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Nanotribology and NanomechanicsNanotribology and Nanomechanics IFundamentals of nanoindentation and nanotribology IVFundamentals of Nanoindentation and NanotribologyMechanical Properties and Structure of Alpha-keratin FibresModern Tribology Handbook, Two Volume SetEncyclopedia of NanotechnologyAdvanced Structural CeramicsAn Assessment of the National Institute of Standards and Technology Center for Nanoscale Science and TechnologyAtomistic Modeling of Materials FailurePrinciples and Applications of TribologyTribology of Diamond-like Carbon FilmsFundamentals of Nanoindentation and Nanotribology IIISpringer Handbook of NanotechnologyTribology and Mechanics of Magnetic Storage Devices15th Wear of MaterialsNew Directions in TribologyMaterials and Surface Engineering in TribologyAtomic Force MicroscopyNano Mechanics and MaterialsDissertation Abstracts InternationalScanning Probe Microscopy¿in Industrial ApplicationsNoncontact Atomic Force MicroscopyTribology for EngineersHandbook of Micro/Nano TribologyScanning Probe Microscopy of PolymersMicro/Nanotribology and Its ApplicationsBiophysics of Human HairNanotribology and Nanomechanics IIJournal of TribologyApplied Scanning Probe Methods VIIDynamics of Microelectromechanical SystemsApplied Scanning Probe Methods IFundamentals of

Tribology and Bridging the Gap Between the Macro- and Micro/NanoscalesTribology of Diamond-like Carbon FilmsFundamentals of Nanoindentation and Nanotribology IIIntroduction to TribologyNano-tribology and Materials in MEMSNanoindentation of Brittle SolidsTribology on the Small Scale

Nanotribology and Nanomechanics

Nanotechnology is a progressive research and development topic with large amounts of venture capital and government funding being invested worldwide. Nano mechanics, in particular, is the study and characterization of the mechanical behaviour of individual atoms, systems and structures in response to various types of forces and loading conditions. This text, written by respected researchers in the field, informs researchers and practitioners about the fundamental concepts in nano mechanics and materials, focusing on their modelling via multiple scale methods and techniques. The book systematically covers the theory behind multi-particle and nanoscale systems, introduces multiple scale methods, and finally looks at contemporary applications in nano-structured and bio-inspired materials.

Nanotribology and Nanomechanics I

This is an introduction to molecular and atomistic modeling techniques applied to

fracture and deformation of solids, focusing on a variety of brittle, ductile, geometrically confined and biological materials. The overview includes computational methods and techniques operating at the atomic scale, and describes how these techniques can be used to model cracks and other deformation mechanisms. The book aims to make new molecular modeling techniques available to a wider community.

Fundamentals of nanoindentation and nanotribology IV

This fully updated Second Edition provides the reader with the solid understanding of tribology which is essential to engineers involved in the design of, and ensuring the reliability of, machine parts and systems. It moves from basic theory to practice, examining tribology from the integrated viewpoint of mechanical engineering, mechanics, and materials science. It offers detailed coverage of the mechanisms of material wear, friction, and all of the major lubrication techniques - liquids, solids, and gases - and examines a wide range of both traditional and state-of-the-art applications. For this edition, the author has included updates on friction, wear and lubrication, as well as completely revised material including the latest breakthroughs in tribology at the nano- and micro- level and a revised introduction to nanotechnology. Also included is a new chapter on the emerging field of green tribology and biomimetics.

Fundamentals of Nanoindentation and Nanotribology

The comprehensive reference and textbook serves as a timely, practical introduction to the principles of nanotribology and nanomechanics. Assuming some familiarity with macroscopic tribology, the book comprises chapters by internationally recognized experts, who integrate knowledge of the field from the mechanics and materials-science perspectives. They cover key measurement techniques, their applications, and theoretical modelling of interfaces, each beginning their contributions with macro- and progressing to microconcepts.

