

Electroless Plating Fundamentals And Applications

Now in its third edition, Fundamentals of Microfabrication and Nanotechnology continues to provide the most complete MEMS coverage available. Thoroughly revised and updated the new edition of this perennial bestseller has been expanded to three volumes, reflecting the substantial growth of this field. It includes a wealth of theoretical and practical information on nanotechnology and NEMS and offers background and comprehensive information on materials, processes, and manufacturing options. The first volume offers a rigorous theoretical treatment of micro- and nanosciences, and includes sections on solid-state physics, quantum mechanics, crystallography, and fluidics. The second volume presents a very large set of manufacturing techniques for micro- and nanofabrication and covers different forms of lithography, material removal processes, and additive technologies. The third volume focuses on manufacturing techniques and applications of Bio-MEMS and Bio-NEMS. Illustrated in color throughout, this seminal work is a cogent instructional text, providing classroom and self-learners with worked-out examples and end-of-chapter problems. The author characterizes and defines major research areas and illustrates them with examples pulled from the most recent literature and from his own work.

Amorphous and Nano Alloys Electroless Depositions: Technology, Theory, Structure and Property describes the whole development and the most important subjects (technology, theory, structure and property) up to date of electroless plating (EP). The author concentrates on the fundamental scientific and academic problems (principle, mechanism and theory) in EP today. Based on the history of EP, this valuable reference describes lots of new EP processes, including electroless Fe based alloy system deposits, formation and theoretical description of electroless alloys, microscopic theory of electroless plating deposits, microscopic structures and surface morphology of electroless deposits, and weldability property of electroless deposits. Focus on the fundamental scientific and academic problems (principles, mechanisms and theory) in electroless plating The book gives a very good overview of the research and development in this field and each chapter is fully referenced Detailed analysis and review of the current data, logically structured for ease of use

This new volume explores the exciting and diverse applications of three-dimensional printing in a variety of industries, including food processing, environmental sciences, biotechnology, medical devices, energy storage, civil engineering, the textile and fashion industry, and more. It describes the various 3D printing methods, the commonly used materials, and the pros and cons. It also presents an overview of the historical development and modern-day trends in additive manufacturing, as well as an exploration of the prospects of 3D printing technology in promoting academic education.

The surface of textiles offers an important platform for functional modifications in order to meet special requirements for a variety of applications. The surface modification of textiles may be achieved by various techniques ranging from traditional solution treatment to biological approaches. This book reviews fundamental issues relating to textile surfaces and their characterisation and explores the exciting opportunities for surface modification of a range of different textiles. Introductory chapters review some

important surface modification techniques employed for improved functional behaviour of textiles and the various surface characterisation methods available. Further chapters examine the different types of surface modification suitable for textiles, ranging from the use of plasma treatments and physical vapour deposition to the use of nanoparticles. Concluding chapters discuss surface modification strategies for various applications of textiles. Surface modification of textiles is a valuable resource for chemists, surface scientists, textile technologists, fibre scientists, textile engineers and textile students. Reviews fundamental issues relating to textiles surfaces and their characterisation Examines various types of surface modification suitable for textiles, including plasma treatments and nanoparticles Discusses surface modification strategies for textile applications such as expansion into technical textile applications

In recent decades, there have been extensive developments in science and technology. These advances provide new techniques to deposit coatings onto various substrates, thus, addressing the ever-increasing performance requirements of various applications. Moreover, as technology itself develops, there are new problems that require new solutions, some of which can be solved through the application of coatings. Thus, the demands from coatings are continually increasing and the field is growing. The collection of articles contained within this volume cover a wide range of different research approaches to coatings reflecting the expanding field of coatings. It covers examples from topics such as a cold spray of magnesium alloys onto steel substrates, mechanical coatings of Ti-based materials onto steel balls, electroless plating of Ni-P coating onto an Mg-based alloy, magnetron sputtering of Ru-Zr coatings onto a Si wafer, a review of ionic liquids that form surface layers, as corrosion inhibitors, nano-composite epoxy coatings containing exfoliated clay (montmorillonite) for steel protection, a coating based on plasma electrolytic oxidation of an aluminum alloy and inhibited epoxy primer for aerospace aluminum alloys. This volume provides a wide-angle snapshot of current coating technologies through the presentation of some specific studies.

