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Book 15th Wear
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II **Materials for**
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Hip Surgery
Medical
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de termos médicos
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Technology **PEEK**
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Interfaces in Total
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Crosslinkable
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Polyolefin Fibres
NiTi Materials
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Orthopedics
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Science Index
Medicus

This issue of Foot and Ankle Clinics will include articles on the following: Ankle replacement vs, arthrodesis; Osteolysis; coronal plane malalignment in total ankle arthroplasty; salvage of failed total ankle

arthroplasty with anterior translation of the talus; malalignment of the foot or leg; use of tendon transfers; management of the failed long-stemmed custom agility total ankle arthroplasty; and many more articles surrounding foot and ankle arthroplasty. 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. This book offers expert guidance on materials for total hip arthroplasty (THA), providing readers with quick access to well-organized summaries on biomaterials such as metals, ceramics, polymers, and composites. It also includes in-depth coverage of biocompatibility and implant problems such as necrosis, ulceration, high toxicity with metals, and allergic reactions. Coverage also emphasizes the mechanical properties of the materials used for prostheses applications, immunity to corrosion,

enhanced biocompatibility, complete inertness to the body environment, and the high capacity to join with the bone and other tissues. Performance of Metals and Ceramics in Total Hip Arthroplasty is an essential reference for engineers and scientists specializing in prostheses design and manufacturing and orthopedic medical professionals. The book can also be used as a study guide for materials science and orthopedics students. This proceedings book of the Biolog Symposium in Seoul is composed of 10 sessions and plenary lectures of

the most current knowledge available in the use of Bioceramics and alternative bearings. More than 50 speakers with world-famous reputations from 12 countries cover 52 topics on recent developments in Bioceramic and alternative bearings in arthroplasty. The introduction of total joint arthroplasty throughout the world has contributed manifold benefits to patients who suffer from joint diseases. Concurrently, however, there has been an increase in revision surgery. Many orthopedic surgeons agree that durability of prostheses is an eternal problem. In particular, periprosthetic

osteolysis recently has been identified as one of the serious problems affecting prosthetic durability. To improve durability, osteolysis and many other problems must be investigated and solved both experimentally and clinically with respect to such aspects as prosthetic material, design, and biological and biomechanical behavior. This book comprises 37 papers that were presented by orthopedic surgeons and biomedical engineers at the 28th Annual Meeting of the Japanese Society for Replacement Arthroplasty, held in March 1998 in Kanazawa, Japan.

The volume is thus a compilation of the latest knowledge about the pathogenesis and reduction of osteolysis and wear, newly developed total hip prostheses, and other current topics of total knee arthroplasty. We earnestly hope that this book will be of benefit to clinicians and researchers, and that it will contribute to the creation of more durable total joint prostheses in the future. SHINICHI IMURA v Contents Preface
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 V List of Contributors.

 XI
 Part 1 Wear and Pathogenesis of

Osteolysis Friction and Wear of Artificial Joints: A Historical Review N. AKAMATSU

 , 3 Matrix Degradation in Osteoclastic Bone Resorption Under Pathological Conditions . This volume covers various aspects of cross-linked polyethylene (XLPE). The contents include manufacture, morphology, structure, properties, applications, early stage development, cross-linking techniques, recycling process, physical and chemical properties as well as the scope and future aspects of XLPE. It focuses on the life cycle analysis of XLPE

and their industrial applications and commercial importance. This book will be of use to academic and industry researchers, as well as graduate students working in the fields of polymer science and engineering, materials science, and chemical engineering. This book covers a wide range of topics in the orthopaedic fields and can be used as a textbook for the final undergraduate engineering course or as a topic on tribology at the postgraduate level. This book can serve as a useful reference for academics, tribology, and materials researchers;

mechanical, materials, and physics engineers; biomedical scientists and professionals in tribology; and related industries. The scientific interest in this book will be evident for many important centres of research, including laboratories and universities throughout the world. The latest scientific and clinical information regarding the use of ceramics in orthopaedic surgery. CeramTec has had a long and close relationship with the French orthopaedic community and this community has been an incontestable pioneer in the use of ceramic in this

field of orthopaedics. That is why the symposium takes place in Paris under the presidency of Professor J.-Y. Lazennec, Hôpital Pitié Salpêtrière. Biomaterials are composed of metallic materials, ceramics, polymers, composites and hybrid materials. Biomaterials used in human beings require safety regulations, toxicity, allergic reaction, etc. When used as implantable materials their biological compatibility, biomechanical compatibility, and morphological compatibility must be assessed. This book explores the design and requirements of biomaterials for the

