

# **Chemical Mechanical Planarization of Microelectronic Materials**

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# Chemical Mechanical Planarization Of Microelectronic Materials

**M.R. Oliver**



## **Chemical Mechanical Planarization Of Microelectronic Materials:**

*Chemical Mechanical Planarization of Microelectronic Materials* Joseph M. Steigerwald, Ronald J. Gutmann, Shyam P. Murarka, 2004

*Chemical Mechanical Planarization Of Microelectronic Materials* J.M. Steigerwald, **Chemical**

**Mechanical Planarization of Microelectronic Materials** Joseph M. Steigerwald, Shyam P. Murarka, Ronald J. Gutmann, 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

**Chemical-Mechanical Planarization of Semiconductor Materials** M.R. Oliver, 2013-03-14 Chemical Mechanical Planarization CMP has emerged in the last two decades and grown rapidly as a basic technology widely used in semiconductor device fabrication As a semiconductor processing step it was developed at IBM in the mid 1980s From this beginning the technology has been widely adopted throughout the semiconductor industry As basic CMP technology has been understood and accepted throughout the semiconductor industry its uses in different parts of the semiconductor process have multiplied This includes special steps for some special process ing flows such as for DRAM technology In addition the availability of CMP technology has enabled the implementation of new technologies with the best example being copper interconnect technology Copper could not be practi cally implemented into semiconductor process flows until the advent of CMP Unfortunately the rapid acceptance and implementation of CMP technol ogy in wafer fabrication has occurred without a corresponding rate of advance in the underlying science Progress is being made in understanding the un derlying CMP mechanisms but in general it is slow and uneven The most noteworthy exception to this trend is the science of metal CMP reactions where the scientific understanding is actually driving much of the advance of the technology There has been no corresponding progress in other CMP areas however Microelectronic Applications of Chemical Mechanical Planarization

Yuzhuo Li, 2007-10-19 An authoritative systematic and comprehensive description of current CMP technology Chemical Mechanical Planarization CMP provides the greatest degree of planarization of any known technique The current standard for integrated circuit IC planarization CMP is playing an increasingly important role in other related applications such as microelectromechanical systems MEMS and computer hard drive manufacturing This reference focuses on the chemical aspects of the technology and includes contributions from the foremost experts on specific applications After a detailed overview of the fundamentals and basic science of CMP Microelectronic Applications of Chemical Mechanical Planarization Provides in depth coverage of a wide range of state of the art technologies and applications Presents information on new designs capabilities and emerging technologies including topics like CMP with nanomaterials and 3D chips Discusses different types of CMP tools pads for IC CMP modeling and the applicability of tribometrology to various aspects of CMP

Covers nanotopography CMP performance and defect profiles CMP waste treatment and the chemistry and colloidal properties of the slurries used in CMP Provides a perspective on the opportunities and challenges of the next fifteen years Complete with case studies this is a valuable hands on resource for professionals including process engineers equipment engineers formulation chemists IC manufacturers and others With systematic organization and questions at the end of each chapter to facilitate learning it is an ideal introduction to CMP and an excellent text for students in advanced graduate courses that cover CMP or related semiconductor manufacturing processes

**Chemical-Mechanical Planarization of Semiconductor Materials** M. R. Oliver, 2014-01-15 **Chemical-mechanical Planarization**, 2002 Advances in Chemical Mechanical Planarization (CMP) Babu Suryadevara, 2021-09-10 Advances in Chemical Mechanical Planarization CMP Second Edition provides the latest information on a mainstream process that is critical for high volume high yield semiconductor manufacturing and even more so as device dimensions continue to shrink The second edition includes the recent advances of CMP and its emerging materials methods and applications including coverage of post CMP cleaning challenges and tribology of CMP This important book offers a systematic review of fundamentals and advances in the area Part one covers CMP of dielectric and metal films with chapters focusing on the use of current and emerging techniques and processes and on CMP of various materials including ultra low k materials and high mobility channel materials and ending with a chapter reviewing the environmental impacts of CMP processes New content addressed includes CMP challenges with tungsten cobalt and ruthenium as interconnect and barrier films consumables for ultralow topography and CMP for memory devices Part two addresses consumables and process control for improved CMP and includes chapters on CMP pads diamond disc pad conditioning the use of FTIR spectroscopy for characterization of surface processes and approaches for defection characterization mitigation and reduction Advances in Chemical Mechanical Planarization CMP Second Edition is an invaluable resource and key reference for materials scientists and engineers in academia and R D Reviews the most relevant techniques and processes for CMP of dielectric and metal films Includes chapters devoted to CMP for current and emerging materials Addresses consumables and process control for improved CMP including post CMP

