Plastic Deformation At High Strain Rates Springer Pdf Pdf

Plastic Deformation At High Strain Rates Springer Pdf Pdf - **plastic deformation at high strain rates springer pdf pdf** Book Review: Unveiling the Power of Words

In a world driven by information and connectivity, the energy of words has become more evident than ever. They have the ability to inspire, provoke, and ignite change. Such may be the essence of the book **plastic deformation at high strain rates springer pdf pdf**, a literary masterpiece that delves deep in to the significance of words and their affect our lives. Compiled by a renowned author, this captivating work takes readers on a transformative journey, unraveling the secrets and potential behind every word. In this review, we will explore the book is key themes, examine its writing style, and analyze its overall affect readers.

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Materials at High Strain Rates T.Z. Blazynski 1987-07-31
Mechanics of Composite Materials and Structures Carlos A. Mota Soares 1999-08-31 A compact presentation of the foundations, current state of the art, recent developments and research directions of all essential techniques related to the mechanics of composite materials and structures. Special emphasis is placed on classic and recently developed theories of composite laminated beams, plates and shells, micromechanics, impact and damage analysis, mechanics of textile structural composites, high strain rate testing and non-destructive testing of composite materials and structures. Topics of growing importance are addressed, such as: numerical methods and optimisation, identification and damage monitoring. The latest results are presented on the art of modelling smart composites, optimal design with advanced materials, and industrial applications. Each section of the book is written by internationally recognised experts who have dedicated most of their research work to a particular field. Readership: Postgraduate students, researchers and engineers in the field of composites. Undergraduate students will benefit from the treatment of the foundations of the mechanics of composite materials and structures.
Superplasticity of Alloys, Intermetallides and Ceramics Oscar A. Kaibyshev 2012-12-06 Superplasticity is shown to be a universal phenomenon in materials ranging from metals and intermetallics to ceramics. Superplastic deformation facilitates the production of materials with specifically chosen properties. This is illustrated using the examples of Mg-, Al-, and Ti-based commercial alloys, steels, and superalloys. Some of the strenghts of this book are: the broad range of materials studied, the reduction of scientific results to a form suitable for the practitioner, a profound physical analysis of the phenomenon, a new approach to superplastic treatment as a kind of strain-heat treatment, the presentation of new data on superplastic flow and on production techniques of micro- and submicrocrystalline structures.
Dislocation Dynamics and Plasticity Taira Suzuki 2013-03-07 In the 1950s the direct observation of dislocations became possible, stimulat ing the interest of many research workers in the dynamics of dislocations. This led to major contributions to the understanding of the plasticity of various crys talline materials. During this time the study of metals and alloys of fcc and hcp structures developed remarkably. In particular, the discovery of the so-called in ertial effect caused by the electron and phonon frictional forces greatly influenced the quantitative understanding of the strength of these metallic materials. Statis tical studies of dislocations moving through random arrays of point obstacles played an important role in the above advances. These topics are described in Chaps. 2-4. Metals and alloys with bcc structure have large Peierls forces compared to those with fcc structure. The reasons for the delay in studying substances with bcc structure were mostly difficulties connected with the purification techniques and with microscopic studies of the dislocation core. In the 1970s, these difficulties were largely overcome by developments in experimental techniques and computer physics. Studies of dislocations in ionic and covalent bonding materials with large Peierls forces provided infonnation about the core structures of dislocations and their electronic interactions with charged particles. These are the main subjects in Chaps. 5-7.

Unified Plasticity for Engineering Applications Sol R. Bodner 2012-12-06 Considerably simplified models of macroscopic material behavior, such as the idealization for metals of elastic-time independent plastic response with a yield (onset) criterion, have served the engineering profession well for many years. They are still basic to the design and analysis of most structural applications. In the need to use materials more effectively, there are circumstances where those traditional models are not adequate, and constitutive laws that are more physically realistic have to be employed. This is especially relevant to conditions where the inherent time dependence of inelastic deformations, referred to as "viscoplasticity", is pronounced such as at elevated temperatures and for high strain rates. Unified theories of elastic-viscoplastic material behavior, which are primarily applicable for metals and metallic alloys, combine all aspects of inelastic response into a set of time dependent equations with a single inelastic strain rate variable. For such theories, creep under constant stress, stress relaxation under constant strain, and stress-strain relations at constant rates are each special cases of a general formulation. Those equations mayor may not include a yield criterion, but models which do not separate a fully elastic region from the overall response could be considered "unified" in a more general sense. The theories have reached a level of development and maturity where they are being used in a number of sophisticated engineering applications. However, they have not yet become a standard method of material representation for general engineering practice.