use in implantology. Metal-Reinforced Ceramics covers the principle of metal-fiber-reinforced ceramics, a well-known topic in the field of reinforced concrete. Much of the work that has been done has remained unpublished, hidden in industrial company archives due to the commercial sensitivity associated with the respective technologies that prevailed at the time, which no longer applies today. This book will discuss advanced technologies that have largely been undocumented before in a broad range of industrial application areas,

with updates on alumina, silicon carbide, boron carbide, tungsten carbide, fused silica, and carbon-based ceramics which are hard, heat resistant, wear resistant, and chemically durable. Provides detailed information on fundamental principles, advanced processing technologies and industrial applications
Features comprehensive industrial knowledge not usually in the public domain from the author's experience spanning more than three decades
Features armor ceramics, bioceramics, aerospace, mining and architectural

ceramic applications
The 14th International Conference on Wear of Materials took place in Washington, DC, USA, 30 March - 3 April 2003. These proceedings contain over two-hundred peer reviewed papers containing the best research, technical developments and engineering case studies from around the world.
Biomaterials and nano-tribology receive special attention in this collection reflecting the general trends in the field. Further highlights include a focus on the new generation of instrumentation to probe wear at increasingly small scales.
Approximately

ninety communications and case studies, a popular format for the academic community have also been included, enabling the inclusion of the most up-to-date research. Over 200 peer-reviewed papers including hot topics such as biomaterials and nano-tribology
Keeping you up-to-date with the latest research from leading experts
Includes communications and case studies
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. PEEK biomaterials are currently used in hundreds of thousands of spinal fusion patients around the world every year. Durability, biocompatibility, and excellent resistance to aggressive sterilization procedures make PEEK a polymer of choice, replacing metal in orthopedic implants, from spinal implants and knee replacements to finger joints and dental implants. The new edition of this authoritative work sees the book expand from 17 chapters to 26 chapters to match

the expansion in applications in PEEK—from spinal cages to spinal rods and disc replacements; hip and knee joint replacement; dental; trauma; and sports medicine. New PEEK formulations have been developed incorporating hydroxyapatite, additives to combat infection, and surface grafted polymers to improve lubrication. The book also covers additive manufacturing, which has made significant inroads with PEEK in the past 5 years as well by introducing the prospect of patient-specific implants. Like the 1st edition, the updated Handbook brings together experts in

many different facets related to PEEK clinical performance as well as in the areas of materials science, tribology, and biology to provide a complete reference for specialists in the field of plastics, biomaterials, medical device design, and surgical applications. Useful for materials scientists and biomedical engineers, both in industry and academia, the book is a one-stop shop for information on PEEK as a biomaterial—including in-depth coverage of materials properties—while also providing cutting-edge information on applications and

combinations of the material. Presents a complete reference work covering PEEK, the leading polymer for spinal implants and a range of other biomedical applications Covers a range of new formulations and applications, including in-depth coverage of the additive manufacturing of PEEK Provides a vital source of supporting information for materials selection decisions and regulatory submissions Dear Colleague and Participant in Bioceramics and Alternative Bearings in Joint th
® Arthroplasty: 11 International BIOLOX Symposium We are

once again very proud of the fact that we have been able to provide you with the proceedings of this Symposium as a part of your registration materials. This is a mayor achievement that could only be made possible by the excellent cooperation of all of the speakers, the publishing house and their staff and the Symposium Administrator and her support staff. Our special thanks to all of them for their hard work and dedication to meet the difficult deadlines required to make this a reality. The proceedings for this Symposium continue the on-going tradition to provide all of us

with a valuable and useful addition to our reference library. We hope that within its covers, you will find the most up to date scientific and clinical information regarding the use of ceramic solutions to address wear related problems in Orthopedic Surgery. This is the first time that the symposium takes place in Italy. The reason we chose Italy and in particular Rome is obvious as CeramTec has had a long term and close relationship with the Italian. CeramTec is pleased that our Symposium Chairmen, Professors F. Benazzo and F. Falez have collaborated with

