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Advanced heat resistant materials are important to achieve the transition to long term sustainable power generation. The global increase in energy consumption and the global warming from greenhouse gas emissions create the need for more sustainable power generation processes. Biomass-fired power plants with higher efficiency could generate more power but also reduce the emission of greenhouse gases, e.g. CO2. Biomass offers no net contribution of CO2 to the atmosphere. To obtain greater efficiency of power plants, one option is to increase the temperature and the pressure in the boiler section of the power plant. This requires improved material properties, such as higher yield strength, creep strength and high-temperature corrosion resistance, as well as structural integrity and safety. Today, some austenitic stainless steels are design to withstand temperatures up to 650 °C in tough environments. Nickel-based alloys are designed to withstand even higher temperatures. Austenitic stainless steels are more cost effective than nickel-based alloys due to a lower amount of expensive alloying elements. However, the performance of austenitic stainless steels at the elevated temperatures of future operation conditions in biomass-red power plants is not yet fully understood. This thesis presents research on the influence of long term high-temperature ageing on mechanical properties, the influence of very slow deformation rates at high-temperature on deformation, damage and fracture, and the influence of high-temperature environment and cyclic operation conditions on the material behaviour. Mechanical and thermal testing have been performed followed by subsequent studies of the microstructure, using scanning electron microscopy, to investigate the material behaviours. Results shows that long term ageing at high temperatures leads to the precipitation of intermetallic phases. These intermetallic phases are brittle at room temperature and become detrimental for the impact toughness of some of the austenitic stainless steels. During slow strain rate tensile deformation at elevated temperature time dependent deformation and recovery mechanisms are pronounced. The creep-fatigue interaction behaviour of an austenitic stainless steel show that dwell time gives shorter life at a lower strain range, but has none or small effect on the life at a higher strain range. Finally, this research results in an increased knowledge of the structural, mechanical and chemical behaviour as well as a deeper understanding of the deformation, damage and fracture mechanisms that occur in heat resistant austenitic alloys at high-temperature environments. It is believed that in the long term, this can contribute to material development achieving the transition to more sustainable power generation in biomass-red power plants.

Additive manufacturing (AM) is a fast-growing sector with the ability to evoke a revolution in manufacturing due to its almost unlimited design freedom and its capability to produce personalised parts locally and with efficient material use. AM companies, however, still face technological challenges such as limited precision due to shrinkage, built-in stresses and limited process stability and robustness. Moreover, often post-processing is needed due to high roughness and remaining porosity. Qualified, trained personnel are also in short supply. In recent years, there have been dramatic improvements in AM design methods, process control, post-processing, material properties and material range. However, if AM is going to gain a significant market share, it must be developed into a true precision manufacturing method. The production of precision parts relies on three principles: Production is robust (i.e. all sensitive parameters can be controlled). Production is predictable (for example, the shrinkage that occurs is acceptable because it can be predicted and compensated in the design). Parts are measurable (as without metrology, accuracy, repeatability and quality assurance cannot be known). AM of metals is inherently a high-energy process with many sensitive and inter-related process parameters, making it susceptible to thermal distortions, defects and process drift. The complete modelling of these processes is beyond current computational power, and novel methods are needed to practicably predict performance and inform design. In addition, metal AM produces highly textured surfaces and complex surface features that stretch the limits of contemporary metrology. With so many factors to consider, there is a significant shortage of background material on how to inject precision into AM processes. Shortage in such material is an important barrier for a wider uptake of advanced manufacturing technologies, and a comprehensive book is thus needed. This book aims to inform the reader how to improve the precision of metal AM processes by tackling the three principles of robustness, predictability and metrology, and by developing computer-aided engineering methods that empower rather than limit AM design. Richard Leach is a professor in metrology at the University of Nottingham and heads up the Manufacturing Metrology Team. Prior to this position, he was at the National Physical Laboratory from 1990 to 2014. His primary love is instrument building, from concept to final installation, and his current interests are the dimensional measurement of precision and additive manufactured structures. His research themes include the measurement of surface topography, the development of methods for measuring 3D structures, the development of methods for controlling large surfaces to high resolution in industrial applications and the traceability of X-ray computed tomography. He is a leader of several professional societies and a visiting professor at Loughborough University and the Harbin Institute of Technology. Simone Carmignato is a professor in manufacturing engineering at the University of Padua. His main research activities are in the