Tribology is a multidisciplinary science that encompasses mechanical engineering, materials science, surface engineering, lubricants, and additives chemistry with tremendous applications. Tribology and Surface Engineering for Industrial Applications discusses the latest in tribology and surface engineering for industrial applications. This book: Offers information on coatings and surface diagnostics Explains a variety of techniques for improved performance Describes applications in automotive, wheel and rail materials, manufacturing, and wind turbines Written for researchers and advanced students, this book encompasses a wide-ranging view of the latest in industrial applications of tribology and surface engineering for a variety of cross-disciplinary applications.

Electroless Plating Fundamentals and Applications William Andrew Electroless Plating Fundamentals and Applications Electroless Nickel Plating: Fundamentals to Applications CRC Press

This volume documents the proceedings of the 7th Symposium on Metallized Plastics: Fundamental and Applied Aspects, held in Newark, New Jersey, December 2-3, 1999. This volume contains a total of 16 papers, which were all rigorously peer reviewed and suitably revised before inclusion. The book is divided into two parts: Metallization Techniques and Properties of Metal Deposits,

and Interfacial and Adhesion Aspects. The topics covered include: various metallization techniques for a variety of plastics including some novel developments involving suitable plastic pretreatments; modification of polymers by plasma and ion-assisted reactions; metal doped plasma polymer films; metal-polyimide nanocomposite films; investigation of metal/polymer interactions by a variety of techniques; ways to improve adhesion of metal/polymer systems; modeling of metal/polymer interfaces; application of surface analytical techniques in the arena of metallized plastics; and ultrathin films on metal surfaces. This volume offers a wealth of information and represents current commentary on the R&D activity taking place in the technologically highly important field of metallized plastics and is of value and interest to anyone interested in the fundamental or applied aspects of metallized plastics. As the demands put on the polymer/metal interface, particularly by the microelectronics industry, become more and more severe, the necessity for understanding this interface, its properties and its limitations, becomes more and more essential. This requires a broad knowledge of, and a familiarity with, the latest findings in this rapidly advancing field. At the very least, such familiarity requires an exchange of information, particularly among those intimately involved in this field. Communications among many of us in this area have made one fact quite obvious: the facilities provided by existing organizations, scientific and otherwise, do not offer the forum necessary to accomplish this exchange of information. It was for this reason that Jean-Jacques Pireaux, Steven Kowalczyk and I organized the first Metallization of Polymers, a symposium sponsored by the American Chemical Society, which took place in Montreal, September 25-28, 1989; the Proceedings from that symposium were published as ACS Symposium Series 440, (1990). It is this same perceived lack of a proper forum, and the encouragement of my colleagues, that prompted me to organize this meeting, so as to bring to the attention of the participants new instruments, materials, methods, advances, and, particularly, thoughts in the field of polymer metallization. The meeting was designed as a workshop, with time being made available throughout for discussion and for the consideration of new findings.

Designed for science and engineering students, this text focuses on emerging trends in processes for fabricating MEMS and NEMS devices. The book reviews different forms of lithography, subtractive material removal processes, and additive technologies. Both top-down and bottom-up fabrication processes are exhaustively covered and the merits of the d Palladium (Pd)-based membranes have received a great deal of attention from both academia and industry thanks to their ability to selectively separate hydrogen from gas streams. The integration of such membranes with appropriate catalysts in membrane reactors allows for hydrogen production with CO₂ capture that can be applied in smaller bioenergy or combined heat and power (CHP) plants, as well as in large-scale power plants. Pd-based membranes are therefore regarded as a Key Enabling Technology (KET) to facilitate the transition towards a knowledge-based, low-carbon, and resource-efficient economy. This Special Issue of the journal Membranes on "Pd-based Membranes: Overview and Perspectives" contains nine peer-reviewed articles. Topics include manufacturing techniques, understanding of material phenomena, module and reactor design, novel applications, and demonstration efforts and industrial exploitation.