us in the preparation and in the execution of Bioceramics and Alternative Bearings in Joint Arthroplasty - 11[®] International BIOLOX Symposium. Nickel-Titanium alloys are smart materials exhibiting unique properties such as superelasticity and shape-memory effect. The material has been used as orthodontic wires in the dental field for over 20 years. This book is a comprehensive overview to the field of Ni-Ti Materials and the physical, chemical and mechanical properties of this versatile alloy. In addition, complications and challenges exhibited in

applications are also discussed. 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
Polyolefin Fibres: Structure, Properties and Industrial Applications, Second Edition, explores one of the most widely used commercial polymers, with a focus on the most important polyolefins, namely

polyethylene, polypropylene, and polyolefin bicomponent fibres. These versatile fibres are durable, chemically resistant, lightweight, economical, and functional. This new edition has been updated and expanded to include cutting-edge research on a broad range of advanced applications. Part I covers the structure and properties of polyolefin fibres, incorporating a new chapter on the environmental aspects of polyolefin use. Part II examines the methods for improving the functionality of polyolefins, providing essential information for those engaged in

developing high-performance materials. A final group of chapters addresses how polyolefin fibres can be incorporated into specific textile applications, such as automotive, geotextile, biomedical, and hygiene products, and explores potential future development. This book is an essential reference for textile technologists and manufacturers, polymer and fibre scientists, yarn and fabric manufacturers, biomedical and device engineers, and industrialists and researchers. Introduces the types, properties and structure of polyolefin fibers for readers new to the polyolefins field

Examines methods to improve the functionality of polyolefin fibers, providing essential information for textile technologists and research and development managers engaged in developing high-performance materials. Presents existing and potential applications of polyolefin fibers, exploring how they can expand the range of commercial polyolefin-based products. The purposes of this book is to give an overview of controversies that orthopaedic surgeons might have to consider when carrying out all levels of hip surgery. Contributions cover

such important paediatric problems such as developmental dysplasia of the hip, Perthes disease, slipped capital femoral epiphysis and hip problems associated with neurological diseases. Traumatic conditions of the hip, including acetabular fractures and femoral neck fractures are covered in detail. Considerable emphasis is given to the field of both primary and revision total hip replacement, with special emphasis on the difference which occur in Europe and North America. Like every other aspect of hip disease, the field of total hip arthroplasty is

continuously changing to improve both the quality and durability of the clinical result. Finally, post-operative complications and their avoidance are covered, particularly in the fields of deep vein thrombosis prophylaxis and management of the infected total hip arthroplasty. The contributions in this volume are from an international array of experts in the field of hip surgery. Orthopaedic -- pin-on-disc -- wear -- tribology -- polyethylene -- testing -- lubricant -- arthroplasty -- synovial fluid -- osteoarthritis -- periprosthetic -- engineering. Providing

alternatives to animal testing is one of the hottest topics in biomedical research, and this groundbreaking volume addresses this critical issues head on. This unique book presents techniques and methods at the forefront of scientific research that have the potential to replace certain whole animal tests. Moreover, this book provides a platform where other widely accepted techniques and scientific advancements can be collated into a concise set of methods that can be implemented within both academic and industrial communities. Applications of

Nanocomposite Materials in Orthopedics provides a solid understanding of recent developments in the field of nanocomposites used in orthopedics. The book covers joint replacement, the load bearing capability of fractured bones, bone soft tissue regeneration, hard tissue replacement, artificial bone grafting, bone repair, bone tissue transplantations, and related topics, thus helping readers understand how to resolve problems associated with bone fracture and orthopedic surgery. A variety of nanocomposite materials are discussed, with

their properties and preparation methods given. Outlines the use of nanotechnology for bone tissue transplantation Describes nanocomposites for bone grafting and artificial bones, also including their properties Includes discussions on tissue engineering of bone and tissue regeneration and transplantation Describes many composite materials and their preparation methods Written by respected experts in the field, Biomaterials in Orthopedics discusses bioabsorbable biomaterials for bone repair, nondegradable materials in orthopaedics and

delivery systems. Topics in this text include biocompatibility and the biomaterial/tissue interface; self-reinforced bioabsorbable devices and guided regeneration; bone substitutes, Tribology of Natural and Artificial Joints The revised edition of the renowned and bestselling title is the most comprehensive single text on all aspects of biomaterials science from principles to applications. Biomaterials Science, fourth edition, provides a balanced, insightful approach to both the learning of the science and technology of

