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Introduction. Thin-film deposition can be regarded as a phase change from a gas phase to a solid phase on a substrate [1, 2].

Typically, we need to know the growth rate, the purity, and the microstructure of the deposited film.

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most serious and persistent reliability problem in the interconnect structure on a Si chip in microelectronic technology. This is because typically a current density of 10^5 to 10^6 A/cm² is

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thin films becomes an increasing concern. Building on the author's previous book, *Electronic Thin Film Science* by Tu, Mayer and Feldman, and based on a graduate course at UCLA given by the author, this new book focuses on reliability science and the processing of thin films. Early chapters address fundamental topics in thin film processes and reliability, including deposition, surface energy and atomic diffusion, before moving onto systematically explain irreversible processes in interconnect and packaging technologies. Describing electromigration, thermomigration

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and stress migration, with a closing chapter dedicated to failure analysis, the reader will come away with a complete theoretical and practical understanding of electronic thin film reliability. Kept mathematically simple, with real-world examples, this book is ideal for graduate students, researchers and practitioners.

Understanding and limiting electromigration in thin films is essential to the continued development of advanced copper interconnects for integrated circuits. Electromigration in thin films and electronic devices provides an

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up-to-date review of key topics in this commercially important area. Part one consists of three introductory chapters, covering modelling of electromigration phenomena, modelling electromigration using the peridynamics approach and simulation and x-ray microbeam studies of electromigration. Part two deals with electromigration issues in copper interconnects, including x-ray microbeam analysis, voiding, microstructural evolution and electromigration failure. Finally, part three covers electromigration in solder, with chapters discussing topics such as electromigration-induced

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microstructural evolution and electromigration in flip-chip solder joints. With its distinguished editor and international team of contributors, Electromigration in thin films and electronic devices is an essential reference for materials scientists and engineers in the microelectronics, packaging and interconnects industries, as well as all those with an academic research interest in the field. Provides up-to-date coverage of the continued development of advanced copper interconnects for integrated circuits Comprehensively reviews modelling of electromigration

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phenomena, modelling electromigration using the peridynamics approach and simulation, and x-ray microbeam studies of electromigration Deals with electromigration issues in copper interconnects, including x-ray microbeam analysis, voiding, microstructural evolution and electromigration failure

This is the first book that can be considered a textbook on thin film science, complete with exercises at the end of each chapter. Ohring has contributed many highly regarded reference books to the AP list, including Reliability and Failure of Electronic

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Materials and the Engineering Science of Thin Films. The knowledge base is intended for science and engineering students in advanced undergraduate or first-year graduate level courses on thin films and scientists and engineers who are entering or require an overview of the field. Since 1992, when the book was first published, the field of thin films has expanded tremendously, especially with regard to technological applications. The second edition will bring the book up-to-date with regard to these advances. Most chapters have been greatly updated, and several new chapters have been added.

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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

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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

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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

King-Ning Tu was born on 30 December 1937 in Canton, China is a professor in the Department of Materials Science and Engineering and the Department of Electrical Engineering at UCLA. King has over 500

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journal publications with citations over 24,000 and an h-factor of 88 (web-Google). He received the TMS John Bardeen Award in 2013. He has co-authored the textbook Electronic Thin Film Science and authored the books Solder Joint Technology: Materials, Properties, and Reliability, and Electronic Thin-Film Reliability. His research is centered on metal-silicon reactions, solder joint reactions, point-contact reactions in nanowires, polarity effect of electromigration on interfacial reactions, and kinetic theories of interfacial reactions. King Tu was an honor as American

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Physical Society -Fellow, 1981, The Metallurgical Society-Fellow, 1988, Materials Research Society -President, 1981, Fellow 2014, Churchill College -Overseas Fellow, 1990. He received The Metallurgical Society -Application to Practice Award, 1981, Acta/Scripta Metallurgical Lecturer, 1990 -1992, Humboldt Research Award for Senior US scientists, 1996, Member of Academia Sinica, ROC, 2002, TMS-EMPM Division Distinguished Scientist/Engineer Award in 2006, TMS John Bardeen Award in 2011, and IEEE Division of Components, Packaging, and Manufacturing Technology Award in 2017. King Tu has been

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awarded numerous fellowships and letter of appreciation for his tremendous works and research in different fields. ?American Physical Society -Fellow, 1981?The Metallurgical Society -Fellow, 1988?Churchill College -Overseas Fellow, 1990?Materials Research Society -President, 1981?The Metallurgical Society -Application to Practice Award, 1988?Alpha Sigma Mu Lecturer of American Society for Metals, 1986?Acta/Scripta Metallurgica Lecturer, 1990 -1992?Humboldt Research Award for Senior US scientists, 1996?Honorary Member of The Korean Institute of Metals and Materials,

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1996?Certificate of Appreciation from SEMATECH for flip-chip study, 1998?Member of Academia Sinica, ROC, 2002King-Ning Tu has published almost 56 articles, research papers on Diffusion and Reactions in Solder Alloys, and around 100 research papers on Silicide Formation. He also has 39 research paper on Electrical Properties and Schottky Barrier of Silicides, 38 papers on Diffusion and Reactions in Metallic Thin Films, and 31 papers on Diffusion and Reactions in Si, SiO₂, and Low k Materials. Including these, King has published two books over the title, K. N. Tu, "Electronic Thin-Film Reliability",

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Cambridge University Press, (2011) and K. N. Tu, J. W. Mayer, and L. C. Feldman, "Electronic Thin Film Science -for Electrical Engineers and Materials Scientists", Macmillan, NY (1992).

This book takes a holistic approach to reliability engineering for electrical and electronic systems by looking at the failure mechanisms, testing methods, failure analysis, characterisation techniques and prediction models that can be used to increase reliability for a range of devices. The text describes the reliability behavior

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of electrical and electronic systems. It takes an empirical scientific approach to reliability engineering to facilitate a greater understanding of operating conditions, failure mechanisms and the need for testing for a more realistic characterisation. After introducing the fundamentals and background to reliability theory, the text moves on to describe the methods of reliability analysis and characterisation across a wide range of applications. Takes a holistic approach to reliability engineering Looks at the failure mechanisms, testing methods, failure

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analysis, characterisation techniques and prediction models that can be used to increase reliability Facilitates a greater understanding of operating conditions, failure mechanisms and the need for testing for a more realistic characterisation

The goal of producing devices that are smaller, faster, more functional, reproducible, reliable and economical has given thin film processing a unique role in technology. Principles of Vapor Deposition of Thin Films brings in to one place a diverse amount of scientific background that is

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considered essential to become knowledgeable in thin film deposition techniques. Its ultimate goal as a reference is to provide the foundation upon which thin film science and technological innovation are possible. * Offers detailed derivation of important formulae. * Thoroughly covers the basic principles of materials science that are important to any thin film preparation. * Careful attention to terminologies, concepts and definitions, as well as abundance of illustrations offer clear support for the text.

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The papers included in this issue of ECS Transactions were originally presented in the symposium ;Novel Plasma Techniques for Low Temperature Processing of Thin Films for Flexible Electronics;, held during the 215th meeting of The Electrochemical Society, in San Francisco, California from May 24 to 29, 2009.

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