Modelling Hot Deformation of Steels John G. Lenard 2013-04-17 Computer Aided Engineering may be defined as an approach to solving tech nological problems in which most or all of the steps involved are automated through the use of computers, data bases and mathematical models. The success of this ap proach, considering hot forming, is tied very directly to an understanding of material behaviour when subjected to deformation at high temperatures. There is general agreement among engineers that not enough is known about that topic -and this gave the initial impetus for the project described in the present study. The authors secured a research grant from NATO (Special Research Grant #390/83) with a mandate to study the "State-of-the-Art of Controlled Rolling". What follows is the result of that study. There are five chapters in this Monograph. The first one, entitled "State-of-the Art of Controlled Rolling" discusses industrial and laboratory practices and research designed to aid in the development of microalloyed steels of superior quality. Follow ing this is the chapter "Methods of Determining Stress-Strain Curves at Elevated Temperatures". The central concern here is the material's resistance to deformation or in other words, its flow strength, the knowledge of which is absolutely essential for the efficient and economical utilization of the computers controlling the rolling process.

Macro- and Micro-Mechanics of High Velocity Deformation and Fracture Kozo Kawata 2012-12-06 The IUTAM Symposium on Macro- and Micro-Mechanics of High Velocity Deformation and Fracture (MMMHVDF) (August 12 - 15, 1985) was held at Science Council of Japan, under the sponsor ship of IUTAM, Science Council of Japan, Japan Society for the Promotion of Science, The Commemorative Association for the Japan World Exposition (1970), and The Japan Society for Aeronautical and Space Sciences. The proposal of the symposium was accepted by the General Assembly of IUTAM, and the scientists mentioned below were appointed by the Bureau of IUTAM to serve as member of the Scientific Committee. The main object of the Symposium was to make a general survey of recent developments in the re search of high velocity solid mechanics and to explore further new ideas for dealing with unsettled problems, of fundamental nature as well as of practical importance. The subjects covered theoretical, experimental, and numerical fields in macro- and micro-mechanics associated with high velocity de formatio~ and fracture in soldis, covering metals, ceramics, polymers, and composites.

Shock Waves and High-Strain-Rate Phenomena in Metals Mare Meyers 2012-12-06 The scientific understanding of high-velocity deformation has advanced substantially during the past decade. On the one hand, the framework for a theory explaining the metallurgical effects of shock waves is beginning to take shape; on the other hand, the technological applications of high strain-rate processes have found their way into industries in countries around the world. Ex plosive cladding, welding, forming, compaction and consolidation, cutting, and hardening, in addition to high energy-rate deformation processes using other energy sources, are some of the topics of contemporary technological importance. Metallurgical effects are of the utmost importance in both the scientific understanding of the phenomena involved, and in the successful development and utilization of the associated applications. The international conference upon which this book is based had as its major objectives the acceleration of progress in the field of high-strain rate deformation and fabrication, including applications, by providing a forum for the exchange of state-of-the art information on the metallurgical effects of high strain-rate deformation and fabrication; and the organization of this informa tion into a timely and coherent body of knowledge focused around significant areas and applications. This volume is a manifestation of these objectives. In addition, the contents of this book were organized to provide for a somewhat logical perspective of the fundamentals, development, and state-of-the-art applications of high strain-rate and shock phenomena.

Rock Friction and Earthquake Prediction WYSS 2012-12-06

Investigations and Applications of Severe Plastic Deformation Terry C. Lowe 2012-12-06 Material processing techniques that employ severe plastic deformation have evolved over the past decade, producing metals, alloys and composites having extraordinary properties. Variants of SPD methods are now capable of creating monolithic materials with submicron and nanocrystalline grain sizes. The resulting novel properties of these materials has led to a growing scientific and commercial interest in them. They offer the promise of bulk nanocrystalline materials for structural; applications, including nanocomposites of lightweight alloys with unprecedented strength. These materials may also enable the use of alternative metal shaping processes, such as high strain rate superplastic forming. Prospective applications for medical, automotive, aerospace and other industries are already under development.