biomaterials and acts as the key reference for practitioners who are involved in the applications of materials in medicine. This new edition incorporates key updates to reflect the latest relevant research in the field, particularly in the applications section, which includes the latest in topics such as nanotechnology, robotic implantation, and biomaterials utilized in cancer research detection and therapy. Other additions include regenerative engineering, 3D printing, personalized medicine and organs on a chip. Translation from the lab to

commercial products is emphasized with new content dedicated to medical device development, global issues related to translation, and issues of quality assurance and reimbursement. In response to customer feedback, the new edition also features consolidation of redundant material to ensure clarity and focus. Biomaterials Science, 4th edition is an important update to the best-selling text, vital to the biomaterials' community. The most comprehensive coverage of principles and applications of all classes of biomaterials Edited

and contributed by the best-known figures in the biomaterials field today; fully endorsed and supported by the Society for Biomaterials Fully revised and updated to address issues of translation, nanotechnology, additive manufacturing, organs on chip, precision medicine and much more. Online chapter exercises available for most chapters The purpose of this book was to offer an overview of recent insights into the current state of arthroplasty. The tremendous long term success of Sir Charnley's total hip arthroplasty has encouraged many researchers to treat

pain, improve function and create solutions for higher quality of life. Indeed and as described in a special chapter of this book, arthroplasty is an emerging field in the joints of upper extremity and spine. However, there are inborn complications in any foreign design brought to the human body. First, in the chapter on infections we endeavor to provide a comprehensive, up-to-date analysis and description of the management of this difficult problem. Second, the immune system is faced with a strange material coming in huge amounts of micro-particles from the tribology code.

Therefore, great attention to the problem of aseptic loosening has been addressed in special chapters on loosening and on materials currently available for arthroplasty. This book incorporates the experience of numerous experts who explore contemporary opinion of how best to rationalise and optimise the interfaces at total hip replacement to provide the most favourable and durable results. The survival of a total hip replacement depends principally on the enduring integrity of the fixation interfaces and of the articular interface. The design of the stem and the material properties of

cement largely determine the state of the component-cement inter face, while the bone-cement interface is significantly influenced by both mechanical and biological factors. The surface finish and shape of cementless implants are designed to preserve the integrity of biological fixation (osseo-integration) at the bone-component interface. Once again, both mechanical and biological factors have to be considered, while bioactive coatings accelerate bone ongrowth. Metal-on-polyethylene is the most widely used articular interface. However,

it has been suggested that wear of polyethylene is one of the major factors contributing to failure of total hip replacements. The increasing prevalence of total hip replacement in younger patients has stimulated the investigation of alternative, more durable couples - including ceramic-polyethylene, ceramic-ceramic and metal-on-metal. Modularity provides greater intra-operative flexibility, but each new modular interface introduces new mechanisms of failure. These need to be anticipated and appropriate measures taken to avoid them. Hopefully this book will provide a better

understanding of the factors that contribute to stable interfaces and long-term survival of total hip arthroplasty. During the 2011 EFORT Congress in Copenhagen, many interesting topics relating to tribology in total hip arthroplasty were discussed during a special day devoted entirely to the subject. EFORT decided that, given the wide interest in these discussions, publication of the presentations would be warmly welcomed by all fellow professionals who were unable to attend. This book is the result. It provides detailed information on currently used articulating materials and their

wear performance. Clinical outcomes are discussed, and important new frontiers are carefully considered. The 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 comprises select proceedings of the International Conference on Emerging Trends in Mechanical Engineering (ICETME 2018). The book covers various topics of mechanical engineering like computational fluid dynamics, heat transfer, machine dynamics, tribology,

and composite materials. In addition, relevant studies in the allied fields of manufacturing, industrial and production engineering are also covered. The applications of latest tools and techniques in the context of mechanical engineering problems are discussed in this book. The contents of this book will be useful for students, researchers as well as industry professionals. The proven concept of the first edition has been continued in the second edition. Including many new entries and completely revised A trilingual dictionary with more than 4300

entries Offering an indispensable vocabulary of basic medical terminology For physicians, medical students and everybody connected with the medical profession Contains important expressions and phrases, essential for professional success in foreign countries Enabling communication with patients of different nationalities as well as medical report writing in foreign languages Acknowledges the particularities within intricacies of Brazilian Portuguese Total hip arthroplasty, the most commonly performed orthopedic procedure, is used to replace or

