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Tribology and Biophysics of Artificial Joints *Tribology and Biophysics of Artificial Joints* **Biotribology of Natural and Artificial Joints Tribology of Natural and Artificial Joints** *Friction, Lubrication and Wear of Artificial Joints* Tribology of Natural and Artificial Joints *Biomaterials and Medical Tribology Tribological Performance of Artificial Joints The friction, lubrication and wear of artificial joints - tribology meets medical engineering* **Joint Replacement Technology** *Liquid-Crystal Nanomaterials Tribology and Sustainability* Tribology of total replacement hip joints studied with new hip joint simulators and a materials-screening apparatus Biotribology **Tribology and Characterization of Surface Coatings** *Proceedings of the ASME/STLE International Joint Tribology Conference* **Handbook Of Polymer Tribology** Biotribology of Human Synovial Joints *Tribology of Artificial Joints* Tribological Performance of Artificial Joints Tribology in Total Hip Arthroplasty **Liquid Crystals in Biotribology Tribology and Surface Engineering for Industrial Applications The Tribology of Ceramic-ceramic Hip Joints** *Experimental Investigations Into the Tribology of Artificial Knee Joints Variation in Joint Fluid Composition and Its Effect on the Tribology of Replacement Joint Articulation* **Tribology in Total Hip Arthroplasty** *Biotribology of Artificial Hip Joints* **Biotribology** Tribology of Artificial Hip Joints *Fundamentals of Tribology* Tribology for Scientists and Engineers *Tribology* **Tribology in Total Hip and Knee Arthroplasty Nano-tribology and Materials in MEMS** *Advanced Tribology* Joint Replacement Technology **Extreme Tribology** *Tribology in Biomechanical Systems* **UHMWPE Biomaterials for Joint Implants**

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Biotribology of Natural and Artificial Joints: Reducing Wear Through Material Selection and Geometric Design provides a thorough overview of key issues surrounding the tribological behaviors of both natural and artificial joints, covering methods for optimizing the performance of biomaterials, summarizing the lubrication and contact mechanics of natural joints, and offering solutions to tribological problems in soft biomaterials and surface failures of materials. Sections cover biomechanics and biotribology of natural and artificial joints, articular cartilage and synovial fluids, methods for improving the tribological properties of artificial joints, and the biotribology of artificial joints with artificial cartilage, regenerated cartilage, and biomimetic design solutions. Provides insights on how to optimize the performance of artificial joints

via friction reduction, better material selection and improved geometric design Looks at the effects of rubbing and loading on tissue regeneration with chondrocytes Discusses lubrication and contact mechanisms for reducing friction and wear in artificial and natural joints Outlines artificial joint design considerations for achieving low wear 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. During the 2010 EFORT Congress in Madrid, many interesting topics relating to tribology in total hip arthroplasty were discussed during a special day devoted entirely to the subject. So successful was the day, and such was the broad interest in the discussions, that EFORT decided that publication of all the presentations would be warmly welcomed by fellow professionals who were unable to attend. This book is the result. It includes detailed information on the different articulating materials and the wear to which they are subject. The various factors that contribute to bearing performance and control wear are thoroughly evaluated, and careful consideration is given to the technology and design solutions proposed with a view to producing low-wearing hip joints. This book will be of interest both to novices who want to learn more about the field and to experienced orthopaedic surgeons wishing to keep abreast of the latest developments. Joint endoprosthetics - the science of implanting artificial joints into the human body - has been around since the 1960?s, and consistent advancements are leading to better practice, materials and mechanics. The present book is devoted to the biophysics and effect of wear, friction and lubrication on artificial joints. The important aspects of biocompatibility and wear resistance are reviewed and a retrospective

