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Young Modulus and Yield Strength Plastic Deformation Explained 11. Dislocation basics Lecture 30 - Elastic Stress Strain Relationship Basics of plastic deformation and characteristics of dislocations - Part 2 Plastic deformation behaviour of single-crystalline martensite of Ti-Nb shape memory alloy ANSYS 17.0 Tutorial - Non Linear Plastic Deformation I-Beam (Material science and engineering)chapter 5 Deformation behaviour of materials Understanding the Mechanical Behavior of Library \u0026 Archive Materials w/ Changes in Relative Humidity Plastic

Deformation and Crystal Structure MDCAT Physics Lecture Series, Ch 13, Elastic \u0026 Plastic Deformation, Physics MDCAT Entry Test ~~Research On Plastic Deformation Behaviour~~ (2009). Research on plastic deformation behaviour and conditions for stepped hole ring rolling. Materials Science and Technology: Vol. 25, No. 11, pp. 1397-1407.

~~Research on plastic deformation behaviour and conditions ...~~

The plastic deformation behavior is related to the distribution, size, orientation, stress state and adjacent grains of each grain . The number of grains in the diameter direction decreases with the grain size. Therefore, the deformation behavior of each grain plays a more important role in the overall deformation behavior.

Plastic deformation behavior of a nickel-based superalloy ...

The model aims to describe the plastic deformation behaviour of fine-grained materials. The mechanical properties of the crystalline phase are modelled using unified viscoplastic constitutive relations, which take dislocation density evolution and diffusion creep into account.

Plastic Deformation Behaviour of Fine Grained Materials ...

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Early plastic deformation behaviour and energy absorption ...

In this way, it was clarified that the plastic deformation of the Mg 12 YZn LPSO-phase exhibits highly anisotropic behavior. It is expected, therefore, that controlling the

microstructure such as homogeneous distribution, and refinement of the LPSO-phases, etc., is extremely important to improve the mechanical properties of LPSO-phases in Mg/LPSO high-strength alloys.

Plastic deformation behavior of Mg12YZn with 18R long ...

The deformation behavior and mechanical properties, which reflect the strengthening mechanisms operating in a steel, at temperatures where dislocation mobility makes possible measurable plastic strain, are commonly determined by uniaxial tensile testing, where loads are applied parallel to the longitudinal axes of sheet or cylindrical specimens with defined gauge lengths.

Deformation Behavior - an overview |

ScienceDirect Topics

In this research, plastic deformation behavior of the commercially aluminum AA-1050 processed by using a newly developed ultrasonic vibration enhanced equal channel angular pressing (UV-ECAP) method has been investigated. Analysis of plastic deformation behavior of ultrafine ... The model aims to describe the plastic deformation behaviour of fine-grained materials. The

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Similarly, Azarbarmas et al. studied hot deformation behavior of IN718 superalloy by isothermal compression tests under the deformation temperature range of 950–1100 °C and strain rate range of 0.001–1 s −1. The results showed DDRX is the dominant

nucleation mechanism in the early stages of deformation in which DRX nucleation occurs by twining behind the bulged areas.

Microstructure evolutions and interfacial bonding behavior ...

Research On Plastic Deformation Behaviour In this research, plastic deformation behavior of the commercially aluminum AA-1050 processed by using a newly developed ultrasonic vibration enhanced equal channel angular pressing (UV-ECAP) method has been investigated. Analysis of plastic deformation behavior of ultrafine ...

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The higher SFE of the 316L steel results in a less pronounced transient cyclic deformation behavior. The plastic shear is more localized, and the formation of deep intrusions leads to microcrack initiation. However, the propagation of such microcracks is impeded by □□-martensite formed very localized within the shear bands.

Cyclic deformation behavior of

austenitic stainless steels ...

t is the true plastic strain. During plastic deformation, the ap-plied load relaxes slightly, while the neutron recording time was set to approximately 20 min, with a constant displacement control...

MATERIALS SCIENCE Copyright © 2020 Temperature dependence ...

In physics and materials science, plasticity, also known as plastic deformation, is the ability of a solid material to undergo permanent deformation, a non-reversible change of shape in response to applied forces. For example, a solid piece of metal being bent or pounded into a new shape displays plasticity as permanent changes occur within the material itself. In engineering, the transition from elastic behavior to plastic

behavior is known as yielding. Plastic deformation is observed in most m

Plasticity (physics) - Wikipedia

Abstract Processes of severe plastic deformation (SPD) are defined as metal forming processes in which a very large plastic strain is imposed on a bulk process in order to make an ultra-fine...