Mechanical Properties and Structure of Alpha-keratin Fibres

Since January 1990, when the first edition ofthis first-of-a-kind book appeared, there has been much experimental and theoretical progress in the multi disciplinary subject of tribology and mechanics of magnetic storage devices. The subject has matured into a rigorous discipline, and many university tribology and mechanics courses now routinely contain material on magnetic storage devices. The major growth in the subject has been on the micro- and nanoscale aspects of tribology and mechanics. Today, most large magnetic storage industries use atomic force microscopes to image the magnetic storage components. Many companies use variations of AFMs such as friction force microscopes (FFMs) for

frictional studies. These instruments have also been used for studying scratch, wear, and indentation. These studies are valuable in the fundamental understanding of interfacial phenomena. In the second edition, I have added a new chapter, Chapter 11, on micro and nanoscale aspects of tribology and mechanics of magnetic storage compo nents. This chapter presents the state of the art of the micro/nanotribology and micro/nanomechanics of magnetic storage components. In addition, typographical errors in Chapters 1 to 10 and the appendixes have been corrected. These additions update this book and make it more valuable to researchers of the subject. I am grateful to many colleagues and particularly to my students, whose work is reported in Chapter 11. I thank my wife, Sudha, who has been forbearing during the progress of the research reported in this chapter.

Modern Tribology Handbook, Two Volume Set

Examining the physical and technical foundation for recent progress with this technique, Applied Scanning Probe Methods offers a timely and comprehensive overview of SPM applications, now that industrial applications span topographic and dynamical surface studies of thin-film semiconductors, polymers, paper, ceramics, and magnetic and biological materials. First it lays the theoretical background of static and dynamic force microscopies, including sensor technology and tip characterization, contributions detail applications such as macro- and nanotribology, polymer surfaces, and roughness investigations. The final part on

industrial research addresses special applications of scanning force nanoprobes such as atomic manipulation and surface modification, as well as single electron devices based on SPM.

Encyclopedia of Nanotechnology

This book brings together recent developments in the areas of MEMS tribology, novel lubricants and coatings for nanotechnological applications, biomimetics in tribology and fundamentals of micro/nano-tribology. Tribology plays important roles in the functioning and durability of machines at small length scales because of the problems associated with strong surface adhesion, friction, wear etc. Recently, a number of studies have been conducted to understand tribological phenomena at nano/micro scales and many new tribological solutions for MEMS have been proposed.

Advanced Structural Ceramics

A fully updated version of the popular Introduction to Tribology, the second edition of this leading tribology text introduces the major developments in the understanding and interpretation of friction, wear and lubrication. Considerations of friction and wear have been fully revised to include recent analysis and data

work, and friction mechanisms have been reappraised in light of current developments. In this edition, the breakthroughs in tribology at the nano- and micro- level as well as recent developments in nanotechnology and magnetic storage technologies are introduced. A new chapter on the emerging field of green tribology and biomimetics is included. Introduces the topic of tribology from a mechanical engineering, mechanics and materials science points of view Newly updated chapter covers both the underlying theory and the current applications of tribology to industry Updated write-up on nanotribology and nanotechnology and introduction of a new chapter on green tribology and biomimetics

An Assessment of the National Institute of Standards and Technology Center for Nanoscale Science and Technology

Atomistic Modeling of Materials Failure

This second edition of Handbook of Micro/Nanotribology addresses the rapid evolution within this field, serving as a reference for the novice and the expert alike. Two parts divide this handbook: Part I covers basic studies, and Part II addresses design, construction, and applications to magnetic storage devices and MEMS. Discussions include: surface physics and methods for physically and

chemically characterizing solid surfaces roughness characterization and static contact models using fractal analysis sliding at the interface and friction on an atomic scale scratching and wear as a result of sliding nanofabrication/nanomachining as well as nano/picoindentation lubricants for minimizing friction and wear surface forces and microrheology of thin liquid films measurement of nanomechanical properties of surfaces and thin films atomic-scale simulations of interfacial phenomena micro/nanotribology and micro/nanomechanics of magnetic storage devices This comprehensive book contains 16 chapters contributed by more than 20 international researchers. In each chapter, the presentation starts with macroconcepts and then lead to microconcepts. With more than 500 illustrations and 50 tables, Handbook of Micro/Nanotribology covers the range of relevant topics, including characterization of solid surfaces, measurement techniques and applications, and theoretical modeling of interfaces. What's New in the Second Edition? New chapters on: AFM instrumentation Surface forces and adhesion Design and construction of magnetic storage devices Microdynamical devices and systems Mechanical properties of materials in microstructure Micro/nanotribology and micro/nanomechanics of MEMS devices

