

**DIFFUSION
PHENOMENA
IN THIN FILMS AND
MICROELECTRONIC
MATERIALS**

Edited by

Devendra Gupta and Paul S. Ho

IBM Thomas J. Watson Research Center
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Diffusion Phenomena In Thin Films And Microelectronic Materials

David Fisher



Diffusion Phenomena In Thin Films And Microelectronic Materials:

Diffusion Phenomena in Thin Films and Microelectronic Materials Devendra Gupta, P. S. Ho, 1988 A comprehensive review of diffusion phenomena in thin films and microelectronic materials theory and technology **Diffusion Phenomena In Thin Films And Microelectronic Materials** D. Gupta, **Thermal Stress and Strain in Microelectronics Packaging** John Lau, 2012-12-06 Microelectronics packaging and interconnection have experienced exciting growth stimulated by the recognition that systems not just silicon provide the solution to evolving applications In order to have a high density performance yield quality reliability low cost and light weight system a more precise understanding of the system behavior is required Mechanical and thermal phenomena are among the least understood and most complex of the many phenomena encountered in microelectronics packaging systems and are found on the critical path of nearly every design and process in the electronics industry The last decade has witnessed an explosive growth in the research and development efforts devoted to determining the mechanical and thermal behaviors of microelectronics packaging With the advance of very large scale integration technologies thousands to tens of thousands of devices can be fabricated on a silicon chip At the same time demands to further reduce packaging signal delay and increase packaging density between communicating circuits have led to the use of very high power dissipation single chip modules and multi chip modules The result of these developments has been a rapid growth in module level heat flux within the personal workstation midrange mainframe and super computers Thus thermal temperature stress and strain management is vital for microelectronics packaging designs and analyses How to determine the temperature distribution in the electronics components and systems is outside the scope of this book which focuses on the determination of stress and strain distributions in the electronics packaging **Defects and Diffusion in Semiconductors X** David Fisher, 2008-03-18 An Annual Retrospective X **Proceedings of the Symposium on Reliability of Metals in Electronics** Hazara S. Rathore, 1995 **Electromigration in Metals** Paul S. Ho, Chao-Kun Hu, Martin Gall, Valeriy Sukharev, 2022-05-12 Learn to assess electromigration reliability and design more resilient chips in this comprehensive and practical resource Beginning with fundamental physics and building to advanced methodologies this book enables the reader to develop highly reliable on chip wiring stacks and power grids Through a detailed review on the role of microstructure interfaces and processing on electromigration reliability as well as characterisation testing and analysis the book follows the development of on chip interconnects from microscale to nanoscale Practical modeling methodologies for statistical analysis from simple 1D approximation to complex 3D description can be used for step by step development of reliable on chip wiring stacks and industrial grade power ground grids This is an ideal resource for materials scientists and reliability and chip design engineers Advanced Nanoscale ULSI Interconnects: Fundamentals and Applications Yosi Shacham-Diamand, Tetsuya Osaka, Madhav Datta, Takayuki Ohba, 2009-09-19 In Advanced ULSI interconnects fundamentals and applications we bring a

comprehensive description of copper based interconnect technology for ultra lar scale integration ULSI technology for integrated circuit IC application In grated circuit technology is the base for all modern electronics systems You can nd electronics systems today everywhere from toys and home appliances to a planes and space shuttles Electronics systems form the hardware that together with software are the bases of the modern information society The rapid growth and vast exploitation of modern electronics system create a strong demand for new and improved electronic circuits as demonstrated by the amazing progress in the eld of ULSI technology This progress is well described by the famous Moore s law which states in its most general form that all the metrics that describe integrated circuit performance e g speed number of devices chip area improve expon tially as a function of time For example the number of components per chip d bles every 18 months and the critical dimension on a chip has shrunk by 50% every 2 years on average in the last 30 years This rapid growth in integrated circuits te nology results in highly complex integrated circuits with an increasing number of interconnects on chips and between the chip and its package The complexity of the interconnect network on chips involves an increasing number of metal lines per interconnect level more interconnect levels and at the same time a reduction in the interconnect line critical dimensions

Materials Reliability in Microelectronics ,1999 **Characterization of Metals and Alloys** Paul Holloway,2010 A better understanding of the microstructure of metals and alloys has led to great advances in the performance and useful applications of these the oldest of mankind s engineered materials This book in the Materials Characterizations series focuses on the particular molecular and atomistic properties of metals insofar as how they affect the different techniques for measuring and analyzing internal structure surface structure and chemical physical properties It provides a vital connection between commonly used characterization techniques like Scanning Electron Microscopy and how such can be used in the various ways that metals are processed machined and used Review of relevant mechanical and chemical properties of metals and how they affect characterization techniques Characterization techniques used for melting and casting machining and metallic thin films processes Concise summaries of major characterization technologies for metals and alloys including Auger Electron Spectroscopy Energy Dispersive X Ray Spectroscopy Neutron Activation Analysis Scanning Electron Microscopy and Transmission Electron Spectroscopy