Severe plastic deformation (SPD) process for metals ...

The present study aims to correlate the shape of the graphite phase with the deformation behaviour, where the plastic deformation and other strain accommodating events are quantified by measurements of the acoustic emission events occurring in the interior of the material at loading.

Studying elastic deformation behaviour of cast irons by ...

Deformation of a material is when you apply sufficient load on a material that it changes shape. Elastic deformation is deformation at low stress, so it is recoverable and not permanent. The material will return to its original shape once the load is removed.

The book gives a comprehensive view of the present ability to take into account the microstructure and texture evolution in building up engineering models of the plastic behaviour of polycrystalline materials at large strains. It is designed for postgraduate students, research engineers and academics that are interested in using advanced models of the mechanical

behaviour of polycrystalline materials.

Plastic ratcheting plays a key role in causing rolling contact failure of rails. Due to demanding conditions imposed by rail transport of mineral products, the main aim of this research is to quantify cyclic plasticity for investigating the plastic deformation behaviour of high strength rail steels currently used in heavy haul railways in Australia. Three high strength rail steels with similar nominal hardness but different chemical composition were considered. Experimental studies were first carried out to investigate the ratcheting behaviour of the three rail steels subjected to uniaxial and non-proportional bi-axial compression-torsion cyclic loading conditions. The results show that an obvious cyclic softening occurs in all three rail steels

under uniaxial strain cycling. Under uniaxial stress cycling, the materials behave slightly different under tension and compression. Under bi-axial compression-torsion stress cycling, both ratcheting strain and ratcheting strain rate are strongly influenced by the non-proportional loading paths. Among all three rail steels, the low alloy heat-treated rail steel grade has a better resistance to ratcheting than the two hypereutectoid rail steel grades. To quantify plastic ratcheting of the three rail steels, an existing cyclic plasticity model was modified by coupling a non-proportional multi-axial parameter into isotropic softening and kinematic hardening rules. The method to calibrate the material parameters for the plasticity model and the simulated results were validated with experimental data for the three

studied rail steels. Comparisons between the simulated results and the experimental data show that the modified cyclic plasticity model has the capacity to simulate both uniaxial and bi-axial ratcheting behaviour of the three rail steels with an acceptable accuracy. A comprehensive study was carried out to evaluate the ratcheting performance of the three rail steels under different wheel-rail cyclic rolling contact conditions, i.e. free rolling, partial slip, and full slip conditions, different friction coefficient and different axle load with the use of the developed constitutive plasticity material model. The results indicate that the crack initiation life decreases with the increase of the normalized tangential traction, the friction coefficient and the axle load for all three rail steels. Additionally, the

results demonstrate that the possible location of crack initiation is within the depth of 3 mm from the running surface of the rail head. Among the three rail steels, the hypereutectoid rail steel grade with the lower carbon content is the best one to apply in heavy haul railway for higher axle load in order to fulfil the demanding conditions imposed by railway transport of mineral products in Australia due to its consistent ratcheting performance under different rolling contact conditions.A single parameter, the maximum SWT parameter, which originated from the strain-life phenomenological approach, Smith-Watson-Topper (SWT) method, for multiaxial fatigue analysis, was proposed to evaluate the stress state in the rail head for assessing the fatigue integrity of the structure. A

numerical procedure to determine the maximum SWT parameter was presented and applied in a case study. The capability of the maximum SWT parameter to predict fatigue crack initiation in the rail head was confirmed in the case study. Analogous to von Mises stress for strength analysis, the maximum SWT parameter can be applied to evaluate fatigue loading state.This doctoral study systematically investigates the ratcheting behaviour and quantified cyclic plasticity of the three rail steels currently used in heavy haul railways in Australia. A constitutive plasticity material model for ratcheting and a systematic program to evaluate ratcheting performance of rail steels under service loading are developed. A better understanding of the influence of wheel-rail rolling contact conditions

and alloy design on the ratcheting performance of rail steels is gained. The outcomes of this study can provide useful information to the development and application of rail steels and the development of effective rail maintenance strategies in order to mitigate rail degradation.