High Strain Rate Behavior of Nanocomposites and Nanocoatings Prashant Jindal 2014-12-30 This book describes the use of multiwall carbon nanotubes as composites with polycarbonates and as protective coatings on glass surfaces. The book explains fabrication and characterization methods for these composites and coatings. The author reports on the use of Split Hopkinson Pressure Bar set up for evaluating the dynamic strength of these composites and coatings and studying the role of carbon nanotubes in the enhancement of their dynamic strength.

Dynamics of Materials Lili Wang 2019-07-25 Dynamics of Materials: Experiments, Models and Applications addresses the basic laws of high velocity flow/deformation and dynamic failure of materials under dynamic loading. The book comprehensively covers different perspectives on volumetric law, including its macro-thermodynamic basis, solid physics basis, related dynamic experimental study, distortional law, including the rate-dependent macro-distortional law reflecting strain-rate effect, its micro-mechanism based on dislocation dynamics, and dynamic experimental research based on the stress wave theory. The final section covers dynamic failure in relation to dynamic damage evolution, including the unloading failure of a crack-free body, dynamics of cracks under high strain-rate, and more. Covers models for applications, along with the fundamentals of the mechanisms behind the models Tackles the difficult interdisciplinary nature of the subject, combining macroscopic continuum mechanics with thermodynamics and macro-mechanics expression with micro-physical mechanisms Provides a review of the latest experimental methods for the equation of state for solids under high pressure and the distortional law under high strain-rates of materials

Microstructure and Texture in Steels Arunansu Haldar 2009-09-03 Microstructure and Texture in Steels and Other Materials comprises a collection of articles pertaining to experimental and theoretical aspects of the evolution of crystallographic texture and microstructure during processing of steels and some other materials. Among the topics covered is the processing-microstructure-texture-property relationship in various kinds of steels, including the latest grade. Special emphasis has been given to introduce recent advances in the characterization of texture and microstructure, as well as modeling. The papers included are written by well-known experts from academia and industrial R and D, which will provide the reader with state-of-the-art, in-depth knowledge of the subject. With these attributes, Microstructure and Texture in Steels and Other Materials is expected to serve the cause of creating awareness of current developments in microstructural science and materials engineering among academic and R and D personnel working in the field.

Advanced Materials Modelling for Structures Holm Altenbach 2013-02-05 This volume presents the major outcome of the IUTAM symposium on “Advanced Materials Modeling for Structures”. It discusses advances in high temperature materials research, and also to provides a discussion the new horizon of this fundamental field of applied mechanics. The topics cover a large domain of research but place a particular emphasis on multiscale approaches at several length scales applied to non linear and heterogeneous materials. Discussions of new approaches are emphasised from various related disciplines, including metal physics, micromechanics, mathematical and computational mechanics.

Material Behavior Under High Stress and Ultrahigh Loading Rates John Mescall 2013-03-07 The Army Materials and Mechanics Research Center in coopera tion with the Materials Science Group of the Department of Chemical Engineering and Materials Science of Syracuse University has been conducting the Annual Sagamore Army Materials Research Conference since 1954. The specific purpose of these conferences has been to bring together scientists and engineers from academic institutions, industry, and government who are uniquely qualified to explore in depth a subject of importance to the Department of Defense, the Army, and the scientific community. The proceedings of this conference, entitled MATERIAL BEHAVIOR UNDER HIGH STRESS AND ULTRAHIGH LOADING RATES, will be published in two parts. The topics covered in the present volume include dynamic plasticity, adiabatic shear/localized deformation, and dynamic fracture mechanics. Papers dealing with ordnance applica tions, projectile launch environment, and recent work-in-progress will appear as an AMMRC Technical Report and will have more limited distribution in accordance with recent Army guidelines. The Conference Chairmen are particularly grateful to the members of the Program Committee. We wish also to acknowledge the assistance of Mr. Charles Polley of the Army Materials and Mechanics Research Center, Mr. Robert Sell, Ms. Helen Brown DeMascio, and Ms. Mary Ann Holmquist of Syracuse University throughout the con ference planning stages and the publication of the text. The continued active interest in and support of these confer ences by Dr. E. Wright and Col. George Sibert, Direct and Deputy Director/Commander, respectively, of the Army Materials and Mechan ics Research Center, is appreciated.