Handbook of Semiconductor Manufacturing Technology Yoshio Nishi,Robert Doering,2017-12-19 Retaining the comprehensive and in depth approach that cemented the bestselling first edition s place as a standard reference in the field the Handbook of Semiconductor Manufacturing Technology Second Edition features new and updated material that keeps it at the vanguard of today s most dynamic and rapidly growing field Iconic experts Robert Doering and Yoshio Nishi have again assembled a team of the world s leading specialists in every area of semiconductor manufacturing to provide the most reliable authoritative and industry leading information available Stay Current with the Latest Technologies In addition to updates to nearly every existing chapter this edition features five entirely new contributions on Silicon on insulator SOI materials and devices Supercritical CO2 in

semiconductor cleaning Low dielectrics Atomic layer deposition Damascene copper electroplating Effects of terrestrial radiation on integrated circuits ICs Reflecting rapid progress in many areas several chapters were heavily revised and updated and in some cases rewritten to reflect rapid advances in such areas as interconnect technologies gate dielectrics photomask fabrication IC packaging and 300 mm wafer fabrication While no book can be up to the minute with the advances in the semiconductor field the Handbook of Semiconductor Manufacturing Technology keeps the most important data methods tools and techniques close at hand

Materials Reliability in Microelectronics II: Volume 265 C. V. Thompson, J. R. Lloyd, 1992-09-30 The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners

Materials Reliability in Microelectronics III: Volume 309 Kenneth P. Rodbell, 1993-08-31 The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners

Materials Reliability in Microelectronics VI: Volume 428 William F. Filter, 1996-11-18 MRS books on materials reliability in microelectronics have become the snapshot of progress in this field Reduced feature size increased speed and larger area are all factors contributing to the continual performance and functionality improvements in integrated circuit technology These same factors place demands on the reliability of the individual components that make up the IC Achieving increased reliability requires an improved understanding of both thin film and patterned feature materials properties and their degradation mechanisms how materials and processes used to fabricate ICs interact and how they may be tailored to enable reliability improvements This book focuses on the physics and materials science of microelectronics reliability problems rather than the traditional statistical accelerated electrical testing aspects Studies are grouped into three large sections covering electromigration gate oxide reliability and mechanical stress behavior Topics include historical summary reliability issues for Cu metallization characterization of electromigration phenomena modelling microstructural evolution and influences oxide and device reliability thin oxynitride dielectrics noncontact diagnostics stress effects in thin films and interconnects and microbeam X ray techniques for stress measurements

Copper Interconnect Technology Tapan Gupta, 2010-01-22 Since overall circuit performance has depended primarily on transistor properties previous efforts to enhance circuit and system speed were focused on transistors as well During the last decade however the parasitic resistance capacitance and inductance associated with interconnections began to influence circuit performance and will be the primary factors in the evolution of nanoscale ULSI technology Because metallic conductivity and resistance to electromigration of bulk copper Cu are better than aluminum use of copper and low k materials is now prevalent in the international microelectronics industry As the feature size of the Cu lines forming interconnects is scaled resistivity of the lines increases At the same time electromigration and stress induced voids due to increased current density become significant reliability issues Although copper low k technology has become fairly mature there is no single book available on the promise and challenges of these next generation technologies In this book a leader in the field describes advanced laser

systems with lower radiation wavelengths photolithography materials and mathematical modeling approaches to address the challenges of Cu interconnect technology Handbook of VLSI Microlithography William B. Glendinning, John N. Helbert, 1991-01-15 This handbook gives readers a close look at the entire technology of printing very high resolution and high density integrated circuit IC patterns into thin resist process transfer coatings including optical lithography electron beam ion beam and x ray lithography The book s main theme is the special printing process needed to achieve volume high density IC chip production especially in the Dynamic Random Access Memory DRAM industry The book leads off with a comparison of various lithography methods covering the three major patterning parameters of line space resolution line edge and pattern feature dimension control The book s explanation of resist and resist process equipment technology may well be the first practical description of the relationship between the resist process and equipment parameters The basics of resist technology are completely covered including an entire chapter on resist process defectivity and the potential yield limiting effect on device production Each alternative lithographic technique and testing method is considered and evaluated basic metrology including optical scanning electron microscope SEM techniques and electrical test devices along with explanations of actual printing tools and their design construction and performance The editor devotes an entire chapter to today s sophisticated complex electron beam printers and to the emerging x ray printing technology now used in high density CMOS devices Energetic ion particle printing is a controllable steerable technology that does not rely on resist and occupies a final section of the handbook Transmission Electron Microscopic Investigation of Corrosion-induced Grain Boundary Voids Michael Jay Brazil, 2000 Handbook of Ceramics Grinding & Polishing Ioan D. Marinescu, Hans Kurt Tönshoff, Ichiro Inasaki, 2000-01-14 Focusing on the machining of ceramic materials such as silicon nitride carbide and zirconia this handbook provides a clear understanding of modern improvements in ceramic processing The 20 international experts chapter authors describe the properties and characteristics of ceramics the various types of abrasive processes and typical tests used in the procedures including cost reduction methods IBM Journal of Research and Development ,1992 Digital Technical Journal of Digital Equipment Corporation ,1992 **High-Density Magnetic Recording and Integrated Magneto-Optics: Materials and Devices: Volume 517** James Bain, 1998-10-13 Papers from an April 1998 symposium are arranged as was the symposium in two sections the first on materials for high density magnetic recording head materials for write transducers and readback sensors and integrated magneto optics materials and devices The first section comprises contributions in such areas as high moment pole materials anisotropic magnetoresistance giant magnetoresistance and exchange materials spin tunnel junctions microstructural issues in longitudinal recording media thermal stability novel structures and nanotribology of wear layers The second section contains papers on garnet materials for integrated photonics fabrication and processing and devices magneto optic recording media and diluted magnetic semiconductors and other materials Annotation copyrighted by Book News Inc Portland OR

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