The core aim of this research project was to improve understanding of the effects of microstructure and crystallographic texture on the high strain rate plastic deformation behaviour of the industrially important Titanium alloy, Ti-6Al-4V. To facilitate this study, four rolled plates of Ti-6Al-4V, with varying thermo-mechanical processing histories, were provided by TIMET Corp., the world's largest supplier of Titanium product. To determine the nature of each

plate's microstructure and the crystallographic texture of the dominant a phase, the four Ti-6Al-4V plates were microstructurally characterised using techniques such as optical microscopy and electron backscatter diffraction (EBSD). The effects of the measured microstructures and textures on the strain rate dependent plastic deformation behaviour of the four Ti-6Al-4V plates were investigated via a series of uniaxial compression and tension tests in the three orthogonal material orientations at quasi-static (10 3 s -1) and high strain rates (10 3 s -1) using a standard electro-mechanical test device and split-Hopkinson pressure bars (SHPB), respectively. To provide further understanding of the effects of microstructure and texture on the plastic deformation

behaviour of Ti-6Al-4V, this time under complex impact loading conditions, the classic Taylor impact experiment was adapted to include an optical measurement and geometry reconstruction technique. A novel experimental setup was designed that consists of an ultra-high speed camera and mirror arrangement, allowing the Taylor impact specimen to be viewed from multiple angles during the experiment. Using the previously mentioned optical measurement and geometry reconstruction technique, it was then possible to gain valuable, previously unobtainable, data on the deformation history of Taylor impact specimens in-situ, such as the major/minor axes of the anisotropically deforming elliptical specimen cross-sections as a function of time and axial position, true strain as a function of

time and axial position, and the true strain rate as a function of axial position. The technique was verified by testing a specimen cut from the in-plane material orientation of a clock-rolled high purity Zirconium plate. The output measurements from a post-deformation image frame were compared with measurements of the recovered specimen made using a coordinate measurement machine (CMM), with analysis showing excellent agreement between the two techniques. The experiment was then carried out on specimens cut from the two orthogonal in-plane material orientations of one of the four Ti-6Al-4V plates. Analysis of the data from these experiments gave significant insight into the plastic deformation behaviour of macroscopically textured Ti-6Al-4V

under complex impact loading. Recovered Ti-6Al-4V specimens from the outlined Taylor impact experiments were then sectioned along specific planes and microstructurally characterised using EBSD, with comparisons made between the pre and post-deformation microstructures. From this analysis, and the previously discussed geometry reconstruction technique, insight was gained into the effects of micro-texture on the general anisotropic plastic deformation behaviour of Ti- 6Al- 4V plate materials and in particular the role of micro-texture on the formation of deformation twins. Finally, the understanding gained from these experiments, and a detailed review of the literature, was used to inform a novel, physically based material modelling framework, capable of

capturing the effects of microstructure and texture on the strain rate and temperature dependent plastic deformation behaviour of Ti-6Al-4V. The model was implemented in the computational software package, MATLAB, and verified by comparison with the mechanical characterisation results from one of the Ti-6Al-4V plates. A number of frameworks are discussed for implementing the new Ti-6Al-4V model within finite element (FE) analysis software packages, such as ABAQUS, LS-DYNA and DEFORM. It is hoped that the new Ti-6Al-4V model can be used to optimise the design of Ti-6Al-4V components and structures for impact loading scenarios.

This volume comprises select proceedings of the 7th International and 28th All India Manufacturing Technology, Design and Research conference 2018 (AIMTDR 2018). The papers in this volume discuss simulations based on techniques such as finite element method (FEM) as well as soft computing based techniques such as artificial neural network (ANN), their optimization and the development and design of mechanical products. This volume will be of interest to researchers, policy makers, and practicing engineers alike.

Grain size is recognized as a key

microstructural factor affecting mechanical and, to some extent, physical properties of metals and metallic materials. For this reason, all the means designed to control and modify the grain size are considered a proper way to design and tailor metallic materials with desired properties. In this sense, microstructure refinement through severe plastic deformation (SPD) techniques can be considered a key method for this purpose. A typical SPD process is currently defined as any method of metal forming under extensive hydrostatic pressure intended to impose a very high strain on a bulk solid without involving any significant change in the overall dimensions and having the ability to produce exceptional grain refinement. What makes SPD processing

techniques so popular and attractive is the possibility of using them to enhance the strength behavior of conventional metallic materials by a factor of up to eight for pure metals such as copper and by some 30-50% for alloys. Despite the impressive property improvement achievable with SPD techniques, their uptake by industry has been rather sluggish. This book intends to give a panorama of the typical SPD techniques intended to optimize the mechanical and physical properties of metals through a significant grain size reduction process. Modeling for this purpose is also presented.

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-like 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.

Addresses fundamentals and advanced topics relevant to the behavior of materials under in-service conditions such as impact, shock, stress and high-strain rate deformations. Deals extensively with materials from a microstructure perspective which is the future direction of research today.