areas of precision manufacturing, dimensional metrology and industrial computed tomography. He is the author of books and hundreds of scientific papers, and he is an active member of leading technical and scientific societies. He has been chairman, organiser and keynote speaker for several international conferences, and received national and international awards, including the Taylor Medal from CIRP, the International Academy for Production Engineering.

Operating at a high level of fuel efficiency, safety, proliferation-resistance, sustainability and cost, generation IV nuclear reactors promise enhanced features to an energy resource which is already seen as an outstanding source of reliable base load power. The performance and reliability of materials when subjected to the higher neutron doses and extremely corrosive higher temperature environments that will be found in generation IV nuclear reactors are essential areas of study, as key considerations for the successful development of generation IV reactors are suitable structural materials for both in-core and out-of-core applications. Structural Materials for Generation IV Nuclear Reactors explores the current state-of-the art in these areas. Part One reviews the materials, requirements and challenges in generation IV systems. Part Two presents the core materials with chapters on irradiation resistant austenitic steels, ODS/FM steels and refractory metals amongst others. Part Three looks at out-of-core materials. Structural Materials for Generation IV Nuclear Reactors is an essential reference text for professional scientists, engineers and postgraduate researchers involved in the development of generation IV nuclear reactors. Introduces the higher neutron doses and extremely corrosive higher temperature environments that will be found in generation IV nuclear reactors and implications for structural materials Contains chapters on the key core and out-of-core materials, from steels to advanced micro-laminates Written by an expert in that particular area

Woldman's Engineering Alloys

Volume 2: Aerospace Material Technologies

Chapter 7.2. Mechanical Properties of Bioceramic Coatings on Medical Implants

Aerospace Materials and Material Technologies

Fatigue of Structures and Materials

Theoretical and practical interests in additive manufacturing (3D printing) are growing rapidly. Engineers and engineering companies now use 3D printing to make prototypes of products before going for full production. In an educational setting faculty, researchers, and students leverage 3D printing to enhance project-related products. Additive Manufacturing Handbook focuses on product design for the defense industry, which affects virtually every other industry. Thus, the handbook provides a wide range of benefits to all segments of business, industry, and government. Manufacturing has undergone a major advancement and technology shift in recent years.

Challenges in Mechanics of Time-Dependent Materials, Volume 2 of the Proceedings of the 2018 SEM Annual Conference& Exposition on Experimental and Applied Mechanics, the second volume of eight from the Conference, brings together contributions to this important area of research and engineering. The collection presents early findings and case studies on fundamental and applied aspects of Experimental Mechanics, including papers in the following general technical research areas: Characterization Across Length Scales Extreme Environments & Environmental Effects Soft Materials Damage, fatigue and Fracture Inhomogeneities & Interfaces Viscoelasticity Research in Progress

Fatigue failure is a multi-stage process. It begins with the initiation of cracks, and with continued cyclic loading the cracks propagate, finally leading to the rupture of a component or specimen. The demarcation between the above stages is not well-defined. Depending upon the scale of interest, the variation may span three orders of magnitude. For example, to a material scientist an initiated crack may be of the order of a micron, whereas for an engineer it can be of the order of a millimetre. It is not surprising therefore to see that investigation of the fatigue process has followed different paths depending upon the scale of phenomenon under investigation. Interest in the study of fatigue failure increased with the advent of industrial ization. Because of the urgent need to design against fatigue failure, early investiga tors focused on prototype testing and proposed failure criteria similar to design formulae. Thus, a methodology developed whereby the fatigue theories were proposed based on experimental observations, albeit at times with limited scope. This type of phenomenological approach progressed rapidly during the past four decades as closed-loop testing machines became available.