Plastic Deformation in Nanocrystalline Materials M. Yu. Gutkin 2004-04-08 The purpose of this book is to serve as both an introductory course on the nanomechanics of deformed nanostructures and as a monograph providing a systematic overview of the current state of the art concerning the structure and deformation behavior of nanocrystalline materials. It is primarily concerned with up-to-date theoretical concepts and key experimental data on defects and plastic deformation processes in nanocrystalline matter. This book focuses on a very hot topic within materials science, and one that is both of great fundamental interest and of crucial importance for a wide range of nanotechnologies that rely on the unique mechanical properties of nanocrystalline materials.

High-Pressure Shock Compression of Solids J.R. Asay 2012-12-06 This book presents a set of basic understandings of the behavior and response of solids to propagating shock waves. The propagation of shock waves in a solid body is accompanied by large compressions, decompression, and shear. Thus, the shear strength of solids and any inelastic response due to shock wave propagation is of the utmost importance. Furthermore, shock compres sion of solids is always accompanied by heating, and the rise of local tempera ture which may be due to both compression and dissipation. For many solids, under a certain range of impact pressures, a two-wave structure arises such that the first wave, called the elastic prescursor, travels with the speed of sound; and the second wave, called a plastic shock wave, travels at a slower speed. Shock-wave loading of solids is normally accomplished by either projectile impact, such as produced by guns or by explosives. The shock heating and compression of solids covers a wide range of temperatures and densities. For example, the temperature may be as high as a few electron volts (1 eV = 11,500 K) for very strong shocks and the densification may be as high as four times the normal density.

Unified Constitutive Equations for Creep and Plasticity A.K. Miller 2012-12-06 Constitutive equations refer to 'the equations that constitute the material response' at any point within an object. They are one of the ingredients necessary to predict the deformation and fracture response of solid bodies (among other ingredients such as the equations of equilibrium and compatibility and mathematical descriptions of the configuration and loading history). These ingredients are generally combined together in complicated computer programs, such as finite element analyses, which serve to both codify the pertinent knowledge and to provide convenient tools for making predictions of peak stresses, plastic strain ranges, crack growth rates, and other quantities of interest. Such predictions fall largely into two classes: structural analysis and manufacturing analysis. In the first category, the usual purpose is life prediction, for assessment of safety, reliability, durability, and/or operational strategies. Some high-technology systems limited by mechanical behavior, and therefore requiring accurate life assess ments, include rocket engines (the space-shuttle main engine being a prominent example), piping and pressure vessels in nuclear and non-nuclear power plants (for example, heat exchanger tubes in solar central receivers and reformer tubes in high-temperature gas-cooled reactors used for process heat applications), and the ubiquitous example of the jet engine turbine blade. In structural analysis, one is sometimes concerned with predicting distortion per se, but more often, one is concerned with predicting fracture; in these cases the informa tion about deformation is an intermediate result en route to the final goal of a life prediction.

Nanostructured Materials by High-Pressure Severe Plastic Deformation Yuntian T. Zhu 2006-01-20 Recently, it was reported that nanostructured materials processed under high pressure by HPT and ECAP have an extraordinary combination of both high strength and high ductility, which are two desirable, but rarely co-existing properties. These findings indicate that high-pressure is a critical factor that can be employed to process nanostructured materials with superior mechanical, and possibly also physical, properties. It is the objective of this workshop to review our current knowledge, identify issues for future research, and discuss future directions on the processing and properties of nanostructured materials via SPD techniques, with a special emphasis on high-pressure effects. The 42 peer-reviewed