Principles and Applications of Tribology

This book covers the area of advanced ceramic composites broadly, providing

important introductory chapters to fundamentals, processing, and applications of advanced ceramic composites. Within each section, specific topics covered highlight the state of the art research within one of the above sections. The organization of the book is designed to provide easy understanding by students as well as professionals interested in advanced ceramic composites. The various sections discuss fundamentals of nature and characteristics of ceramics, processing of ceramics, processing and properties of toughened ceramics, high temperature ceramics, nanoceramics and nanoceramic composites, and bioceramics and biocomposites.

Tribology of Diamond-like Carbon Films

Since 1959, the National Research Council (NRC), at the request of the National Institute of Standards and Technology (NIST), has annually assembled panels of experts to assess the quality and effectiveness of the NIST measurements and standards laboratories. In 2011, the NRC evaluated three of the six NIST laboratories: the Center for Nanoscale Science and Technology (CNST), the NIST Center for Neutron Research (NCNR) and the Information Technology Laboratory (ITL). Each of these was addressed individually by a separate panel of experts; this report assesses CNST.

Fundamentals of Nanoindentation and Nanotribology III

Tribology for engineers discusses recent research and applications of principles of friction, wear and lubrication, and provides the fundamentals and advances in tribology for modern industry. The book examines tribology with special emphasis on surface topography, wear of materials and lubrication, and includes dedicated coverage on the fundamentals of micro and nanotribology. The book serves as a valuable reference for academics, tribology and materials researchers, mechanical, physics and materials engineers and professionals in related industries with tribology. Edited and written by highly knowledgeable and well-respected researchers in the field Examines recent research and applications of friction, wear and lubrication Highlights advances and future trends in the industry

Springer Handbook of Nanotechnology

These proceedings of the 15th International Conference on Wear of Materials focus on the friction and wear of materials in various applications under different environments from the nanometer scale to the meter scale. The conference provides a unique international forum for researchers and practitioners from different disciplines to exchange latest results. Coverage includes: . Wear assessment and monitoring . Wear modeling, mechanisms, mapping and prediction

. Wear-corrosion testing and control . Surface engineering for wear and wear-corrosion control . Development of new wear test methods and wear test methodologies . Wear of materials for biomedical applications . Wear of non-equilibrium materials: from atomic dimensions to the micro-scale . Wear of hard and superhard materials . Wear of materials in the earthmoving, minerals processing and mining industries

Tribology and Mechanics of Magnetic Storage Devices

15th Wear of Materials

This major work has established itself as the definitive reference in the nanoscience and nanotechnology area in one volume. In presents nanostructures, micro/nanofabrication, and micro/nanodevices. Special emphasis is on scanning probe microscopy, nanotribology and nanomechanics, molecularly thick films, industrial applications and microdevice reliability, and on social aspects. Reflecting further developments, the new edition has grown from six to eight parts. The latest information is added to fields such as bionanotechnology, nanorobotics, and NEMS/MEMS reliability. This classic reference book is orchestrated by a highly experienced editor and written by a team of distinguished experts for those

learning about the field of nanotechnology.