This volume documents the proceedings of the Second International Symposium on Polyimides and Other High Temperature

Polymers: Synthesis, Characterization and Applications, held in Newark, New Jersey, December 3-6, 2001. Polyimides possess many desirable attributes, so this class of materials has found applications in many technologies ranging from Electroless Nickel Plating: Fundamentals to Applications provides a complete and actualized view of electroless nickel plating, thus greatly improving the accessibility of knowledge on the subject. It touches upon all aspects of electroless nickel, from the fundamentals (including thermodynamics of electroless plating, bath chemistry, and substrate preparation) to more applied areas of the field such as bath replenishment, composite coatings, post-treatments, polyalloys, graded and multilayer coatings, ultrasound assistance, applications, and properties. Contributed to by a variety of international authors to ensure different points of view and interests are addressed, this book stands as the first complete and updated state-of-the-art text on electroless nickel in the twenty-first century. It also serves as the first technical book with a strong emphasis on nickel-boron. It also focuses on environmental aspects. Including cutting-edge content presented sufficiently extensive to be directly useful to the practitioner, this book is aimed at materials scientists, metallurgists, and other professionals working with electroless nickel plating.

MEMS technology and applications have grown at a tremendous pace, while structural dimensions have grown smaller and smaller, reaching down even to the molecular level. With this movement have come new types of applications and rapid advances in the technologies and techniques needed to fabricate the increasingly miniature devices that are literally changing our world. A bestseller in its first edition, Fundamentals of Microfabrication, Second Edition reflects the many developments in methods, materials, and applications that have emerged recently. Renowned author Marc Madou has added exercise sets to each chapter, thus answering the need for a textbook in this field. Fundamentals of Microfabrication, Second Edition offers unique, in-depth coverage of the science of miniaturization, its methods, and materials. From the fundamentals of lithography through bonding and packaging to quantum structures and molecular engineering, it provides the background, tools, and directions you need to confidently choose fabrication methods and materials for a particular miniaturization problem. New in the Second Edition Revised chapters that reflect the many recent advances in the field Updated and enhanced discussions of topics including DNA arrays, microfluidics, micromolding techniques, and nanotechnology In-depth coverage of bio-MEMs, RF-MEMs, high-temperature, and optical MEMs. Many more links to the Web Problem sets in each chapter

The definitive resource for electroplating, now completely up to date With advances in information-age technologies, the field of electroplating has seen dramatic growth in the decade since the previous edition of Modern Electroplating was published. This expanded new edition addresses these developments, providing a comprehensive, one-stop reference to the latest methods and applications of electroplating of metals, alloys, semiconductors, and conductive polymers. With special emphasis on electroplating and electrochemical plating in nanotechnologies, data storage, and medical applications, the Fifth Edition boasts vast amounts of new and revised material, unmatched in breadth and depth by any other book on the subject. It includes: Easily accessible, self-contained contributions by over thirty experts Five completely new chapters and hundreds of additional pages A cutting-edge look at applications in nanoelectronics Coverage of the formation of nanoclusters and quantum dots using scanning tunneling

microscopy (STM) An important discussion of the physical properties of metal thin films Chapters devoted to methods, tools, control, and environmental issues And much more A must-have for anyone in electroplating, including technicians, platers, plating researchers, and metal finishers, Modern Electroplating, Fifth Edition is also an excellent reference for electrical engineers and researchers in the automotive, data storage, and medical industries.