Product Development for the Defense Industry

Uniform Building Code

Untersuchung und Modellierung des viskoplastischen Verformungsverhaltens oxidpartikelverstaerkter Staehle

High Temperature Oxidation and Corrosion of Metals

High Temperature Coatings

Describes the weldability aspects of structural materials used in a wide variety of engineering structures, including steels, stainless steels, Ni-base alloys, and Al-base alloys Welding Metallurgy and Weldability describes weld failure mechanisms associated with either fabrication or service, and failure mechanisms related to microstructure of the weldment. Weldability issues are divided into fabrication and service related failures; early chapters address hot cracking, warm (solid-state) cracking, and cold cracking that occur during initial fabrication, or repair. Guidance on failure analysis is also provided, along with examples of SEM fractography that will aid in determining failure mechanisms. Welding Metallurgy and Weldability examines a number of weldability testing techniques that can be used to quantify susceptibility to various forms of weld cracking. Describes the mechanisms of weldability along with methods to improve weldability Includes an introduction to weldability testing and techniques, including strain-to-fracture and Varestraint tests Chapters are illustrated with practical examples based on 30 plus years of experience in the field Illustrating the weldability aspects of structural materials used in a wide variety of engineering structures, Welding Metallurgy and Weldability provides engineers and students with the information needed to understand the basic concepts of welding metallurgy and to interpret the failures in welded components. Advanced Fracture Mechanics and Structural Integrity is organized to cover quantitative descriptions of crack growth and fracture phenomena. The mechanics of fracture are explained, emphasizing elastic-plastic and time-dependent fracture mechanics. Applications are presented, using examples from power generation, aerospace, marine, and chemical industries, with focus on predicting the remaining life of structural components and advanced testing metods for structural materials. Numerous examples and end-of-chapter

problems are provided, along with references to encourage further study.The book is written for use in an advanced graduate course on fracture mechanics or structural integrity.

Annotation New edition of a reference that presents the values of properties typical for the most common alloy processing conditions, thus providing a starting point in the search for a suitable material that will allow, with proper use, all the necessary design limitations to be met (strength, toughness, corrosion resistance and electronic properties, etc.) The data is arranged alphabetically and contains information on the manufacturer, the properties of the alloy, and in some cases its use. The volume includes 32 tables that present such information as densities, chemical elements and symbols, physical constants, conversion factors, specification requirements, and compositions of various alloys and metals. Also contains a section on manufacturer listings with contact information. Edited by Frick, a professional engineering consultant. Annotation c. Book News, Inc., Portland, OR (booknews.com).

Characterization of Biomaterials

High Temperature Creep-fatigue

Low-cycle Thermal Fatigue

Fatigue at High Temperature

Fatigue of structures and materials covers a wide scope of different topics. The purpose of the present book is to explain these topics, to indicate how they can be analyzed, and how this can contribute to the designing of fatigue resistant structures and to prevent structural fatigue problems in service. Chapter 1 gives a general survey of the topic with brief comments on the signi?cance of the aspects involved. This serves as a kind of a program for the following chapters. The central issues in this book are predictions of fatigue properties and designing against fatigue. These objectives cannot be realized without a physical and mechanical understanding of all relevant conditions. In Chapter 2 the book starts with basic concepts of what happens in the material of a structure under cyclic loads. It illustrates the large number of variables which can affect fatigue properties and it provides the essential background knowledge for subsequent chapters. Different subjects are presented in the following main parts: • Basic chapters on fatigue properties and predictions (Chapters 2–8) • Load spectra and fatigue under variable-amplitude loading (Chapters 9–11) • Fatigue tests and scatter (Chapters 12 and 13) • Special fatigue conditions (Chapters 14–17) • Fatigue of joints and structures (Chapters 18–20) • Fiber-metal laminates (Chapter 21) Each chapter presents a discussion of a speci?c subject.