New Directions in Tribology

Friction, lubrication, adhesion, and wear are prevalent physical phenomena in everyday life and in many key technologies. This book incorporates a bottom-up approach to friction, lubrication, and wear into a versatile textbook on tribology. This is done by focusing on how these tribological phenomena occur on the small scale -- the atomic to the micrometer scale -- a field often called nanotribology. The book covers the microscopic origins of the common tribological concepts of roughness, elasticity, plasticity, friction coefficients, and wear coefficients. Some macroscale concepts (like elasticity) scale down well to the micro- and atomic-scale, while other macroscale concepts (like hydrodynamic lubrication) do not. In addition, this book also has chapters on topics not typically found in tribology texts: surface energy, surface forces, lubrication in confined spaces, and the atomistic origins of friction and wear. These chapters cover tribological concepts that become increasingly important at the small scale: capillary condensation, disjoining pressure, contact electrification, molecular slippage at interfaces, atomic scale stick-slip, and atomic bond breaking. Throughout the book, numerous examples are provided that show how a nanoscale understanding of tribological phenomena is essential to the proper engineering of important modern technologies such as MEMS, disk drives, and nanoimprinting. For the second

edition, all the chapters have been revised and updated to incorporate the most recent advancements in nanoscale tribology. Another important enhancement to the second edition is the addition of problem sets at the end of each chapter.

Materials and Surface Engineering in Tribology

Since the original publication of Noncontact Atomic Force Microscopy in 2002, the noncontact atomic force microscope (NC-AFM) has achieved remarkable progress. This second treatment deals with the following outstanding recent results obtained with atomic resolution since then: force spectroscopy and mapping with atomic resolution; tuning fork; atomic manipulation; magnetic exchange force microscopy; atomic and molecular imaging in liquids; and other new technologies. These results and technologies are now helping evolve NC-AFM toward practical tools for characterization and manipulation of individual atoms/molecules and nanostructures with atomic/subatomic resolution. Therefore, the book exemplifies how NC-AFM has become a crucial tool for the expanding fields of nanoscience and nanotechnology.

Atomic Force Microscopy

This book highlights some of the most important structural, chemical, mechanical

and tribological characteristics of DLC films. It is particularly dedicated to the fundamental tribological issues that impact the performance and durability of these coatings. The book provides reliable and up-to-date information on available industrial DLC coatings and includes clear definitions and descriptions of various DLC films and their properties.

Nano Mechanics and Materials

These proceedings of the November 2007 symposium include a range of papers in these dynamic disciplines within materials science. Evolving and complementary, nanoindentation and nanotribology substantially add to the evidence that biomechanical research has caused a number of disciplines to overlap. In addition, researchers are finding new mechanical tests that can measure smaller and smaller forces and displacements. This situation is reflected in the 27 papers with general topics including the relation among nanomechanics, tribology and nanostructures; size effects and indentation of thin films (including an invited paper on the mechanical properties of 3C-SiC films for MEMS applications); nanotribology and friction (with an invited paper on quasi-static and oscillatory indentation in linear viscoelastic solids); and nanome-chanics of polymers in time-dependent characterization.

Dissertation Abstracts International

This book highlights some of the most important structural, chemical, mechanical and tribological characteristics of DLC films. It is particularly dedicated to the fundamental tribological issues that impact the performance and durability of these coatings. The book provides reliable and up-to-date information on available industrial DLC coatings and includes clear definitions and descriptions of various DLC films and their properties.

Scanning Probe Microscopy¿in Industrial Applications

The highlights of this book include an examination of the use of scanning probe microscopy to characterize a variety of polymeric materials, from polymer single crystals and molecular films to composites and biopolymers. The volume provides a synthesis of critical overviews and important new developments, including applications in atomic resolution, chemical force microscopy, and recognition/nanolithography. It includes a review of basic principles and operational modes, terminology, trends, and a discussion of key industrial applications, such as polymer fibers, polymer composites, and filled polymers. It also includes chapters on biopolymers and living cells and on methods for probing micromechanical properties.

Noncontact Atomic Force Microscopy

Tribology for Engineers

The comprehensive reference and textbook serves as a timely, practical introduction to the principles of nanotribology and nanomechanics. Assuming some familiarity with macroscopic tribology, the book comprises chapters by internationally recognized experts, who integrate knowledge of the field from the mechanics and materials-science perspectives. They cover key measurement techniques, their applications, and theoretical modelling of interfaces, each beginning their contributions with macro- and progressing to microconcepts.