analysis of modern joint endoprosthetic designs is presented. Data on clinical aspects of endoprosthetics are cited in support of the text. Advancements in genetic engineering, and promising new techniques of designing bone and cartilage transplants are explored, and a critical comparison between tribological mechanisms of operation and natural joint functioning are made.An exceptional resource for all specialists in orthopedy, biophysics, immunology and engineers engaged in developing artificial joints. Joint replacement is a very successful medical treatment. However, the survivorship of the implants could be adversely affected due to the loss of materials in the form of particles or ions as the bearing surfaces articulate against earch other. The consequent tissue and immune response to the wear products, remain one of the key factors of their failure. Tribology has been defined as the science and technology of interacting surfaces in relative motion and all related wear products (e.g., particles, ions, etc.). Over the last few decades, in an attempt to understand and improve joint replacement technology, the tribological performance of several material combinations have been studied experimentally and assessed clinically. In addition, research has focused on the biological effects and long term consequences of wear products. Improvements have been made in manufacturing processes, precision engineering capabilities, device designs and materials properties in order to minimize wear and friction and maximize component longevity in vivo. The present study aims to firstly better understand the dynamic mechanism of the artificial hip joint and secondly to investigate important issues affecting the lifespan and performance of hip implants. To this end, a three-dimensional computational biomechanics model based upon multibody dynamics methodology is developed taking the spatial nature of the physiological loading and motion of the human body, the inertial forces of the hip components and bearing surface tribology into account. The calculation of the intra-joint contact forces developed is based on a continuous contact force approach that accounts for the geomertical and materials properties of the contacting surfaces. In addition, the friction

effects due to the contact between hip components are also taken into account using the Stribeck friction model. The third edition of Joint Replacement Technology provides a thoroughly updated review of recent developments in joint replacement technology. Joint replacement is a standard treatment for joint degradation and has improved the quality of life of millions of patients. Collaboration between clinicians and researchers is critical to its continued success and to meet the rising expectations of patients and surgeons. This edition covers a range of updated and new content, ranging from chapters on materials analysis and selection, to methodologies and techniques used for joint replacement and clinical challenges of replacing specific joints. Key topics include tribological considerations and experiments; challenges in joint bearing surfaces; cementless fixation techniques; healing responses to implants. Clinical challenges and perspectives are covered with the aid of case studies. Thanks to its widespread collaboration and international contributors, Joint Replacement Technology, Third Edition is useful for materials scientists and engineers in both academia and the biomedical industry. Chemists, clinicians, and other researchers in this area will also find this text invaluable. This third edition provides an updated comprehensive review of recent developments in joint replacement technology. Reviews a range of specific joints, biological and mechanical issues and fixation techniques. Includes revised and new content, such as sections on regulatory affairs, AI techniques and 3D printing. Tribology is the science of interacting surfaces; when these surfaces are in a biological system, it is called as biotribology. With the increasing rate of joint replacement operations and need for artificial prosthesis, biotribology is becoming a very important and rapidly growing branch of tribology. Based on this fact, in this chapter, basic tribological concepts are presented in terms of friction, lubrication, and wear; then with these fundamental backgrounds the biotribological behavior of natural and artificial hip joints are discussed in detail. Moreover, material pairs that are used in artificial joint replacements and the application of surface modification

for the enhancement of the tribological properties of these materials are handled. Furthermore, the determination of tribological behavior of joint materials such as wear, coefficient of friction, friction torque, and frictional heating by using conventional techniques and hip joint simulator are discussed. Finally, the measurement and analysis of wear in both retrieved prosthesis and experimental studies are discussed referring the latest research articles. During the 2010 EFORT Congress in Madrid, many interesting topics relating to tribology in total hip arthroplasty were discussed during a special day devoted entirely to the subject. So successful was the day, and such was the broad interest in the discussions, that EFORT decided that publication of all the presentations would be warmly welcomed by fellow professionals who were unable to attend. This book is the result. It includes detailed information on the different articulating materials and the wear to which they are subject. The various factors that contribute to bearing performance and control wear are thoroughly evaluated, and careful consideration is given to the technology and design solutions proposed with a view to producing low-wearing hip joints. This book will be of interest both to novices who want to learn more about the field and to experienced orthopaedic surgeons wishing to keep abreast of the latest developments. This book describes available tribology technologies and introdces a comprehensive overview of tribology. General, up-to-date knowledge on how tribology is approached in various related areas of research, both experimental and computational is provided. Tribology has been central to the development of this field of engineering and Friction, Lubrication, and Wear of Artificial Joints brings together the work of the foremost authorities. Recent key work, particularly on hip and knee replacement prostheses form the major part of this book. Artificial joint technology, clinical practice, and the monitoring of on-going wear in use have progressed by leaps and bounds in the last few years. Medical research engineers, tribology specialists, and materials technologists each play an important role in ensuring that this marriage of engineering and medicine delivers the best possible outcome