*Handbook of Semiconductor Manufacturing Technology* Yoshio Nishi, Robert Doering, 2000-08-09 The *Handbook of Semiconductor Manufacturing Technology* describes the individual processes and manufacturing control support and infrastructure technologies of silicon based integrated circuit manufacturing many of which are also applicable for building devices on other semiconductor substrates Discussing ion implantation rapid thermal processing photomask fabrication chip testing and plasma etching the editors explore current and anticipated equipment devices materials and practices of silicon based manufacturing The book includes a foreword by Jack S Kilby cowinner of the Nobel Prize in Physics 2000 for his part in the invention of the integrated circuit

Chemical-Mechanical Planarization: Volume 767 Duane S. Boning, 2003-08-27 Chemical mechanical planarization CMP has emerged as a critical fabrication technology for advanced integrated circuits

Even as the applications of CMP have diversified and we have begun to understand aspects of the physics and chemistry of the process a new generation of CMP innovations is unfolding New slurries and consumables are under development New applications to novel devices continue to appear This book the most recent in a successful series on CMP offers a review of the advances to date and provides a comprehensive discussion of the future challenges that must be overcome Presentations from academia government labs and industry are featured Topics include CMP modeling CMP science CMP slurries and particles for planarization of copper oxide and other materials planarization applications including shallow trench isolation STI copper damascene and novel devices and CMP integration

*Chemical Mechanical Planarization in IC Device Manufacturing III* Robert Leon Opila, 2000 This volume contains the proceedings of the third international symposium on Chemical Mechanical Planarization integrated circuit device manufacturing held at the 196th Meeting of the Electrochemical Society in Honolulu Hawaii October 20-22 1999

Development of a New Generation of Polyurethane Polishing Pad Used in Chemical Mechanical Planarization of Microelectronic Materials Viraj K. Shah, 2002

Chemical-Mechanical Planarization: Volume 867 Materials Research Society. Fall Meeting, 2005-07-19 Technology requirements associated with the progressive scaling of devices for future technology nodes coupled with the aggressive introduction of new materials places tremendous demands on chemical mechanical polishing The goal of this 2005 book which is part of a popular series from MRS is to bring together experts from a broad spectrum of research and technology groups currently working on CMP to review advances made and to offer a comprehensive discussion of future challenges that must be overcome The book shows trends in the development of consumables process modules tool designs process integration modeling defect characterization and metrology Topics include planarization processes and applications consumables CMP pads and slurries CMP equipment and metrology and CMP modeling and simulation

**Colloidal Aspects of Chemical Mechanical Planarization (CMP)** Tanuja Danie Gopal, 2004

*Characterization of the Chemical Mechanical Planarization (CMP) Polishing Pad Using Pyrene Fluorescence* Kori V. Bevans, 1999

**Tribology In Chemical-Mechanical Planarization** Hong Liang, David Craven, 2005-03-01 Illustrating their intersecting role in manufacturing and technological development this book examines tribological principles and their applications in CMP including integrated circuits basic concepts in surfaces of contacts and common defects as well as friction lubrication fundamentals and the basics of wear The book concludes its focus with mechanical aspects of CMP pad materials elastic modulus and cell buckling As the first source to integrate CMP and tribology Tribology in Chemical Mechanical Planarization provides applied scientists and engineers in the fields of semiconductors and microelectronics with clear foresight to the future of this technology

**Integrated Modeling of Chemical Mechanical Planarization/Polishing (CMP) for Integrated Circuit Fabrication** Jianfeng Luo, 2003

*Integrated Modeling of Chemical Mechanical Planarization for Sub-Micron IC Fabrication* Jianfeng Luo, David Dornfeld, 2014-03-12 Chemical mechanical planarization or chemical mechanical polishing as it is simultaneously referred to

has emerged as one of the critical processes in semiconductor manufacturing and in the production of other related products and devices MEMS for example Since its introduction some 15 years ago CMP as it is commonly called has moved steadily into new and challenging areas of semiconductor fabrication Demands on it for consistent efficient and cost effective processing have been steady This has continued in the face of steadily decreasing feature sizes impressive increases in wafer size and a continuing array of new materials used in devices today There are a number of excellent existing references and monographs on CMP in circulation and we defer to them for detailed background information They are cited in the text Our focus here is on the important area of process models which have not kept pace with the tremendous expansion of applications of CMP Preston's equation is a valuable start but represents none of the subtleties of the process Specifically we refer to the development of models with sufficient detail to allow the evaluation and tradeoff of process inputs and parameters to assess impact on quality or quantity of production We call that an integrated model and more specifically we include the important role of the mechanical elements of the process

*Tribo-chemical Mechanisms of Copper Chemical Mechanical Planarization (CMP)* Shantanu Tripathi, 2008

**Chemical-Mechanical Polishing - Fundamentals and Challenges: Volume 566** S. V. Babu, 2000-02-10 The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners

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