In Advanced ULSI interconnects – fundamentals and applications we bring a comprehensive description of copper-based interconnect technology for ultra-large scale integration (ULSI) technology for integrated circuit (IC) application. Integrated circuit technology is the base for all modern electronics systems. You can find electronics systems today everywhere: from toys and home appliances to airplanes 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 systems create a strong demand for new and improved electronic circuits as demonstrated by the amazing progress in the field 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 exponentially as a function of time. For example, the number of components per chip doubles 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 circuit technology 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.

This book is mostly based on papers presented at the Fourth International Symposium on this topic held in Savannah, Georgia. However, in addition to these papers, certain very relevant papers have also been included to broaden the scope and thus enhance the value of this book. Currently there is tremendous interest in these materials because of their unique properties and applications in diverse technological areas ranging from microelectronics to aerospace to adhesive bonding. This book is divided into three parts: Part 1: Synthesis and Bulk Characterization; Part 2: Surface and Interface Aspects (Composites and Metallization); and Part 3: Applications. The topics covered include: synthesis of a number of polyimides with tailored properties; nanocomposites for high-performance applications; molecular assembly of polyimides; polyimide L-B films; metallization of polyimides; applications of high temperature polymers as proton exchange membranes; dielectrics, and in textile.

This book begins with a thorough background of the subject. Next, the authors discuss the significance of electrometallurgy within the broader spectrum of science and technology. They then expand the previously laid theoretical base and explain mechanisms of metal deposition and applications for all existing related technologies. The book will be of interest to undergraduate and graduate students involved with electrochemistry of metals, materials

science, plating technologies, electronics materials and other fields. Scientists and engineers working in a variety of industries in addition to electrometallurgical process plants will find it an invaluable reference as it provides a thorough background of electrometallurgy, then explores the more advanced mechanisms of metal deposition in a logical manner. The first book to paint a complete picture of the challenges of processing functional nanomaterials for printed electronics devices, and additive manufacturing fabrication processes. Following an introduction to printed electronics, the book focuses on various functional nanomaterials available, including conducting, semi-conducting, dielectric, polymeric, ceramic and tailored nanomaterials. Subsequent sections cover the preparation and characterization of such materials along with their formulation and preparation as inkjet inks, as well as a selection of applications. These include printed interconnects, passive and active modules, as well as such high-tech devices as solar cells, transparent electrodes, displays, touch screens, sensors, RFID tags and 3D objects. The book concludes with a look at the future for printed nanomaterials. For all those working in the field of printed electronics, from entrants to specialized researchers, in a number of disciplines ranging from chemistry and materials science to engineering and manufacturing, in both academia and industry.

Thanks to their outstanding hydrogen selectivity, palladium membranes have attracted extensive R&D interest. They are a potential breakthrough technology for hydrogen production and also have promising applications in the areas of thermochemical biorefining. This book summarises key research in palladium membrane technologies, with particular focus on the scale-up challenges. After an introductory chapter, Part one reviews the fabrication of palladium membranes. Part two then focuses on palladium membrane module and reactor design. The final part of the book reviews the operation of palladium membranes for synthesis gas/hydrogen production, carbon capture and other applications. Review of manufacture and design issues for palladium membranes Discussion of the applications of palladium membrane technology, including solar steam reforming, IGCC plants, NGCC plants, CHP plants and hydrogen production Examples of the technology in operation

Nanodroplets, the basis of complex and advanced nanostructures such as quantum rings, quantum dots and quantum dot clusters for future electronic and optoelectronic materials and devices, have attracted the interdisciplinary interest of chemists, physicists and engineers. This book combines experimental and theoretical analyses of nanosized droplets which reveal many attractive properties. Coverage includes nanodroplet synthesis, structure, unique behaviors and their nanofabrication, including chapters on focused ion beam, atomic force microscopy, molecular beam epitaxy and the "vapor-liquid- solid" route. Particular emphasis is given to the behavior of metallic nanodroplets, water nanodroplets and nanodroplets in polymer and metamaterial nanocomposites. The contributions of leading scientists and their research

groups will provide readers with deeper insight into the chemical and physical mechanisms, properties, and potential applications of various nanodroplets.

