methodologies for analysing the reliability, failure, and degradation of different organic materials, used in optoelectronics and microelectronics; Provides an overview of different failure mechanisms in different organic materials; Explains how to correlate product performance and reliability to materials degradation; Provides an overview of simulation techniques and methodologies to predict lifetime and reliability of engineering materials and components; Integrates several degradation causes in different materials (thermal, moisture, light radiation, mechanical damage, and more) into large-scale system solutions in several industrial domains (lighting, automotive, oil/gas, and transport and more); Includes case studies from different failure/degradation mechanisms in different industrial sectors.

Microelectronic Materials C. Grovenor 1994 Advanced Materials for Thermal Management of Electronic Packaging Xingcun Colin Tong 2011-01-05 The need for advanced thermal management materials in electronic packaging has been widely recognized as thermal challenges become barriers to the electronic industry’s ability to provide continued improvements in device and system performance. With increased performance requirements for smaller, more capable, and more efficient electronic power devices, systems ranging from active electronically scanned radar arrays to web servers all require components that can dissipate heat efficiently. This requires that the materials have high capability of dissipating heat and maintaining compatibility with the die and electronic packaging. In response to critical needs, there have been revolutionary advances in thermal management materials and technologies for active and passive cooling that promises to enable effective and effective thermal management solutions. This book meets the need for a comprehensive approach to advanced thermal management in electronic packaging, with coverage of the fundamentals of heat transfer, component design guidelines, materials selection and assessment, air, liquid, and thermoelectric cooling, characterization techniques and methodology, processing and manufacturing technology, balance between cost and performance, and application niches. The final chapter presents a roadmap and future perspective on developments in advanced thermal management materials for electronic packaging.
Chemical Perspectives of Microelectronic Materials
1990

Nanolithography and Patternning Techniques in Microelectronics
D Bucknall 2005-09-30
Techniques such as surface patterning have facilitated the emergence of advanced polymers with applications in areas such as microelectronics. Surface patterning of polymers has conventionally been undertaken by optical lithography. However, a new generation of nanolithographic and patterning techniques has made it possible to develop complex patterns at the nanoscale. Non-conventional lithography and patterning summarises this new range of techniques and their industrial applications. A number of chapters look at ways of forming and modifying surfaces for patterning. These are complemented by chapters on particular patterning techniques such as soft lithography, ion beam patterning, the use of nanostencils, photolithography and inkjet printing. The book also discusses processes present during the manufacture of microelectronics. With its distinguished international team of contributors, Non-conventional lithography and patterning is a standard reference for both those researching and using advanced polymers in such areas as microelectronics and biomedical devices. Looks at alternative approaches used to develop complex patterns at the nanoscale Concentrates on state of the art nanolithographic methods Written by a distinguished international team of contributors

Diffusion Phenomena in Thin Films and Microelectronic Materials
Depen Datta Gupta 1988
A comprehensive review of diffusion phenomena in thin films and microelectronic materials – theory and technology.

Die-A奁t Materials for High Temperature Applications in Microelectronics Packaging
Kim S. Siow 2019-01-29
This book presents the scientific principles, processing conditions, probable failure mechanisms, and a description of reliability performance and equipment required for implementing high-temperature and lead-free die attach materials. In particular, it addresses the use of solder alloys, silver and copper sintering, and transient liquid-phase sintering. While different solder alloys have been used widely in the microelectronics industry, the implementation of sintering silver and transient liquid-phase sintering remains limited to a handful of companies. Hence, the book devotes many chapters to sintering technologies, while simultaneously providing only a cursory coverage of the more widespread techniques employing solder alloys. Addresses the differences between sintering and soldering (the current die-attach technologies), thereby comprehensively addressing principles, methods, and performance of these high-temperature die-attach materials; Emphasizes the industrial perspective, with chapters written by engineers who have hands-on experience using these technologies; Baker Hughes, Bosch and ON Semiconductor, are represented as well as materials suppliers such as Indium; Simultaneously provides the detailed science underlying these technologies by leading academic researchers in the field.