for the patients who receive the implants. Contents of this book include: Biotribology - A personal view The influence of component geometry on the measurement of wear A tribological study of metal-on-metal total replacement hip joints The lubrication and friction of conventional UHMWPE, novel compliant layer and hard bearing surfaces for use in total hip prostheses Prediction of lubricating film thickness in UHMWPE hip joint replacements Wear of ceramic-on-ceramic hip prostheses under micro-separation simulation conditions Friction and wear testing of DLC type coatings on total hip replacement prostheses Simulator testing of total knee replacement A new measurement method for wear scars generated with knee simulators This book summarizes the theoretical and experimental studies confirming the concept of the liquid-crystalline nature of boundary lubrication in synovial joints. It is shown that cholesteric liquid crystals in the synovial liquid play a significant role in the mechanism of intra-articular friction reduction. The results of structural, rheological and tribological research of the creation of artificial synovial liquids containing cholesteric liquid crystals in natural synovial liquids are described. These liquid crystals reproduce the lubrication properties of natural synovia and provide a high chondroprotective efficiency. They were tested in osteoarthritis models and in clinical practice. Wear and osteolysis are still the most important potential problems in total hip and knee arthroplasty. Although technology in arthroplasty has been improved dramatically during the past decade, the clinical data relating to some implants reveal that many concerns remain. During the “Tribology Day” within the scientific programme of the 2013 EFORT Congress in Istanbul, the main topics included these concerns as well as the benefits of the materials most commonly used in total hip and knee arthroplasty. This book includes the presentations delivered on the day and covers a range of interesting issues regarding metal, ceramic, and polyethylene articulations. It provides information on the current concepts relating to tribology in total hip arthroplasty and offers a critical outlook on possible improvements in total knee arthroplasty. This handbook is a

collection of authoritative information in the new and expanding field of polymer tribology. It brings together various research topics in the field of polymer tribology in a single volume, and provides relevant data in polymer tribology for research and industrial applications.The book's chapters are written by active, world-renowned researchers in the field. Subjects covered in this book range from the fundamentals of polymer tribology to highly applied topics such as machine element design (bearing and gears), hip prosthetic and microsystems applications.Readers in the field of tribology, in general, and polymer tribology, in particular, will find it very useful as it covers nearly all aspects of polymer tribology. Academics creating new courses based on polymer tribology will also find this book's comprehensive coverage valuable. Researchers will find this book a ready source of the state-of-the-art in the field of polymer tribology. Tribology is the “science and technology of interactingsurfaces in relative motion” and encompasses the study offriction, wear and lubrication. By extension biotribology isusually defined as the tribological phenomena occurring in eitherthe human body or in animals. Therefore, it is possible to considertribological processes that may occur after implantation of anartificial device in the human body and the tribological processesnaturally occurring in or on the tissues and organ of animals.Animals, including humans, possess a wide variety of sliding andfrictional interfaces. The authors aim to provide some advances in research inbiotribology. They cover several aspects of biotribology such astribology of synovial joints and artificial replacements; wear ofscrews and plates in bone fractures repair; wear of denture andrestorative materials; friction of the skin and comfort ofclothing; wear of replacement heart valves; tribology of contactlenses and ocular tribology; biotribology on the microscale andnanoscale levels, etc. This book can be used as a research text for final undergraduateengineering courses (for example, materials, biomedical, etc.) orfor those studying the subject of biotribology at the postgraduatelevel. It can also serve as a useful reference for academics,biomechanical researchers, biologists, chemists,