Handbook of Micro/Nano Tribology

Scanning Probe Microscopy of Polymers

This volume focuses on methods to measures and model small-volume mechanical and tribological properties. Nanoscale characterization of the mechanical and tribological properties of surfaces is important in many engineering applications.

Micro/Nanotribology and Its Applications

This title is designed to provide a clear and comprehensive overview of tribology. The book introduces the notion of a surface in tribology where a solid surface is described from topographical, structural, mechanical, and energetic perspectives. It also describes the principal techniques used to characterize and analyze surfaces. The title then discusses what may be called the fundamentals of tribology by introducing and describing the concepts of adhesion, friction, wear, and lubrication. The book focuses on the materials used in tribology, introducing the major classes of materials used, either in their bulk states or as coatings, including both protective layers and other coatings used for decorative purposes. Of especial importance to the tribology community are sections that provide the latest information on Nanotribology, Wear, Lubrication, and Wear-Corrosion: Tribocorrosion and Erosion-Corrosion.

Biophysics of Human Hair

The Encyclopedia of Nanotechnology provides a comprehensive and multi-disciplinary reference to the many fields relevant to the general field of nanotechnology. It aims to be a comprehensive and genuinely international reference work and will be aimed at graduate students, researchers, and

practitioners. The Encyclopedia of Nanotechnology introduces a large number of terms, devices and processes which are related to the multi-disciplinary field of Nanotechnology. For each entry in this 4 volume set a 4-10 page description is provided by an expert in the field. Contributions are made by experts from the US, Europe and Asia, making this a comprehensive and truly international Reference Work. The authors are typically from academia, however one quarter of all entries were written by persons from industry. Topics covered in the Reference Work include: - Nano- Microfabrication Processes and Materials for Fabrication - Nanoscale Measurement Techniques - Nanostructures - Nanomaterials - Nanomechanics - Molecular Modeling and Its Role in Advancing Nanotechnology - MEMS/NEMS - Microfluidics and Nanofluidics - Biomedical Engineering and Biodevices - Bio/Nanotechnology and Nanomedicine - Bio/Nanotechnology for cellular engineering - Drug Delivery – Technology and Applications - Assembly - Organic Electronics - Nano-optical Devices - Micro/nano Integration - Materials, Coatings and Surface Treatments for Nanotribology - Micro/NanoReliability – thermal, mechanical etc. - Biomimetics

Nanotribology and Nanomechanics II

This book presents the biophysics of hair. It covers the structure of hair, its mechanical properties, nanomechanical characterization, tensile deformation, tribological characterization, the thickness distribution and binding interactions on

hair surface.

Journal of Tribology

The word tribology was fIrst reported in a landmark report by P. Jost in 1966 (Lubrication (Tribology)--A Report on the Present Position and Industry's Needs, Department of Education and Science, HMSO, London). Tribology is the science and technology of two interacting surfaces in relative motion and of related subjects and practices. The popular equivalent is friction, wear and lubrication. The economic impact of the better understanding of tribology of two interacting surfaces in relative motion is known to be immense. Losses resulting from ignorance of tribology amount in the United States alone to about 6 percent of its GNP or about $200 billion dollars per year (1966), and approximately one-third of the world's energy resources in present' use, appear as friction in one form or another. A fundamental understanding of the tribology of the head-medium interface in magnetic recording is crucial to the future growth of the $100 billion per year information storage industry. In the emerging microelectromechanical systems (MEMS) industry, tribology is also recognized as a limiting technology. The advent of new scanning probe microscopy (SPM) techniques (starting with the invention of the scanning tunneling microscope in 1981) to measure surface topography, adhesion, friction, wear, lubricant-fIlm thickness, mechanical properties all on a micro to nanometer scale, and to image lubricant molecules and

the availability of supercomputers to conduct atomic-scale simulations has led to the development of a new fIeld referred to as Microtribology, Nanotribology, or Molecular Tribology (see B. Bhushan, J. N. Israelachvili and U.