Chemical Perspectives of Microelectronic Materials
1992

Chemical Perspectives of Microelectronic Materials III:
Volume 282
C. R. Abernathy 1993-03-23
The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Plasma Applications for Material Modification
Francisco L. Tabarès 2021-09-24
This book is an up-to-date review of the most important technological applications of plasmas, from microelectronics to biological materials and from fusion plasmas to atmospheric ones. Each its technical chapters is written by long-experienced, internationally recognised researchers. The book provides a deep and comprehensive insight into plasma technology and its associated elemental processes and is illustrated throughout with excellent figures and references to complement each section. Although some of the topics covered can be traced back several decades, care has been taken to emphasize the most recent findings and expected evolution. The first time the word ‘plasma’ appeared in print in a scientific publication devoted to the study of electrical discharges in gases was 1928, when Irving Langmuir published his article ‘Oscillations in Ionized Gases’. It was the baptism of the predominant state of matter in the known universe (it is estimated that up to 99% of matter is plasma), although not on earth, where the conditions of pressure and temperature make normal the states of matter (solid, liquid, gas) which, in global terms, are exotic. It is enough to add energy to a solid (in the form of heat or electromagnetic radiation) to go into the liquid state, from which gas is obtained through an additional supply of energy. If we continue adding energy to the gas, we will partially or totally ionise it and reach a new state of matter, plasma, made up of free electrons, atoms and molecules (electrically neutral particles) and ions (endowed with a positive or a negative electric charge).

Microelectronics
Jerry C. Whitaker 2018-10-03
When it comes to electronics, demand grows as technology shrinks. From consumer and industrial markets to military and aerospace applications, the call is for more functionality in smaller and smaller devices. Culled from the second edition of the best-selling Electronics Handbook, Microelectronics, Second Edition presents a summary of the current states of microelectronics and its innovative directions. This book focuses on the materials, devices, and applications of microelectronics technology. It details the IC design process and VLSI circuits, including gate arrays, programmable logic devices and arrays, parasitic capacitance, and transmission line delays. Coverage ranges from thermal properties and semiconductor materials to MOSFETs, digital logic families, memory devices, microprocessors, digital-to-analog and analog-to-digital converters, digital filters, and multichip module technology. Expert contributors discuss applications in many areas of microelectronic technology, which are used in industrial electronics markets, such as computers, radar and communications equipment, satellites, aircraft and navigational equipment, military elec

Microelectronics to Nano electronics
Anupama B. Kaul 2017-12-19
Composed of contributions from top experts, Microelectronics to Nanoelectronics: Materials, Devices and Manufacturability offers a detailed overview of important recent scientific and technological developments in the rapidly evolving nanoelectronics area. Under the editorial guidance and technical expertise of noted materials scientist Anupama B. Kaul of California Institute of Technology’s Jet Propulsion Lab, this book captures the ascent of microelectronics into the nanoscale realm. It addresses a wide variety of important scientific and technological issues in nanoelectronics research and development. The book also showcases some key application areas of micro-electro-mechanical-systems (MEMS) that have reached the commercial realm. Capitalizing on Dr. Kaul’s considerable technical experience with micro- and nanotechnologies and her extensive research in prestigious academic and industrial labs, the book offers a fresh perspective on application-driven research in micro- and nanoelectronics, including MEMS. One more low hanging fruit in this area is transitioning from the lab to the market, where new and exciting materials, devices, and manufacturing technologies are revolutionizing the electronics industry. Although many micro- and nanotechnologies still face major scientific and technological challenges and remain within the realm of academic research labs, rapid advances in this area have led to the recent emergence of new applications and markets. This handbook encapsulates that exciting recent progress by providing high-quality content contributed by international experts from academia, leading industrial institutions—such as Hewlett-Packard—and government laboratories including the U.S. Department of Energy’s Sandia National Laboratory. Offering something for everyone, from students to scientists to entrepreneurs, this book showcases the broad spectrum of cutting-edge technologies that show significant promise for electronics and related applications in which nanotechnology...
plays a key role.