physicists,biomedicals and materials engineers, and other professionals inrelated engineering, medicine and biomedical industries. Joint replacement is a very successful medical treatment. However, the survivorship of the implants could be adversely affected due to the loss of materials in the form of particles or ions as the bearing surfaces articulate against earch other. The consequent tissue and immune response to the wear products, remain one of the key factors of their failure. Tribology has been defined as the science and technology of interacting surfaces in relative motion and all related wear products (e.g., particles, ions, etc.). Over the last few decades, in an attempt to understand and improve joint replacement technology, the tribological performance of several material combinations have been studied experimentally and assessed clinically. In addition, research has focused on the biological effects and long term consequences of wear products. Improvements have been made in manufacturing processes, precision engineering capabilities, device designs and materials properties in order to minimize wear and friction and maximize component longevity in vivo. This book investigates the in vivo and in vitro performance of the orthopaedic implants and their advanced bearings. Contributions are solicited from the researchers working in the field of biotribology and bioengineering Tribology and Sustainability brings a vision of promoting a greener, cleaner and eco-friendly environment by highlighting sustainable solutions in tribology via the development of self-lubricating materials, green additives in lubricants, natural fibre-reinforced materials and biomimetic approaches. Backed by supporting schematic diagrams, data tables and illustrations for easy understanding, the book focuses on recent advancements in tribology and sustainability. Global sustainability and regional requirements are addressed through chapters on natural composites, green lubricants, biomedical systems and wind energy systems, with a dedicated chapter on a global sustainability scenario. FEATURES Highlights sustainability via new tribological approaches and how such methods are essential Covers the theoretical aspects of various tribological topics concerning

mechanical and material designs for energy-efficient systems Includes practical global sustainability based on the regional requirements of tribological research and sustainable impact Reviews the tribology of green lubricants, green additives and lightweight materials Discusses topics related to biomimetics and biotribology Tribology and Sustainability will assist researchers, professionals and graduate students in tribology, surface engineering, mechanical design and materials engineering, including mechanical, aerospace, chemical and environmental engineering. "Advanced Tribology" is the proceedings of the 5th China International Symposium on Tribology (held every four years) and the 1st International Tribology Symposium of IFToMM, held in Beijing 24th-27th September 2008. It contains seven parts: lubrication; friction and wear; micro/nano-tribology; tribology of coatings, surface and interface; biotribology; tribo-chemistry; industry tribology. The book reflects the recent progress in the fields such as lubrication, friction and wear, coatings, and precision manufacture etc. in the world. The book is intended for researchers, engineers and graduate students in the field of tribology, lubrication, mechanical production and industrial design. The editors Jianbin Luo, Yonggang Meng, Tianmin Shao and Qian Zhao are all the professors at the State Key Lab of Tribology, Tsinghua University, Beijing. Medical tribology can be defined as the science of tribological phenomena in the human body, both those that naturally occur in the tissues or organs and those that arise after implantation of an artificial device, while biomaterials are inert substances designed to be incorporated into living systems. Biomaterials and medical tribology brings together a collection of high quality articles and case studies focussing on new research and developments in these two important fields. The book provides details of the different types of biomaterial available and their applications, including nanoparticles for biomedical applications, synergism effects during fiction and fretting corrosion experiments, application of biomedical-grade titanium alloys in trabecular bone and artificial joints, fatigue strengthening of an orthopaedic Ti6AI4V alloy,

wear determination on retrieved metal-on-metal hip arthoplasty, natural articular joints, the importance of bearing porosity in engineering and natural lubrication, tribological characterization of human tooth enamel, and finally, liposome-based carrier systems and devices used for pulmonary drug delivery. Biomaterials and medical tribology is an essential reference for materials scientists, engineers, and researchers in the field of medical tribology. The title also provides an overview for academics and clinicians in this area. Tribology is an unfamiliar term for many, but is experienced by all. It is the science of friction, wear and lubrication of contacting surfaces in relative motion. The aim of this book is to introduce the fundamentals of tribology as well as its challenges in extreme operating conditions. The book comprises a historical background and an introduction to familiarize both undergraduate and postgraduate readers with such an important topic. It addresses a comprehensive coverage of classical tribology of solid contacts, friction mechanics, wear mechanisms and lubrication technologies. The tribology of polymer composites, MEMS and NEMS are explored. In addition, tribology of automotive components is presented, as are tribological applications in many practical situations.Various test methods used in evaluating wear are reviewed. Diverse techniques applied in predicting wear behavior by mathematical models, FE modeling and ANN approach are discussed. The book reviews key features of extraordinary conditions associated with, but not limited to, harsh environments, severe sliding and poor lubrication challenges. A basic understanding of failure modes in tribological systems is covered. The state-of-the-art research on tribology under these extreme conditions is extensively discussed, which will be of interest to researchers. The book highlights solutions for extreme tribology problems and provides an overview of various factors affecting tribosystems in harsh conditions. TRIBOLOGY AND CHARACTERIZATION OF SURFACE COATINGS The book provides updated information on the friction and wear behavior of coatings used in various industrial applications. Surface modification is a cost-effective process of increasing