papers in this book cover areas of high pressure effect on the nanostructure and properties of SPD-processed materials, fundamentals of nanostructured materials, development of high-pressure SPD technologies for commercializations, recent advances of SPD technologies as well as applications and future markets of SPD-processed nanostructured materials.
Dynamics of Heterogeneous Materials Vitali Nesterenko 2013-03-09 This monograph deals with the behavior of essentially nonlinear heterogeneous materials in processes occurring under intense dynamic loading, where microstructural effects play the main role. This book is not an introduction to the dynamic behavior of materials, and general information available in other books is not included. The material herein is presented in a form I hope will make it useful not only for researchers working in related areas, but also for graduate students. I used it successfully to teach a course on the dynamic behavior of materials at the University of California, San Diego. Another course well suited to the topic may be nonlinear wave dynamics in solids, especially the part on strongly nonlinear waves. About 100 problems presented in the book at the end of each chapter will help the reader to develop a deeper understanding of the subject. I tried to follow a few rules in writing this book: (1) To focus on strongly nonlinear phenomena where there is no small parameter with respect to the amplitude of disturbance, including solitons, shock waves, and localized shear. (2) To take into account phenomena sensitive to materials structure, where typical space scale of material parameters (particle size, cell size) are presented in the models or are variable in experimental research.
Deformation Processes in TRIP/TWIP Steels Anja Weidner 2020-04-09 This book demonstrates the potential of novel in-situ experiments, performed on microscopic and macroscopic length scales, for investigating localized deformation processes in metallic materials, particularly their kinetics and the associated evolution of local strain fields. It features a broad methodological portfolio, spanning optical and electron microscopy, digital image correlation, infrared theromgraphy and acoustic emission testing, and particularly focuses on identifying the localized microscopic deformation processes in high-strength/high-ductility CrMnNi TRIP/TWIP (TRansformation Induced Plasticity/TWinning Induced Plasticity) steels. Presenting state-of-the art methodology applied to topical and pertinent problems in materials engineering, this book is a valuable resource for researchers and graduate students working in the field of plasticity and deformation of structural materials.
Explosive Welding, Forming and Compaction T.Z. Blazynski 2012-12-06 The last two decades have seen a steady and impressive development, and eventual industrial acceptance, of the high energy-rate manufact turing techniques based on the utilisation of energy available in an explo sive charge. Not only has it become economically viable to fabricate complex shapes and integrally bonded composites-which otherwise might not have been obtainable easily, if at all-but also a source of reasonably cheap energy and uniquely simple techniques, that often dispense with heavy equipment, have been made available to the engineer and applied scientist. The consolidation of theoretical knowledge and practical experience which we have witnessed in this area of activity in the last few years, combined with the growing industrial interest in the explosive forming, welding and compacting processes, makes it possible and also opportune to present, at this stage, an in-depth review of the state of the art. This book is a compendium of monographic contributions, each one of which represents a particular theoretical or industrial facet of the explosive operations. The contributions come from a number of practising engineers and scientists who seek to establish the present state of knowledge in the areas of the formation and propagation of shock and stress waves in metals, their metallurgical effects, and the methods of experimental assessment of these phenomena.
Numerical Modeling of Materials Under Extreme Conditions Nicola Bonora 2014-05-09 The book presents twelve state of the art contributions in the field of numerical modeling of materials subjected to large strain, high strain rates, large pressure and high stress triaxialities, organized into two sections. The first part is focused on high strain rate-high pressures such as those occurring in impact dynamics and shock compression related phenomena, dealing with material response identification, advanced modeling incorporating microstructure and damage, stress waves propagation in solids and structures response under impact. The latter part is focused on large strain-low strain rates applications such as those occurring in technological material processing, dealing with microstructure and texture evolution, material response at elevated temperatures, structural behavior under large strain and multi axial state of stress.
Dislocation Dynamics During Plastic Deformation Ulrich Messerschmidt 2010-04-19 Along with numerous illustrative examples, this text provides an overview of the dynamic behavior of dislocations and its relation to plastic deformation. It introduces the general properties of dislocations and treats the dislocation dynamics in some detail.