Applied Scanning Probe Methods VII

The mechanical properties of wool, hair and other alpha-keratin fibres represent the most important physical properties for which these fibres are used, whether this be in the manufacture of textile garments, reshaping human hair, or in the alignment of fibres in paint brushes.

Dynamics of Microelectromechanical Systems

Recent research has led to a deeper understanding of the nature and consequences of interactions between materials on an atomic scale. The results have resonated throughout the field of tribology. For example, new applications require detailed understanding of the tribological process on macro- and microscales and new knowledge guides the rational

Applied Scanning Probe Methods I

Understanding the Basics of Nanoindentation and Why It Is Important Contact damage induced brittle fracture is a common problem in the field of brittle solids. In the case of both glass and ceramics—and as it relates to both natural and artificial bio-materials—it has triggered the need for improved fabrication technology and new product development in the industry. The Nanoindentation Technique Is Especially Dedicated to Brittle Materials Nanoindentation of Brittle Solids highlights the science and technology of nanoindentation related to brittle materials, and considers the applicability of the nanoindentation technique. This book provides a thorough understanding of basic contact induced deformation mechanisms, damage initiation, and growth mechanisms. Starting from the basics of contact mechanics and nanoindentation, it considers contact mechanics, addresses contact issues in brittle solids, and explores the concepts of hardness and elastic modulus of a material. It examines a variety of brittle solids and deciphers the physics of deformation and fracture at scale lengths compatible with the microstructural unit block. Discusses nanoindentation data analysis methods and various nanoindentation techniques Includes nanoindentation results from the authors' recent research on natural biomaterials like tooth, bone, and fish scale materials Considers the nanoindentation response if contact is made too quickly in glass Explores energy issues related to the nanoindentation of glass Describes the nanoindentation response of a coarse grain alumina Examines nanoindentation on microplasma sprayed hydroxyapatite coatings Nanoindentation of Brittle Solids provides a brief history of indentation, and explores the science and technology of

nanoindentation related to brittle materials. It also offers an in-depth discussion of indentation size effect; the evolution of shear induced deformation during indentation and scratches, and includes a collection of related research works.

Fundamentals of Tribology and Bridging the Gap Between the Macro- and Micro/Nanoscales

The recent emergence and proliferation of proximal probes, e.g. SPM and AFM, and computational techniques for simulating tip-surface interactions has enabled the systematic investigation of interfacial problems on ever smaller scales, as well as created means for modifying and manipulating nanostructures. In short, they have led to the appearance of the new, interdisciplinary fields of micro/nanotribology and micro/nanomechanics. This volume serves as a timely, practical introduction to the principles of nanotribology and nanomechanics and applications to magnetic storage systems and MEMS/NEMS. Assuming some familiarity with macrotribology/mechanics, the book comprises chapters by internationally recognized experts, who integrate knowledge of the field from the mechanics and materials-science perspectives. They cover key measurement techniques, their applications, and theoretical modelling of interfaces, each beginning their contributions with macro- and progressing to microconcepts. After reviewing the fundamental experimental and theoretical aspects in the first part, Nanotribology

and Nanomechanics then treats applications. Three groups of readers are likely to find this text valuable: graduate students, research workers, and practicing engineers. It can serve as the basis for a comprehensive, one- or two-semester course in scanning probe microscopy; applied scanning probe techniques; or nanotribology/nanomechanics/nanotechnology, in departments such as mechanical engineering, materials science, and applied physics. With a Foreword by Physics Nobel Laureate Gerd Binnig Dr. Bharat Bhushan is an Ohio Eminent Scholar and The Howard D. Winbigler Professor in the Department of Mechanical Engineering, Graduate Research Faculty Advisor in the Department of Materials Science and Engineering, and the Director of the Nanotribology Laboratory for Information Storage & MEMS/NEMS (NLIM) at the Ohio State University, Columbus, Ohio. He is an internationally recognized expert of tribology and mechanics on the macro- to nanoscales, and is one of the most prolific authors. He is considered by some a pioneer of the tribology and mechanics of magnetic storage devices and a leading researcher in the fields of nanotribology and nanomechanics using scanning probe microscopy and applications to micro/nanotechnology. He is the recipient of various international fellowships including the Alexander von Humboldt Research Prize for Senior Scientists, Max Planck Foundation Research Award for Outstanding Foreign Scientists, and the Fulbright Senior Scholar Award.