This book provides a perspective on the research, development, and manufacturing aspects of structural materials in India. The contents highlight materials to strengthen technology advancements in sectors like aerospace, defense, automotive, energy, health, and ICT. With the momentum of the 'Make in India' initiative, India has seen an increase in manufacturing of advanced components for these sectors. The vast field of materials covers a whole gamut including structural materials such as metals like steel, aluminum, titanium, polymers, glass, cement and composites; functional materials such photovoltaics, and smart materials are also discussed. This anthology focuses on structural materials and studies, in particular, the Indian landscape of manufacturing capability, R&D capability and status of advanced structural materials compared to the rest of the world. This study highlights the gaps and suggests necessary actions in the national landscape of structural materials, given the pull that will come from the burgeoning advanced components manufacturing over the next 10-15 years. The scope of this study is limited to structural materials covering metals and alloys, structural polymers, cement, glass, composites and high temperature ceramics. The contents of this book will be useful to researchers, industry professionals, and policy makers alike.

Ferritisch-martensitische Stähle sind etablierte Strukturmaterialien für den Hochtemperatureinsatz. Charakteristisch ist jedoch die kontinuierliche Abnahme der Festigkeit unter zyklischer Belastung. Auf Basis einer umfassenden mechanischen Charakterisierung des Materials wurde ein gekoppeltes, viskoplastisches Materialmodell entwickelt, dass die zyklische Entfestigung und Lebensdauer ferritisch-martensitischer Stähle unter kombinierter Kriech- und Ermüdungsbelastung beschreiben kann. - Ferritic-martensitic steels are established structural materials for high-temperature applications. However, these steels show characteristic softening under cyclic loading. Based on a comprehensive mechanical characterization, a coupled viscoplastic model was established to describe cyclic softening and lifetime of ferritic-martensitic steels under combined creep-fatigue loading.

ICAF 2011 Structural Integrity: Influence of Efficiency and Green Imperatives

Report of Investigations

Proceedings of the International Conference on Low-Energy Dislocation Structures, University of Virginia, School of Engineering and Applied Science, Charlottesville, Virginia, August 10-14, 1986

Medical Textile Materials

Sodium Fast Reactors with Closed Fuel Cycle

This book serves as a comprehensive resource on various traditional, advanced and futuristic material technologies for aerospace applications encompassing nearly 20 major areas. Each of the chapters addresses scientific principles behind processing and production, production details, equipment and facilities for industrial production, and finally aerospace application areas of these material technologies. The chapters are authored by pioneers of industrial aerospace material technologies. This book has a well-planned layout in 4 parts. The first part deals with primary metal and material processing, including nano manufacturing. The second part deals with materials characterization and testing methodologies and technologies. The third part addresses structural design. Finally, several advanced material technologies are covered in the fourth part. Some key advanced topics such as "Structural Design by ASIP", "Damage Mechanics-Based Life Prediction and Extension" and "Principles of Structural Health Monitoring" are dealt with at equal length as the traditional aerospace materials technology topics. This book will be useful to students, researchers and professionals working in the domain of aerospace materials.

This book is concerned with providing a fundamental basis for understanding the alloy-gas oxidation and corrosion reactions observed in practice and in the laboratory. Starting with a review of the enabling thermodynamic and kinetic theory, it analyzes reacting systems of increasing complexity. It considers in turn corrosion of a pure metal by a single oxidant and by multi-oxidant gases, followed by corrosion of alloys producing a single oxide then multiple reaction products. The concept of "diffusion paths" is used in describing the distribution of products in reacting systems, and diffusion data is used to predict reaction rates whenever possible.