the life of components so that the whole device need not be changed if the surface is worn out. The tribological behavior of biological implants is currently an active topic and a thorough discussion is one of the book's features. Tribology and Characterization of Surface Coatings explores key issues which are important in the research and development of surface coatings by providing updated information on friction and wear behavior of coatings used in different industrial applications. It covers the various coating deposition techniques, tribological response of nanocomposite coatings, multilayer hardfacing, and wear testing methods for coatings at nanoscale. The use of nanostructures may alter the tribological, characterization, and mechanical properties of the materials. Thermal spraying is the most widely used technique in industry for the deposition of coatings and their tribological properties need to be determined. This book also includes the recent trends in biotribology and the materials used in implants to counter the abrasive wear. Audience The book will serve as a reference to researchers, scientists, academicians, industrial engineers, and students who work in the fields of materials/polymer science and mechanical engineering. Apart from their applications to aerospace and electronics industries, the coatings are also used in the field of biomedical engineering. This book discusses the tribological, rheological and optical properties of liquid-crystal nanomaterials as well as lubricant media. It also describes the formation of liquid-crystal materials and the application of cholesteric liquid-crystal compounds in technical friction units and in human and animal joints. Further, it shows the connection between the tribological and other physical properties of liquid-crystal cholesterol compounds and develops a lubricity conceptual model of cholesteric–nematic, liquid-crystalline nanostructures on the basis of physical and energetic interpretations. This general model is valid for all surfaces and friction pairs, including biopolymers, and could lead to applications of cholesteric liquid-crystalline nanomaterials in different friction units and tribosystems as well as in the treatment of joint diseases. Joint endoprosthetics - the science of implanting artificial joints into the

human body - has been around since the 1960's, and consistent advancements are leading to better practice, materials and mechanics. The present book is devoted to the biophysics and effect of wear, friction and lubrication on artificial joints. The important aspects of biocompatibility and wear resistance are reviewed and a retrospective analysis of modern joint endoprosthetic designs is presented. Data on clinical aspects of endoprosthetics are cited in support of the text. Advancements in genetic engineering, and promising new techniques of designing bone and cartilage transplants are explored, and a critical comparison between tribological mechanisms of operation and natural joint functioning are made. An exceptional resource for all specialists in orthopedy, biophysics, immunology and engineers engaged in developing artificial joints. A dozen papers from a December 1992 symposium in Miami, Florida, explore the relationship between the laboratory testing of wear and erosion and the actual performance of the mechanical components tested. The topics include plastic plain bearings at low velocity, slurry erosion, internal combustion (cont.) Significant differences in tribology demonstrated by these experiments indicate that the composition of joint fluid affects the tribology of Co- Cr on PE joint prostheses, though the variability in friction could not be explained by physiological variation in the components examined. In related work, the relative importance of contact area and normal load is evaluated in the wear of a Co-Cr on PE articulation. Within a relevant range of contact stress, volumetric wear rate increased with increasing contact area, and was independent of normal load. The results of these tribological investigations are brought together in a conceptual framework under which to consider the wear of PE in TJA. Tribology of Natural and Artificial Joints 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. This book presents a comprehensive, state-of-the-art review of the latest progresses in UHMWPE biomaterials, which has been critical for the performance and longevity of joint implants. Oriented by clinical challenges to UHMWPE-based joint implants, it introduces the processing, crosslinking, structural manipulation, oxidation mechanism, stabilization, drug delivery, and wear, as well as clinical performance, biomechanics, and simulated studies of joint implant based on UHMWPE with low wear, which are aimed to tackle or minimize the adverse effect related to wear and wear debris. These contributions provide fundamentals of chemistry and physics of UHMWPEs to help understand the clinical performances of UHMWPE based joint implants. Perspectives to next generation UHMWPE to meet the unmet challenges in clinical use are included. This second edition of Joint Replacement Technology provides a thoroughly updated review of recent developments in joint replacement technology. Joint replacement is a standard treatment for joint degradation and has improved the quality of life of millions of patients. Collaboration between clinicians and researchers is critical to its continued success and to meet the rising expectations of patients and surgeons. Part one introduces the advances in joint replacement technology, tribological considerations and experiments, and immune and regenerative responses to joint replacements. Part two covers the materials and techniques used in joint replacement. The advantages and disadvantages of different metals are explained here, as well as the use of ceramics. This section also addresses challenges in joint bearing surfaces, design, and cementless fixation techniques. Biological and mechanical issues are considered in part three, including healing responses to implants and biological causes of prosthetic joint failure, and