Material Instabilities in Elastic and Plastic Solids Henryk Petryk 2014-05-04 This book collects recent theoretical developments in the area of material instability in elastic and plastic solids along with related analytical and numerical methods and applications. The existing different approaches to instability phenomena in metal single crystals, polycristals and in geomaterials are presented with the emphasis laid on mutual relations and on unifying concepts, including ellipticlty loss and the energy criterion. Quasi-static bifurcation, initiation of single or multiple shear bands and post-critical strain localization are examined along with dynamic phenomena as wave propagation, moving shocks, internal snap-through and instability of flutter type. This gives an overview of a variety of material instability problems, methods and applications.
The Physics of Large Deformation of Crystalline Solids James F. Bell 2013-03-13 Historically, a major problem for the study of the large deformation of crystalline solids has been the apparent lack of unity in experimentally determined stress-strain functions. The writer's discovery in 1949 of the unexpectedly high velocity of incremental loading waves in pre-stressed large deformation fields emphasized to him the pressing need for the independent, systematic experimental study of the subject, to provide a firm foundation upon which physically plausible theories for the finite deformation of crystalline solids could be constructed. Such a study undertaken by the writer at that time and continued uninterruptedly to the present, led in 1956 to the development of the diffraction grating experiment which permitted, for the first time, the optically accurate determination of the strain-time detail of non-linear finite amplitude wave fronts propagating into crystalline solids whose prior history was precisely known. These experimental diffraction grating studies during the past decade have led to the discovery that the uniaxial stress-strain functions of 27 crystalline solids are unified in a single, generalized stress-strain function which is described, much of it hitherto unpublished, in the present monograph. The detailed study of over 2,000 polycrystal and single crystal uni axial stress experiments in 27 crystalline solids, in terms of the variation of a large number of pertinent parameters, has provided new unified pat terns of understanding which, it is hoped, will be of interest and value to theorists and experimentalists alike.
Constitutive Relation in High/Very High Strain Rates Kozo Kawata 2013-11-20 The IUTAM Symposium on Constitutive Relation in High/Very High Strain Rates (CRHVHSR) was held October 16 - 19, 1995, at Seminar House, Science University of Tokyo, under the sponsorship of IUTAM, Japan Society for the Promotion of Science, The Commemorative Association for the Japan World Exposition (1970), Inoue Foundation for Science, The Japan Society for Aeronautical and Space Sciences, and Science University of Tokyo. The proposal to hold the symposium was accepted by the General Assembly of IUT AM held in Haifa, Israel, in August 1992, and the scientists mentioned below were appointed by the Bureau of IUTAM to serve as members of the Scientific Committee. The main object of the symposium was to make a general survey of recent developments in the research of constitutive relations in high and very high strain rates and related problems in high velocity solid mechanics, and to explore further new ideas for dealing with unresolved problems of a fundamental nature as well as of practical importance. The subjects covered theoretical, experimental, and numerical fields in the above-mentioned problems in solids, covering metals, polymers, ceramics, and composites. Emphasis was given to the following fields: 1. Material characterization of solids in high velocity deformation, experimental techniques, typical data obtained by these techniques, modeling, and constitutive relations 2. Strain rate dependent elasto-visco-plastic stress waves 3. Crack initiation, propagation, and dynamic fracture toughness 4. Dynamic stress concentration 5. Structural dynamics in impact and constitutive relations of solids 6.
Shock-Wave Phenomena and the Properties of Condensed Matter Gennady I. Kanel 2013-06-29 One of the main goals of investigations of shock-wave phenomena in condensed matter is to develop methods for predicting effects of explosions, high-velocity collisions, and other kinds of intense dynamic loading of materials and structures. Based on the results of international research conducted over the past 30 years, this book is addressed not only to experts in shock-wave physics, but also to interested representatives from adjacent fields of activity and to students who seek an introduction to the current issues.
Micro-scaled Products Development via Microforming Ming Wang Fu 2014-01-04 ‘Micro-scaled Products Development via Microforming’ presents state-of-the-art research on microforming processes, and focuses on the development of micro-scaled metallic parts via microforming processes. Microforming refers to the fabrication of microparts via micro-scaled plastic deformation and presents a promising micromanufacturing process. When compared to other micromanufacturing processes, microforming offers advantages such as high productivity and good mechanical properties of the deformed microparts. This book provides extensive and informative illustrations, tables and photos in order to convey this information clearly and directly to readers. Although the knowledge of macroforming processes is abundant and widely used in industry, microparts cannot be developed by leveraging existing knowledge of macroforming because the size effect presents a barrier to this knowledge transfer. Therefore systematic knowledge of microforming needs to be developed. In tandem with product miniaturization, the demand on microparts has been increased for their wide applications in many industries, including automotive, bio-medical, aerospace and consumer electronics industries. Micromanufacturing technologies have thus become more and more important. This book is intended for postgraduates, manufacturing engineers and professionals working in the areas of manufacturing and materials processing.