The papers presented in High Temperature Structural Design, ESIS Publication 12, are the reviewed and revised versions of the lectures presented at the eponymous Venice Conference. This conference was deliberately tailored to include all industrial areas where high temperature structural integrity problems are encountered, and an effort was made to cover several different aspects of structural design, including material modelling and experience feedback, and to achieve a cross-fertilization of ideas between different application areas. The twenty two papers are grouped together under four headings, namely Design Practice, Stress and Strain Analysis Methods, damage Evaluation, and, finally, In-Service Experience. Representing the current state-of-the-art in high temperature structural design, this volume can be wholeheartedly recommended, not only to engineering designers, but also to physicists and to materials scientists concerned with the integrity of structures at high temperatures in all areas of industry.

Untersuchung und Modellierung des Haltezeiteinflusses auf die zyklische Entfestigung ferritisch-martensitischer Stähle

Additive Manufacturing Handbook

Damage Mechanisms and Life Assessment of High Temperature Components

Behavior of Materials Under Conditions of Thermal Stress

Challenges in Mechanics of Time-Dependent Materials, Volume 2

Medical Textile Materials provides the latest information on technical textiles and how they have found a wide range of medical applications, from wound dressings and sutures, to implants and tissue scaffolds. This book offers a systematic review of the manufacture, properties, and applications of these technical textiles. After a brief introduction to the human body, the book gives an overview of medical textile products and the processes used to manufacture them. Subsequent chapters cover superabsorbent textiles, functional wound dressings, bandages, sutures, implants, and other important medical textile technologies. Biocompatibility testing and regulatory control are then addressed, and the book finishes with a review of research and development strategy for medical textile products. Provides systematic and comprehensive coverage of the manufacture, properties, and applications of medical textile materials Covers recent developments in medical textiles, including antimicrobial dressings, drug-releasing materials, and superabsorbent textiles Written by a highly knowledgeable author with extensive experience in industry and academia

This book provides an overview of state-of-the-art research on “Systems and Optimization Aspects of Smart Grid Challenges.” The authors have compiled and integrated different aspects of applied systems optimization research to smart grids, and also describe some of its critical challenges and requirements. The promise of a smarter electricity grid could significantly change how consumers use and pay for their electrical power, and could fundamentally reshape the current Industry. Gaining increasing interest and acceptance, Smart Grid technologies combine power generation and delivery systems with advanced communication systems to help save energy, reduce energy costs and improve reliability. Taken together, these technologies support new approaches for load balancing and power distribution, allowing optimal runtime power routing and cost management. Such unprecedented capabilities, however, also present a set of new problems and challenges at the technical and regulatory levels that must be addressed by Industry and the Research Community.

Precision Metal Additive ManufacturingCRC Press

Thermomechanical Fatigue Behavior of Materials

Advanced Fracture Mechanics and Structural Integrity

Chiave dell'acciaio

Proceedings of the 2019 Annual Conference on Experimental and Applied Mechanics

Fatigue Damage, Crack Growth and Life Prediction

A review is presented of available information on the behavior of brittle and ductile materials under conditions of thermal stress and thermal shock. For brittle materials, a simple formula relating physical properties to thermal-shock resistance are derived and used to determine the relative significance of two indices currently in use for rating materials. The importance of simulating operating conditions in thermal-shock testing is deduced from the formula and is experimentally illustrated by showing that BeO could be both inferior or superior to Al2O3 in thermal shock depending on the testing conditions. For ductile materials, thermal-shock resistance depends upon the complex interrelation among several metallurgical variables which seriously affect strength and ductility. These variables are briefly discussed and illustrated from literature sources. The importance of simulating operating conditions in tests for rating ductile materials is especially to be emphasized because of the importance of testing conditions in metallurgy. A number of practical methods that have been used to minimize the deleterious effects of thermal stress and thermal shock are outlined.