As the first book to compile the fundamentals, applications, reference information and analytical tools on the topic, Hydrometallurgy presents a condensed collection of information that can be used to improve the efficiency and effectiveness with which metals are extracted, recovered, manufactured, and utilized in aqueous media in technically viable and reliable, environmentally responsible, and economically feasible ways. Suitable for students and researchers, this college-level overview addresses Fundamentals of Chemical Metallurgy in Aqueous Media, Speciation and Phase Diagrams, Rate Processes in Aqueous Metal Processing, Aqueous Metal Extraction and Leaching, Fundamentals of Metal Concentration Processes and more.

Several developed countries are facing serious problems in medical environments owing to the aging society, and extension of healthy lifetime has become a big challenge. Biomedical engineering, in addition to life sciences and medicine, can help tackle these problems. Innovative technologies concerning minimally invasive treatment, prognosis and early diagnosis, point-of-care testing, regenerative medicine, and personalized medicine need to be developed to realize a healthy aging society. This book presents cutting-edge research in biomedical engineering from materials, devices, imaging, and information perspectives. The contributors are senior members of the Research Center for Biomedical Engineering, supported by the Ministry of Education, Culture, Sports, Science and Technology, Japan. All chapters are results of collaborative research in engineering and life sciences and cover nanotechnology, materials, optical sensing technology, imaging technology, image processing technology, and biomechanics, all of which are important areas in biomedical engineering. The book will be a useful resource for researchers, students, and readers who are interested in biomedical engineering.

Like its predecessors, volume three of this meanwhile well-established series covers selected topics from electrochemical science and its applications. The authors have been carefully selected among the leaders in the respective fields. Their authoritative and comprehensive contributions represent the latest state-of-the-art. Special attention is paid to recent developments, which are critically and thoroughly discussed. Each contribution of the present volume continues the high standards of this series. This new series has been warmly welcomed by scientists world-wide, which is reflected by the following review of the second volume: 'All the contributions in this volume are well up to the standard of this excellent series and will be of great value to electrochemists... The editors again deserve to be congratulated on this fine collection of reviews.' *Journal of Electroanalytical Chemistry and Interfacial Chemistry*

Surface engineering includes many facets of materials science that help regulate the function, quality, and safety of products such

as automotive, textile, and electronic materials. New technologies are developing to help enhance the surface performance. *Surface Engineering Techniques and Applications: Research Advancements* provides recent developments in surface engineering techniques and applications. It details scientific and technological results while also giving insight to current research, economic impact, and environmental concerns so that academics, practitioners, and professionals in the field, as well as students studying these areas, can deepen their understanding of new surface processes.

Gold is used in a wide range of industrial and medical applications and accounts for over 10 percent of the annual demand for metal, worth billions of dollars annually. While much has been written about the mystique and trade of gold, very little has been written about the science and technology in which it is involved. Edited by two respected authorities from the World Gold Council, *Gold: Science and Applications* provides researchers with the definitive handbook on the current science and applications of this valuable and beautiful precious metal. Packed with contributions from the world's leading experts, this volume brings in authoritative information from a number of sciences, including chemistry, physics, nanotechnology and metallurgy. The book presents a myriad of applications, ranging from electronics to medicine and optics. A comprehensive overview chapter provides historical perspectives of the element and each chapter describes potential further uses, including applications currently being developed. *Gold Applications in Use Today Include: Medical Dental Electronics Engineering Industrial Pollution Control Photography Catalysts Nanotechnology*