reconstruct the hip with an artificial joint. Perspectives in Total Hip Arthroplasty outlines developments in technologies and biomaterials used for this procedure, with a focus on the tribological interactions of the materials used. Part one outlines the history of total hip arthroplasty and goes on to explore advances in techniques and biomaterials. Part two focuses on the tribology of materials used to perform this procedure, explaining the impact of wear on the load-bearing surface, a major cause of failure in hip prostheses. Chapters review a range of materials,

including modern biomaterials, hybrid materials, metal, ceramic, and polyethylene. The book also discusses the tribological interactions of these materials when used in total hip arthroplasty. Perspectives in Total Hip Arthroplasty is a key resource for clinicians, researchers, and academics interested in the tribology of total hip arthroplasty, as well as materials researchers, engineers, and academics concerned with the tribology of biomaterials. Covers techniques from innovative surgeons and designs from multinational manufacturers, as

well as information on improvements in technologies and biomaterials. Discusses the tribology of all the major materials used in total hip arthroplasty. Since the publication of the best-selling first edition, the growing price and environmental cost of energy have increased the significance of tribology. Handbook of Lubrication and Tribology, Volume II: Theory and Design, Second Edition demonstrates how the principles of tribology can address cost savings, energy conservation, and environmental pr Dear Colleague and Participant of Bioceramics in Joint

Arthroplasty 8'h
Biolog" Symposium
It is a pleasure for
us to be able to
present you with
the proceedings of
this Symposium.
This is something
that we are very
proud of, as it is the
first time that we
have been able to
achieve our
objective of
distributing this
collection of all
presentations made
at this Symposium
in a printed form at
this time. The
achievement of this
goal was reached in
great part as a
result of the
excellent
cooperation of all of
the speakers as
well as the
commitment of the
publishing house to
assist us in every
way possible to
meet the strict
deadlines imposed.

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and our own
Symposium
Administrator, Hedi
Kissinger. We
believe that you will
find this book to be
a valuable and
useful addition to
your reference
library. We hope
that within its
covers, you will find
the most up to date
scientific and
clinical information
regarding the use
of ceramic solutions
to address wear
related problems in
Orthopedic
Surgery. "The

replacement of a
degenerated joint
such as the hip and
knee is one of the
most outstanding
interventions that
allows the medical
community to
restore the patient's
quality of life.
However, today's
patient is
increasingly
younger and more
active and this
presents a
challenge for the
orthopaedic
community as a
greater demand has
been created for a
longer lasting
artificial joint that
can allow the
patient to maintain
their lifestyle and
thus new
approaches in
biotribology have
been focused on
this area of
research. This
invaluable book
provides a broad

introduction to the boundary conditions, developments and latest research activities already available to the surgeon and offers an insight into solutions being developed for new high performance bearings in joint replacements. The contributors are leading experts in their field and this is the first complete volume to bring together such unique insights. Orthopaedic engineers, surgeons and researchers concerned with new biomaterials would find this a vital reference volume to evaluate the latest state of research in the area."-- With the constant evolution of implant technology, and

improvement in the production of allograft and bone substitutes, the armamentarium of the orthopaedic surgeon has significantly expanded. In particular, the recent involvement of nanotechnologies opens up the possibilities of new approaches in the interactive interfaces of implants. With many important developments occurring since the first edition of this well-received book, this updated resource informs orthopaedic practitioners on a wide range of biomechanical advances in one complete reference guide. Biomechanics and Biomaterials in

Orthopedics, 2nd edition compiles the most prominent work in the discipline to offer newly-qualified orthopedic surgeons a summary of the fundamental skills that they will need to apply in their day-to-day work, while also updating the knowledge of experienced surgeons. This book covers both basic concepts concerning biomaterials and biomechanics as well as their clinical application and the experience from everyday practical use. This book will be of great value to specialists in orthopedics and traumatology, while also providing an important basis for graduate and

postgraduate learning. During the 2011 EFORT Congress in Copenhagen, many interesting topics relating to tribology in total hip arthroplasty were discussed during a special day devoted entirely to the subject. EFORT decided that, given the wide interest in these discussions,

publication of the presentations would be warmly welcomed by all fellow professionals who were unable to attend. This book is the result. It provides detailed information on currently used articulating materials and their wear performance. Clinical outcomes

are discussed, and important new frontiers are carefully considered. The 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.