High Temperature Coatings, Second Edition, demonstrates how to counteract the thermal effects of rapid corrosion and degradation of exposed materials and equipment that can occur under high operating temperatures. This is the first true practical guide on the use of thermally protective coatings for high-temperature applications, including the latest developments in materials used for protective coatings. It covers the make-up and behavior of such materials under thermal stress and the methods used for applying them to specific types of substrates, as well as invaluable advice on inspection and repair of existing thermal coatings. With his long experience in the aerospace gas turbine industry, the author has compiled the very latest in coating materials and coating technologies, as well as hard-to-find guidance on maintaining and repairing thermal coatings, including appropriate inspection protocols. The book is supplemented with the latest reference information and additional support to help readers find more application- and industry-type coatings specifications and uses. Offers an overview of the underlying fundamental concepts of thermally-protective coatings, including thermodynamics, energy kinetics, crystallography and equilibrium phases Covers essential chemistry and physics of underlying substrates, including steels, nickel-iron alloys, nickel-cobalt alloys and titanium alloys Provides detailed guidance on a wide variety of coating types, including those used against high temperature corrosion and oxidative degradation and thermal barrier coatings

The design of biomedical devices almost always involves some form of mechanical characterization of biomaterials. This chapter

provides a broad overview of experimental methods and important considerations for mechanical characterization of biomaterials, with special attention to the practical needs of engineers and scientists who encounter a need to characterize the mechanical properties of a biomaterial but may not know where to begin or what the key considerations should be. Many details are necessarily omitted from this broad overview, but numerous references are provided for greater technical depth on a particular topic, standardized methodologies, and exemplary studies. Fundamental concepts are introduced, beginning with stress and strain versus force and displacement. The mechanical properties measured from a stress – strain curve, different types of stress – strain curves, and corresponding constitutive models are reviewed, including differences in material classes and anisotropy. Three primary methods of analysis for fracture mechanics are introduced, including stress concentrations, energy criteria for crack initiation and propagation (fracture toughness), and statistical methods for the probability of fracture. The mechanical characterization of biomaterials begins with selection and preparation of standardized test specimens, which are critical to obtaining accurate and reproducible measurements of material properties. Practical considerations are outlined for selection and preparation of the specimen size, geometry, surface finish, and precracking. The mechanical characterization of biomaterial test specimens always involves the application and measurement of load and deformation. Practical considerations are outlined for the selection and use of load frames, load cells, load fixtures, extensometers, and strain gauges. A number of common loading modes are introduced and compared: uniaxial tension, uniaxial compression, biaxial tension, torsion, diametral compression, three-point bending, four-point bending, and in-plane shear (including biomaterial-tissue interfacial shear strength). Strain-rate sensitivity or time-dependent behavior can profoundly influence stress – strain behavior and thus measured mechanical properties. The effects of high strain rates may be characterized by impact testing using a pendulum, drop tower, or split Hopkinson pressure bar. The effects of low strain rates may be characterized by creep deformation or creep rupture tests. The time-dependent behavior of viscoelastic materials is introduced, including creep, stress relaxation, common constitutive models, and practical considerations for testing. The frequency of loading, or cyclic loading, is another aspect of time-dependent behavior, which is critical for mechanical characterization of biomaterials, leading to fatigue deformation and failure or viscoelastic creep and stress relaxation. Practical considerations are described for selecting the waveform, frequency, cyclic stress/strain levels, loading mode, and test duration. Common methods are introduced for fatigue lifetime testing (including S-N curves, notch factors, and fatigue damage), fatigue crack propagation, and dynamic mechanical analysis (DMA). Nondestructive tests are particularly useful for sampling small volumes of a biomaterial (e.g., implant retrieval or biopsy) or characterizing spatial heterogeneity in mechanical properties. Various indentation tests and indenter geometries are introduced and compared, including classic hardness (Brinell and Rockwell), microhardness (Knoop and Vickers), and instrumented nanoindentation (Berkovich, cube corner, etc.). Methods and limitations are described for characterizing the reduced modulus, viscoelasticity, and fracture toughness using indentation. Ultrasonic wave-propagation methods are also introduced with an emphasis on methods for characterizing anisotropic elastic constants. Biomaterials are typically subjected to various sterilization methods prior to service and an aqueous physiological environment in service. Therefore, the effects of temperature, pressure, various aqueous media (water, phosphate buffered saline (PBS), media, foetal bovine serum (FBS), lipids, etc.), and irradiation on mechanical characterization of biomaterials are considered, including the degradation of mechanical properties by various mechanisms involving water uptake, hydrolysis, and oxidation. Finally, methods and guidelines are provided for data acquisition from transducers and data analysis, including an introduction to some basic statistical methods.