The first of many important works featured in CRC Press' *Metals and Alloys Encyclopedia Collection*, the *Encyclopedia of Iron, Steel, and Their Alloys* covers all the fundamental, theoretical, and application-related aspects of the metallurgical science, engineering, and technology of iron, steel, and their alloys. This Five-Volume Set addresses topics such as extractive metallurgy, powder metallurgy and processing, physical metallurgy, production engineering, corrosion engineering, thermal processing, metalworking, welding, iron- and steelmaking, heat treating, rolling, casting, hot and cold forming, surface finishing and coating, crystallography, metallography, computational metallurgy, metal-matrix composites, intermetallics, nano- and micro-structured metals and alloys, nano- and micro-alloying effects, special steels, and mining. A valuable reference for materials scientists and engineers, chemists, manufacturers, miners, researchers, and students, this must-have encyclopedia: Provides extensive coverage of properties and recommended practices Includes a wealth of helpful charts, nomograms, and figures Contains cross referencing for quick and easy search Each entry is written by a subject-matter expert and reviewed by an international panel of renowned researchers from academia, government, and industry. Also Available Online This Taylor & Francis encyclopedia is also available through online subscription, offering a variety of extra benefits for researchers, students, and librarians, including: Citation tracking and alerts Active reference linking Saved searches and marked lists HTML and PDF format options Contact Taylor and Francis for more information or to inquire about subscription options and print/online combination packages. US: (Tel) 1.888.318.2367; (E-mail) e-reference@taylorandfrancis.com International: (Tel) +44 (0) 20 7017 6062; (E-mail) online.sales@tandf.co.uk

This book includes papers on recent research carried out in the field of metal-matrix composites (MMCs). Processing, microstructure, and mechanical properties of MMCs and unreinforced matrix alloys will be covered with a focus on aluminum, titanium, nickel, and copper MMCs. Those involved in the research of MMCs and unreinforced alloys, particularly in aerospace, space, and automotive materials research, will find this volume indispensable.

"MEMS Materials and Processes Handbook" is a comprehensive reference for researchers searching for new materials, properties of known materials, or specific processes available for MEMS fabrication. The content is separated into distinct sections on "Materials" and "Processes". The extensive "Material Selection Guide" and a "Material Database" guides the reader through the selection of appropriate materials for the required task at hand. The "Processes" section of the book is organized as a catalog of various microfabrication processes, each with a brief introduction to the technology, as well as examples of common uses in MEMS.

The revised edition presents, extends, and updates a thorough analysis of the factors that cause and accelerate the aging of conductive and insulating materials of which transmission and distribution electrical apparatus is made. New sections in the second edition summarize the issues of the aging, reliability, and safety of electrical apparatus, as well as supporting equipment in the field of generating renewable energy (solar, wind, tide, and wave power). When exposed to atmospheric corrosive gases and fluids, contaminants, high and low temperatures, vibrations, and other internal and external impacts, these systems deteriorate; eventually the ability of the apparatus to function properly is destroyed. In the modern world of "green energy", the equipment providing clean, electrical energy needs to be properly maintained in order to prevent premature failure. The book's purpose is to help find the proper ways to slow down the aging of electrical apparatus, improve its performance, and extend the life of power generation, transmission, and distribution equipment.

The global biosensors industry is approaching towards multi-billion market. The modern biosensors market growth is driven by the continuous technological advancements in the biosensors ecosystem, increase in the use of biosensors for nonmedical applications, lucrative growth in point-of-care diagnostics, and rise in the demand for glucose monitoring systems. Increasing applications in diagnosis of various diseases and development of nanoparticle based electrochemical biosensors significantly stimulates growth of biosensors industry. The second volume of "Advances in Biosensors: Reviews", Book Series contains six chapters written by 24 authors from 7 countries: Brazil, China, Denmark, Japan, South Africa, Sweden and Ukraine.

The papers included in this issue of ECS Transactions were originally presented in the symposium "Nanomaterials for Energy Conversion and Storage", held during the 212th meeting of The Electrochemical Society, in Washington, DC, from October 7 to 12, 2007.