Tribology of Diamond-like Carbon Films

Here is a textbook for senior undergraduate and graduate level students that offers a novel and systematic look into the dynamics of MEMS. It includes numerous solved examples together with the proposed problems. The material to be found here will also be of interest to researchers with a non-mechanical background. The book focuses on the mechanical domain, specifically the dynamic sub-domain, and provides an in-depth treatment of problems that involve reliable modeling, analysis and design.

Fundamentals of Nanoindentation and Nanotribology II

Micro/nanotribology as a field is concerned with experimental and theoretical investigations of processes ranging from atomic and molecular scales to the microscale, occurring during adhesion, friction, wear, and thin-film lubrication at sliding surfaces. As a field it is truly interdisciplinary, but this confronts the would-be entrant with the difficulty of becoming familiar with the basic theories and applications: the area is not covered in any undergraduate or graduate scientific curriculum. The present work commences with a history of tribology and micro/nanotribology, followed by discussions of instrumentation, basic theories of friction, wear and lubrication on nano- to microscales, and their industrial applications. A variety of research instruments are covered, including a variety of scanning probe microscopes and surface force apparatus. Experimental research and modelling are expertly dealt with, the emphasis throughout being applied

aspects.

Introduction to Tribology

Atomic force microscopes are very important tools for the advancement of science and technology. This book provides an introduction to the microscopes so that scientists and engineers can learn both how to use them, and what they can do.

Nano-tribology and Materials in MEMS

Describes new state-of-the-science tools and their contribution to industrial R&D With contributions from leading international experts in the field, this book explains how scanning probe microscopy is used in industry, resulting in improved product formulation, enhanced processes, better quality control and assurance, and new business opportunities. Readers will learn about the use of scanning probe microscopy to support R&D efforts in the semiconductor, chemical, personal care product, biomaterial, pharmaceutical, and food science industries, among others. Scanning Probe Microscopy in Industrial Applications emphasizes nanomechanical characterization using scanning probe microscopy. The first half of the book is dedicated to a general overview of nanomechanical characterization methods, offering a complete practical tutorial for readers who are new to the topic. Several

chapters include worked examples of useful calculations such as using Hertz mechanics with and without adhesion to model a contact, step-by-step instructions for simulations to guide cantilever selection for an experiment, and data analysis procedures for dynamic contact experiments. The second half of the book describes applications of nanomechanical characterization in industry, including: New formulation development for pharmaceuticals Measurement of critical dimensions and thin dielectric films in the semiconductor industry Effect of humidity and temperature on biomaterials Characterization of polymer blends to guide product formulation in the chemicals sector Unraveling links between food structure and function in the food industry Contributions are based on the authors' thorough review of the current literature as well as their own firsthand experience applying scanning probe microscopy to solve industrial R&D problems. By explaining the fundamentals before advancing to applications, Scanning Probe Microscopy in Industrial Applications offers a complete treatise that is accessible to both novices and professionals. All readers will discover how to apply scanning probe microscopy to build and enhance their R&D efforts.

Nanoindentation of Brittle Solids

This volume contains 35 present ations on the developments and advances made in tribology. Subjects discussed include: surface engineering; rolling bearings; thermal effects in tribo-systems; and environmental issues in tribology.

Tribology on the Small Scale

The first volume in the series was released in January 2004 and the second to fourth volumes in early 2006. The field is now progressing so fast that there is a need for one volume every 12 to 18 months to capture latest developments. Volume VII presents 9 chapters on a variety of new and emerging techniques and refinements of SPM applications.