Microelectronic Materials C.R.M. Grovenor 2017-10-05 This practical book shows how an understanding of structure, thermodynamics, and electrical properties can explain some of the properties of materials used in microelectronics, and can assist in the design of new materials for specific applications. It emphasizes the importance of the phase chemistry of microelectronic materials and systems for ensuring the long-term stability of new devices. The book discusses single-crystal and polycrystalline silicon, aluminium- and gold-based metallisation schemes, packaging semiconductor devices, failure analysis, and the suitability of various materials for optoelectronic devices and solar cells. It has been designed for senior undergraduates, graduates, and researchers in physics, electronic engineering, and materials science.

High Dielectric Constant Materials Howard Huff 2006-03-30 Issues relating to the high-K gate dielectric are among the greatest challenges for the evolving International Technology Roadmap for Semiconductors (ITRS). More than just an historical overview, this book will assess previous and present approaches related to scaling the gate dielectric and their impact, along with the creative directions and forthcoming challenges that will define the future of gate dielectric scaling technology.

Contributions of DOE Weapons Labs and NIST to Semiconductor Technology Microelectronic Materials and Processes R.A. Levy 2012-12-06 The primary thrust of very large scale integration (VLSI) is the miniaturization of devices to increase packing density, achieve higher speed, and consume lower power. The fabrication of integrated circuits containing in excess of four million components per chip with design rules in the submicron range has now been made possible by the introduction of innovative circuit designs and the development of new microelectronic materials and processes. This book addresses the latter challenge by assessing the current status of the science and technology associated with the production of VLSI silicon circuits. It represents the cumulative effort of experts from academia and industry who have come together to blend their expertise into a tutorial overview and cohesive update of this rapidly expanding field. A balance of fundamental and applied contributions covers the basics of microelectronics materials and process engineering. Subjects in materials science include silicon, silicides, resists, dielectrics, and interconnect metallization. Subjects in process engineering include crystal growth, epitaxy, oxidation, thin film deposition, fine-line lithography, dry etching, ion implantation, and diffusion. Other related topics such as process simulation, defects phenomena, and diagnostic techniques are also included. This book is the result of a NATO-sponsored Advanced Study Institute (ASI) held in Castelvecchio Pascoli, Italy. Invited speakers at this institute provided manuscripts which were edited, updated with other contributions solicited from non-participants to this ASI. Methods and Materials in Microelectronic Technology Joachim Bargon 2013-03-09 The papers collected in this volume were presented at the International Symposium on Methods and Materials in Microelectronic Technology. This symposium was sponsored by IBM Germany, and it was held September 29 - October 1, 1982, in Bad Neuenahr, West Germany. The progress of semiconductor and microelectronic technology has become so rapid and the field so sophisticated that it is imperative to exchange the latest insight gained as frequently as it can be accomplished. In addition, it is peculiar for this field that the bulk of the investigations are carried out at industrial research and development laboratories, which makes some of the results less readily accessible. Because of these circumstances, the academic community, which among other things, is supposed to communicate the progress in this field to students of different disciplines, finds it rather difficult to stay properly informed. It was the intent of this IBM sponsored symposium to bring together key scientists from academic institutions, primarily from Europe, with principal investigators of the industrial scene. Accordingly, this symposium exposed technologists to scientists and vice versa. Scientific advances often lead directly to technological innovations. In turn, new technologies are often arrived at empirically and, because of that, are initially poorly understood. Scientific inquiry then attempts to probe these processes and phenomena in order to achieve a better understanding. Thus science and technology are intricately interconnected, and it is important that technical exchange between technologists and scientists is facilitated, since the problems are typically interdisciplinary in nature.

Microelectronic Materials C. R. M. Grovenor 1995 This practical book shows how an understanding of structure, thermodynamics, and electrical properties can explain some of the properties of materials used in microelectronics, and can assist in the design of new materials for specific applications. It emphasizes the importance of the phase chemistry of semiconductor and metal systems for ensuring the long-term stability of new devices. The book discusses single-crystal and polycrystalline silicon, aluminium- and gold-based metallisation schemes, packaging semiconductor devices, failure analysis, and the suitability of various materials for optoelectronic devices and solar cells. It has been designed for senior undergraduates, graduates, and researchers in physics, electronic engineering, and materials science.