a new chapter on imaging of joint prostheses. Each chapter in part four describes the clinical challenges of replacing specific joints, with specific focus on hip, knee, intervertebral disc joint, shoulder arthroplasty, elbow arthroplasty, and pyrocarbon small joint arthroplasty. Thanks to its widespread collaboration and international contributors, Joint Replacement Technology is useful for materials scientists and engineers in both academia and biomedical industry. Chemists, clinicians, and other researchers in this area will also find it invaluable. This second edition provides an updated comprehensive review of recent developments in joint replacement technology Provides coverage for the most pertinent materials science and engineering issues in depth Reviews the specific joints, biological and mechanical issues and fixation techniques Fundamentals of Tribology deals with the fundamentals of lubrication, friction and wear, as well as mechanics of contacting surfaces and their topography. It begins by introducing the reader to the importance of tribology in everyday life and offers a brief history of the subject. It then describes the nature of rough surfaces and the mechanics of contacting elastic solids and their deformation under load and friction in their relative motion. The book goes on to discuss the importance of lubricant rheology with respect to viscosity and density. Then, the principles of hydrodynamic lubrication are covered with derivations of the governing Reynolds and energy equations. Applications of hydrodynamic lubrication in various forms of bearings -- journal bearings, thrust bearings and externally pressurised bearings -- are outlined. The important and still evolving subject of elastohydrodynamic lubrication is treated in some detail, both at its fundamentals and its applications in thin shell or overlay bearings, cam-followers and internal combustion engine pistons. The fundamentals of biotribology are also covered, particularly its applications to endo-articular mammalian joints such as hip and knee joints and their arthroplasty. In addition, there is a treatment of the rapidly emerging knowledge of tribological phenomena in lightly loaded vanishing conjunctions (nanotribology), in natural systems and very small devices,

such as MEMS and high density data storage media. There is also a new chapter on the rapidly emerging subject of surface texturing to promote retention of microreservoirs of lubricant, acting as microbearings and improving lubrication of otherwise poorly lubricated conjunctions. This book targets the undergraduate and postgraduate body as well as engineering professionals in industry, where often a quick solution or understanding of certain tribological fundamentals is sought. The book can also form an initial basis for those interested in research into certain aspects of tribology.

- Proceedings Of The ASME STLE International Joint Tribology Conference
- Handbook Of Polymer Tribology
- Biotribology Of Human Synovial Joints
- Tribology Of Artificial Joints
- Tribological Performance Of Artificial Joints
- Tribology In Total Hip Arthroplasty
- Liquid Crystals In Biotribology
- Tribology And Surface Engineering For Industrial Applications
- The Tribology Of Ceramic ceramic Hip Joints
- Experimental Investigations Into The Tribology Of Artificial Knee Joints
- Variation In Joint Fluid Composition And Its Effect On The Tribology Of Replacement Joint Articulation
- Tribology In Total Hip Arthroplasty
- Biotribology Of Artificial Hip Joints
- Biotribology
- Tribology Of Artificial Hip Joints
- Fundamentals Of Tribology
- Tribology For Scientists And Engineers
- Tribology
- Tribology In Total Hip And Knee Arthroplasty
- Nano tribology And Materials In MEMS
- Advanced Tribology
- Joint Replacement Technology
- Extreme Tribology
- Tribology In Biomechanical Systems
- UHMWPE Biomaterials For Joint Implants