Laser Shock Processing of FCC Metals Yongkang Zhang 2013-03-29 Laser shock processing (LSP) is a new and promising surface treatment technique for improving the fatigue durability, corrosion, wear resistance and other mechanical properties of metals and alloys. During LSP, the generated shock wave can introduce a deep compressive residual stress into the material, due to its high-pressure (GPa-TPa), ultra-fast (several tens nanoseconds), ultra-high strain-rate and high-energy. The overall properties and behavior of metal materials subjected to LSP were significantly improved because a refined surface layer was successfully obtained. Nevertheless, up to now, a clear scenery between micro-structure and macro-property of the refined surface layer, especially formation of sub-micrometer grains from coarse grains during severe plastic deformation, is still pending. Therefore, the basic studies of the underlying mechanism for grain refinement by ultra-high strain-rate presented in this book becomes more and more crucial.
Sintering and Plastic Deformation L. J. Bonish 2013-12-19
Mechanical Properties of Ceramics Joshua Pelleg 2014-04-22 This book discusses the mechanical properties of ceramics and aims to provide both a solid background for undergraduate students, as well as serving as a text to bring practicing engineers up to date with the latest developments in this topic so they can use and apply these to their actual engineering work. Generally, ceramics are made by moistening a mixture of clays, casting it into desired shapes and then firing it to a high temperature, a process known as 'vitrification'. The relatively late development of metallurgy was contingent on the availability of ceramics and the know-how to mold them into the appropriate forms. Because of the characteristics of ceramics, they offer great advantages over metals in specific applications in which hardness, wear resistance and chemical stability at high temperatures are essential. Clearly, modern ceramics manufacturing has come a long way from the early clay-processing fabrication method, and the last two decades have seen the development of sophisticated techniques to produce a large variety of ceramic material. The chapters of this volume are ordered to help students with their laboratory experiments and guide their observations in parallel with lectures based on the current text. Thus, the first chapter is devoted to mechanical testing. A chapter of ductile and superplastic ceramic is added to emphasize their role in modern ceramics (chapter 2). These are followed by the theoretical basis of the subject. Various aspects of the mechanical properties are discussed in the following chapters, among them, strengthening mechanisms, time dependent and cyclic deformation of ceramics. Many practical illustrations are provided representing various observations encountered in actual ceramic-structures of particularly technical significance. A comprehensive list of references at the end of each chapter is included in this textbook to provide a broad basis for further studying the subject. The work also contains a unique chapter on a topic not discussed in other textbooks on ceramics concerning nanosized ceramics. This work will also be useful as a reference for materials scientists, not only to those who specialize in ceramics.
Encyclopedia of Continuum Mechanics Holm Altenbach 2020-01-04 This Encyclopedia covers the entire science of continuum mechanics including the mechanics of materials and fluids. The encyclopedia comprises mathematical definitions for continuum mechanical modeling, fundamental physical concepts, mechanical modeling methodology, numerical approaches and many fundamental applications. The modelling and analytical techniques are powerful tools in mechanical civil and areospsace engineering, plus in related fields of plasticity, viscoelasticity and rheology. Tensor-based and reference-frame-independent, continuum mechanics has recently found applications in geophysics and materials.
Proceedings of the First International Conference on Theoretical, Applied and Experimental Mechanics Emmanuel E. Gdoutos 2018-05-26 ICTAEM_1 treated all aspects of theoretical, applied and experimental mechanics including biomechanics, composite materials, computational mechanics, constitutive modeling of materials, dynamics, elasticity, experimental mechanics, fracture, mechanical properties of materials, micromechanics, nanomechanics, plasticity, stress analysis, structures, wave propagation. During the conference special symposia covering major areas of research activity organized by members of the Scientific Advisory Board took place. ICTAEM_1 brought together the most outstanding world leaders and gave attendees the opportunity to get acquainted with the latest developments in the area of mechanics. ICTAEM_1 is a forum of university, industry and government interaction and serves in the exchange of ideas in an area of utmost scientific and technological importance.