III-V Microelectronics J.P. Nougier 2014-05-27 As is well known, Silicon widely dominates the market of semiconductor devices and circuits, and in particular is well suited for Ultra Large Scale Integration processes. However, a number of III-V compound semiconductor devices and circuits have recently been built, and the contributions in this volume are devoted to those types of materials, which offer a number of interesting properties. Taking into account the great variety of problems encountered and of their mutual correlations when fabricating a circuit or even a device, most of the aspects of III-V microelectronics, from fundamental physics to modelling and technology, from materials to devices and circuits are reviewed. Containing contributions from European researchers of international repute this volume is the definitive reference source for anyone interested in the latest advances and results of current experimental research in III-V microelectronics.

Microelectronic Materials and Processes R. a Levy 1989-01-31 Dielectric Films for Advanced Microelectronics Mikhail Baklanov 2007-04-04 The topic of thin films is an area of increasing importance in materials science, electrical engineering and applied solid state physics; with both research and industrial applications in microelectronics, computer manufacturing, and physical devices. Advanced, high-performance computers, high-definition TV, broadband imaging systems, flat-panel displays, robotic systems, and medical electronics and diagnostics are a few examples of the miniaturized device technologies that depend on the utilization of thin film materials. This book presents an in-depth overview of the novel developments made by the scientific leaders in the area of modern dielectric films for advanced microelectronic applications. It contains clear, concise explanations of material science of dielectric films and their problem for device operation, including high-k, low-k, medium-k dielectric films and also specific features and requirements for dielectric films used in the packaging technology. A broad range of related topics are covered, from physical principles to design, fabrication, characterization, and applications of novel dielectric films.

Chemical Mechanical Planarization of Microelectronic Materials Joseph M. Steigerwald 2008-09-26 Chemical Mechanical Planarization (CMP) plays an important role in today's microelectronics industry. With its ability to achieve global planarization, its universality (material insensitivity), its applicability to multilayered systems, and its relative cost-effectiveness, CMP is the ideal planarizing medium for the interlayered dielectrics and metal films used in silicon integrated circuit fabrication. But although the past decade has seen unprecedented research and development into CMP, there has
been no single-source reference to this rapidly emerging technology-until now. Chemical Mechanical Planarization of Microelectronic Materials provides engineers and scientists working in the microelectronics industry with unified coverage of both the fundamental mechanisms and engineering applications of CMP. Authors Steigerwald, Murarka, and Gutmann—all leading CMP pioneers—provide a historical overview of CMP, explain the various chemical and mechanical concepts involved, describe CMP materials and processes, review the latest scientific data on CMP worldwide, and offer examples of its uses in the microelectronics industry. They provide detailed coverage of the CMP of various materials used in the making of microcircuitry: tungsten, aluminum, copper, polysilicon, and various dielectric materials, including polymers. The concluding chapter describes post-CMP cleaning techniques, and most chapters feature problem sets to assist readers in developing a more practical understanding of CMP. The only comprehensive reference to one of the fastest growing integrated circuit manufacturing technologies, Chemical Mechanical Planarization of Microelectronic Materials is an important resource for research scientists and engineers working in the microelectronics industry. An indispensable resource for scientists and engineers working in the microelectronics industry, Chemical Mechanical Planarization of Microelectronic Materials is the only comprehensive single-source reference to one of the fastest growing integrated circuit manufacturing technologies. It provides engineers and scientists who work in the microelectronics industry with unified coverage of both the fundamental mechanisms and engineering applications of CMP, including: * The history of CMP * Chemical and mechanical underpinnings of CMP * CMP materials and processes * Applications of CMP in the microelectronics industry * The CMP of tungsten, aluminum, copper, polysilicon, and various dielectrics, including polymers used in integrated circuit fabrication * Post-CMP cleaning techniques * Chapter-end problem sets are also included to assist readers in developing a practical understanding of CMP.