Structural Materials for Generation IV Nuclear Reactors

Proceedings of the 2018 Annual Conference on Experimental and Applied Mechanics

Nonlinear Fracture Mechanics for Engineers

Elements of Metallurgy and Engineering Alloys

Microstructure-sensitive Design for Performance Optimization

The accelerating rate at which new materials are appearing, and transforming the engineering world, only serves to emphasize the vast potential for novel material structure and related performance. Microstructure Sensitive Design for Performance Optimization (MSDPO) embodies a new methodology for systematic design of material microstructure to meet the requirements of design in optimal ways. Intended for materials engineers and researchers in industry, government and academia as well as upper level undergraduate and graduate students studying material science and engineering, MSDPO provides a novel mathematical framework that facilitates a rigorous consideration of the material microstructure as a continuous design variable in the field of engineering design. Presents new methods and techniques for analysis and optimum design of materials at the microstructure level. Authors' methodology introduces spectral approaches not available in previous texts, such as the incorporation of crystallographic orientation as a variable in the design of engineered components with targeted elastic properties. Numerous illustrations and examples throughout the text help readers grasp the concepts.

Proceedings of the 26th Symposium of the International Committee on Aeronautical Fatigue are a widely referenced summary of advances in aeronautical design against fatigue. This is a bi-annual event and the proceedings have been published in book form for over 35 years.

Challenges in Mechanics of Time-Dependent Materials, Volume 2 of the Proceedings of the 2019 SEM Annual Conference& Exposition on Experimental and Applied Mechanics, the second volume of six from the Conference, brings together contributions to this important area of research and engineering. The collection presents early findings and case studies on fundamental and applied aspects of Experimental Mechanics, including papers in the following general technical research areas: Characterization Across Length Scales Extreme Conditions & Environmental Effects Soft Materials and Biomaterials Damage, Fatigue and Fracture Structure, Function and Performance Rate Effects in Elastomers Viscoelasticity & Viscoplasticity Research in Progress In-situ Techniques and Microscale Effects on Mechanical Behavior Fracture and Fatigue in Brittle Materials Novel Experimental Methods Fatigue and Fracture in Extreme Environments Integration of Models and Experiments Failure in Elastomers and Gels Rate Effects in Elastomers Microscale and Microstructural Effects on Mechanical Behavior Mechanics of Energy Materials Additive Manufacturing: Fatigue and Fracture Mechanics of Composite Materials Interfacial and Mixed-Mode Fracture Vibration Effects and High Cycle Fatigue

Proceedings of the 26th Symposium of the International Committee on Aeronautical Fatigue, Montreal, Canada, 1-3 June 2011

Challenges in Mechanics of Time Dependent Materials, Fracture, Fatigue, Failure and Damage Evolution, Volume 2
Oxidation Mechanisms of Materials for Heat Exchanging Components in CO2/H2O-containing Gases Relevant to Oxy-fuel Environments
On High-Temperature Behaviours of Heat Resistant Austenitic Alloys
Optimization and Security Challenges in Smart Power Grids