The phenomenon of superconductivity in materials offers great opportunities for fundamental and applied sciences. Application of superconducting material in measuring devices, medical diagnostics, in space and energy industries and transport, is only a short list of possible use of the phenomenon of superconductivity in everyday human activity. The special collection "Superconductors

and Superconductivity” consists of papers published by Trans Tech Publications Inc. from 2010 up to 2015 and covers a wide range of advanced achievements in the field of applied research and applied application of superconductors in different branches of engineering. Compiled scientific papers are presented in two chapters: Chapter 1: Superconductors: Properties and Production Technologies Chapter 2: Practice of Using Superconductors and Superconductivity

The papers included in this issue of ECS Transactions were originally presented in the symposium ¿Fundamentals of Energy Storage and Conversion¿, held during the 213th meeting of The Electrochemical Society, in Phoenix, Arizona from May 18 to 23, 2008.

Various metallic or non-metallic surfaces are frequently treated by electrochemical methods (e.g. electrodeposition, electroless deposition, anodization, passivation, etc.) in order to achieve a desirable property important for biomedical applications. Applications include orthopedic or dental implants, dressings for wound healing and different skin diseases, surfaces for the prevention of bio-film formation of corrosion inhibition in biological media. The aim of this issue of Modern Aspects of Electrochemistry is to review the latest developments of the surface treatments for biomedical applications in relation to electrochemical science and technology. This new volume of Modern Aspect of Electrochemistry brings to the scientists, engineers and students summarized results and new concepts of surface treatments for the biomedical applications which may have significant influence for the future practical applications.

This book provides an overview of the fabrication methods for anti-abrasive nanocoatings. The connections among fabrication parameters, the characteristics of nanocoatings and the resulting properties (i.e. nanohardness, toughness, wear rate, load-bearing ability, friction coefficient, and scratch resistance) are discussed. Size-affected mechanical properties of nanocoatings are examined, including their uses. Anti-abrasive nanocoatings, including metallic-, ceramic-, and polymeric-based layers, as well as different kinds of nanostructures, such as multi-layered nanocomposites and thin films, are reviewed. Provides a comprehensive overview of the fabrication methods for anti-abrasive nanocoatings Discusses the connections among fabrication parameters, the characteristics of nanocoatings and the resulting properties Reviews advantages and drawbacks of fabrication methods for anti-abrasive nanocoatings and clarifies the place of these nanocoatings in the world of nanotechnology

Unlike electroplating, electroless plating allows uniform deposits of coating materials over all surfaces, regardless of size, shape and electrical conductivity. Electroless copper and nickel-phosphorus deposits provide protective and functional coatings in industries as diverse as electronics, automotive, aerospace and chemical engineering. This book discusses the latest research in electroless depositions. After an introductory chapter, part one focuses on electroless copper depositions reviewing such areas as surface morphology and residual stress, modelling surface structure, adhesion strength of electroless copper deposit, electrical resistivity and applications of electroless copper deposits. Part two goes on to look at electroless nickel-phosphorus depositions with chapters on the crystallisation of nickel-phosphorus deposits, modelling the thermodynamics and kinetics of crystallisation of nickel-phosphorus deposits, artificial neural network (ANN) modelling of crystallisation temperatures, hardness evolution of nickel-

phosphorus deposits and applications of electroless nickel-phosphorus plating. Written by leading experts in the field Electroless copper and nickel-phosphorus plating: Processing, characterisation and modelling is an invaluable guide for researchers studying electroless deposits or materials science as well as for those working in the chemical, oil and gas, automotive, electronics and aerospace industries. Written by leading experts in the field, this important book reviews the deposition process and the key properties of electroless copper and nickel-phosphorus deposits as well as their practical applications Chapters review areas such as surface morphology and residual stress, modelling surface structure, crystallisation of nickel-phosphorus deposits and hardness evolution An invaluable guide for researchers studying electroless deposits or materials science as well as for those working in the chemical, oil and gas, automotive, electronics and aerospace industries

This handbook is a comprehensive guide to the selection and applications of copper and copper alloys, which constitute one of the largest and most diverse families of engineering materials. The handbook includes all of the essential information contained in the ASM Handbook series, as well as important reference information and data from a wide variety of ASM publications and industry sources.

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