Springer Handbook of Experimental Solid Mechanics William N. Sharpe 2008-12-04 As a reference book, the Springer Handbook provides a comprehensive exposition of the techniques and tools of experimental mechanics. An informative introduction to each topic is provided, which advises the reader on suitable techniques for practical applications. New topics include biological materials, MEMS and NEMS, nanoindentation, digital photomechanics, photoacoustic characterization, and atomic force microscopy in experimental solid mechanics. Written and compiled by internationally renowned experts in the field, this book is a timely, updated reference for both practitioners and researchers in science and engineering.

Deformation and Strength of Materials P. Feltham 1966

Mineral Fillers in Thermoplastics I Josef Jancar 2003-07-01 In recent years, a growing number of engineering applications of light weight and energy efficient plastics can be found in high quality parts vital to the func tioning of entire equipments and structures. Improved mechanical properties, especially balance of stiffness and toughness, are among the most frequently desired features of the new materials. In addition, reduced flammability is con sidered the single most important requirement for further expansion of plastics into large volume and demanding markets such as construction and mass trans port. Production of power cables also requires flame retardant cable jacketing plastics to replace or at least to reduce consumption of environmentally unsound PVC. The two principal ways to achieve the goals mentioned above include the development of completely new thermoplastic polymers and various modifica tions of the existing ones. Development and commercialization of a new ther moplastic require mobilization of large human and financial resources, the lat ter being within the range from $100 million to $10 billion, in comparison to $100 thousand to $10 million needed to develop and commercialize polymeric mate rial with prescribed end use properties using physical or chemical modification of an existing plastic. In addition, the various markets utilizing thermoplastics demand large flexibility in material properties with only moderate volumes, at the best.

Advanced Nanoindentation in Materials Ting Tsui 2018-03-05 This book is a printed edition of the Special Issue "Advanced Nanoindentation in Materials" that was published in Materials

Metallurgical Effects at High Strain Rates R. Rohde 2012-12-06 A conference on Metallurgical Effects at High Strain Rates was held at Albuquerque, New Mexico, February 5 through 8, 1973, under joint sponsorship of Sandia Laboratories and the Physical Metallurgy Committee of The Metallurgical Society of AIME. This book presents the written proceedings of the meeting. The purpose of the conference was to gather scientists from diverse disciplines and stimulate interdisciplinary discussions on key areas of materials response at high strain rates. In this spirit, it was similar to one of the first highly successful con ferences on this subject held in 1960, in Estes Park, Colorado, on The Response of Metals to High Velocity Deformation. The 1973 conference was able to demonstrate rather directly the increased understanding of high strain rate effects in metals that has evolved over a period of roughly 12 years. In keeping with the interdisciplinary nature of the meeting, the first day was devoted to a tutorial session of invited papers to provide attendees of diverse backgrounds with a common basis of understanding. Sessions were then held with themes centered around key areas of the high strain rate behavior of metals.

Plastic Deformation of Ceramics R.C. Bradt 2013-11-11 This proceedings volume, "Plastic Deformation of Ceramics," constitutes the papers of an international symposium held at Snowbird, Utah from August 7-12, 1994. It was attended by nearly 100 scientists and engineers from more than a dozen countries representing academia, national laboratories, and industry. Two previous conferences on this topic were held at The Pennsylvania State University in 1974 and 1983. Therefore, the last major international conference focusing on the deformation of ceramic materials was held more than a decade ago. Since the early 1980s, ceramic materials have progressed through an evolutionary period of development and advancement. They are now under consideration for applications in engineering structures. The contents of the previous conferences indicate that considerable effort was directed towards a basic understanding of deformation processes in covalently bonded or simple oxide ceramics. However, now, more than a decade later, the focus has completely shifted. In particular, the drive for more efficient heat engines has resulted in the development of silicon-based ceramics and composite ceramics. The discovery of high-temperature cupric oxide-based superconductors has created a plethora of interesting perovskite-Iike structured ceramics. Additionally, nanophase ceramics, ceramic thin films, and various forms of toughened ceramics have potential applications and, hence, their deformation has been investigated. Finally, new and exciting areas of research have attracted interest since 1983, including fatigue, nanoindentation techniques, and superplasticity.