In joint replacement surgery with suboptimal bone, allograft materials are often used to achieve biological fixation of the metallic implant to the host bone and reducing the implant fixation time. The most commonly used techniques are cemented and hydroxyapatite (HA)-coated metallic implants. Typically, HA coatings are suggested for patients with better bone stock, whereas recommended implant fixation process for most other osteoporotic patients is bone cements. In general, there is a long-standing need to improve the performance of hip and other devices for longer in vivo implant lifetime that can help in reducing the number of revision surgeries, as well as minimizing physical and mental trauma to the patient. To achieve these goals, it is important to understand the mechanical and biological properties of coatings that can influence not only its short- and long-term bioactivity but also life span in vivo. Over the years, it has been recognized that the stability of a coated implant is governed by its physical and mechanical properties. A coating that separates from the implant provides no advantage over an uncoated implant and undesirable due to problems with debris materials, which can lead to osteolysis. Therefore, it is important to properly characterize the coated implants in terms of its physical and mechanical properties. In this chapter, specific details on coating characterization techniques including sample dimensions, sample preparation, experimental procedure and data interpretation are discussed. In particular, the standards and requirements of regulatory organizations are presented elucidating the significance and use of each characterization. It is important to appreciate that mechanical properties of coatings can only be determined with certain coating specification such as coating thickness. This chapter is designed even for non-experts to follow mechanical property characterizations of coatings on medical implants.

This practical reference provides thorough and systematic coverage on both basic metallurgy and the practical engineering aspects of metallic material selection and application.

Fracture mechanics is an essential tool for engineers in a number of different engineering disciplines. For example, an engineer in a metals- or plastics-dependent industry might use fracture mechanics to evaluate and characterize materials, while another in aerospace or construction might use fracture mechanics-based methods for product design and service life-time estimation. This balanced treatment, which covers both applied engineering and mathematical aspects of the topic, provides a much-needed multidisciplinary treatment of the field suitable for the many diverse applications of the subject. While texts on linear elastic fracture mechanics abound, no complete treatments of the complex topic of nonlinear fracture mechanics have been available in a textbook format - until now. Written by an author with extensive industry credentials as well as academic experience, Nonlinear Fracture Mechanics for Engineers examines nonlinear fracture mechanics and its applications in mechanics, materials testing, and life prediction of components. The book includes the first-ever complete examination of creep and creep-fatigue crack growth. Examples and problems reinforce the concepts presented. A complete chapter on applications and case studies involving nonlinear fracture mechanics completes this thorough evaluation of this dynamic field of study.

High Temperature Structural Design (ESIS Publication 12)
Future Landscape of Structural Materials in India
Low-energy Dislocation Structures
Welding Metallurgy and Weldability
Proceedings of Fatigue, Durability and Fracture Mechanics

This book presents the proceedings of Fatigue Durability India 2016, which was held on September 28–30 at J N Tata Auditorium, Indian Institute of Science, Bangalore. This 2nd International Conference & Exhibition brought international industrial experts and academics together on a single platform to facilitate the exchange of ideas and advances in the field of fatigue, durability and fracture mechanics and its applications. This book comprises articles on a broad spectrum of topics from design, engineering, testing and computational evaluation of components and systems for fatigue, durability, and fracture mechanics. The topics covered include interdisciplinary discussions on working aspects related to materials testing, evaluation of damage, nondestructive testing (NDT), failure analysis, finite element modeling (FEM) analysis, fatigue and fracture, processing, performance, and reliability. The contents of this book will appeal not only to academic researchers, but also to design engineers, failure analysts, maintenance engineers, certification personnel, and R&D professionals involved in a wide variety of industries.

Sodium Fast Reactors with Closed Fuel Cycle delivers a detailed discussion of an important technology that is being harnessed for commercial energy production in many parts of the world. Presenting the state of the art of sodium-cooled fast reactors with closed fuel cycles, this book:Offers in-depth coverage of reactor physics, materials, design, s

Precision Metal Additive Manufacturing
Chapter 3. Mechanical Characterization of Biomaterials