Plastic Deformation At High Strain Rates Springer

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Lec 37: Plastic Deformation at High Strain Rates 4*Lec 36: Plastic Deformation at High Strain Rates 3 Macroscopic elastic and plastic* *deformation {Texas A\u0026M: Intro to Materials} Increasing Material Strength w/ Cold Work/Plastic Deformation; True vs. Engineering Stress \u0026 Strain* Elastic and plastic deformation at the atomic scale {Texas A\u0026M: Intro to Materials} **Dislocations and Plastic Deformation** *Elastic and Plastic Deformation* **Elastic and plastic deformation** Plastic Deformation and Crystal Structure *Ductility, toughness and resilience* Mechanism of plastic deformation, slip, twinning and dislocation. *Muddiest Point- Phase Diagrams I: Eutectic Calculations and Lever Rule Properties and Grain Structure* Basics of plasticity theory in 6 min ~~EXPERIMENT 5 : OBSERVATION ON THE MICROSTRUCTURE OF CAST IRON (MEC291)~~ ~~Metals 101-5 Deformation~~ *08.4 Generalized Hooke's Law ANSYS 17.0 Tutorial - Non Linear Plastic Deformation I-Beam Basic sciences - Brittle vs Ductile Severe plastic deformation : case study Elastic Deformation and Plastic Deformation | Mechanical Properties of Solids | Don't Memorise* ~~Ductile and Brittle Materials by stress strain curve~~ *Muddiest Points: Dislocations and Plastic Deformation of Metals Plastic deformation of polymers Plastic deformation and crystal structure* Young Modulus, Elastic \u0026 Plastic Deformation ~~Lecture 28: Plastic deformation 2~~ **Plastic Deformation At High Strain**

The plastic deformation and fracture behaviour of Ti-55511 alloy subjected to high strain rate at room temperature have been reported.

Results obtained from the mechanical testing show that macro shear failure occurs when strain rate is above 1370 s ?1, and the failure strain is about 0.16. Collapse of the specimens occurs along a plane inclined at an angle of about 45° to the compression axis, and the strain rate hardening effect of Ti-55511 alloy is apparent.

High-strain-rate plastic deformation and fracture ...

In the present paper a new method, an original testing device and techniques for the study of plastic deformation in materials at high strain rates up to 2×10 4 s ?1 achieved with the use of very short stress pulses (length within 10–20 ?s) are described.

Plastic deformation at high strain rates | SpringerLink

On the other hand, the exceptionally high strain rates accessible by MD are directly applicable to a number of processes involving high-temperature deformation. For example, ballistic impacts produce high strain rate deformation (>10 5 s ?1), which is often accompanied by the generation of shockwaves and temperatures near the solidus at the projectile interface [10] , [11] .

Plastic deformation of nanocrystalline aluminum at high ...

Under tensile stress plastic deformation is characterized by a strain hardening region and a necking region and finally, fracture (also called rupture). During strain hardening the material becomes stronger through the movement of atomic dislocations. The necking phase is indicated by a reduction in cross-sectional area of the specimen.

HIGH STRAIN DEFORMATION - University of Babylon

Plastic deformation below the ?-peak temperature of high purity b.c.c. metals builds a microstructure of long screw dislocations, as shown by transmission electron microscopy (TEM) (see examples in ref. 10). In this work, we perform for tantalum, a typical torsion deformation to 0.05% at room temperature (RT).

Plastic Deformation - an overview | ScienceDirect Topics

The stress-strain curve has a positive slope beyond the elastic limit, i.e., in the plastic range the stress required to cause further deformation increases with increasing strain, a phenomenon called work-hardening or strain-hardening occurs.

Plastic Deformation of Metals (With Diagram) | Metallurgy

Severe plastic deformation (SPD) is a generic term describing a group of metalworking techniques involving very large strains typically involving a complex stress state or high shear, resulting in a high defect density and equiaxed "ultrafine" grain (UFG) size (d < 500 nm) or nanocrystalline (NC) structure (d < 100 nm).

Severe plastic deformation - Wikipedia

For describing plastic deformation at high strain rate of ductile materials such as steel, the Johnson-Cook (JC) empirical model has been generally applied [7,14,19]. The strain hardening term in the original JC constitutive model was represented by using a power law. Another more accurate strain hardening model was developed on the basis of a ...

Mechanical and fracture behavior of high strength steels ...

When copper is deformed to high plastic strain (? ? 3?4) at high strain rates (? ? 10 4 s ?1 a microstructure with grain sizes of ? 0.1 ?m can be produced. It is proposed that this microstructure develops by dynamic recrystallization, which is enabled by the adiabatic temperature rise.

Dynamic recrystallization in high-strain, high-strain-rate ...

closely simulate the condition of a metal undergoing high strain, high strain-rate plastic deformation in a shaped charge jet or explosively forged projectile. The detonation of the explosive in intimate contact with the metal generates, in the latter, a shock wave of high amplitude which significantly modifies its

HIGH STRAIN, HIGH STRAIN-RATE DEFORMATION OF COPPER

In a tensile test, the plastic deformation of the single crystal occurs by slip on certain planes in particular direction. The grips of the cross-head of the tensile machine, which hold the specimen, must remain in a line during elongation of the specimen.

Plastic Deformation of Metals: 3 Modes | Metallurgy

Plastic deformation is the permanent deformation or change in the shape of a solid body without fracture under the action of a sustained force. This occurs when a large stress is applied on to a substance. Plastic deformation is irreversible and is permanent. Plastic deformation is best explained by the chemical concept “plasticity”.

Difference Between Elastic and Plastic Deformation ...

Deformation mechanisms is commonly characterized as brittle, ductile, and brittle-ductile.The driving mechanism responsible is a subject of interplay between internal (e.g composition, grain size and lattice-preferred orientation) and external (e.g temperature and fluid pressure) factors. These mechanisms produce a range of microstructures studied in rocks to constrain the conditions ...

Deformation mechanism - Wikipedia

Under tensile stress, plastic deformation is characterized by a strain hardening region and a necking region and finally, fracture (also called rupture). During strain hardening the material becomes stronger through the movement of atomic dislocations. The necking phase is indicated by a reduction in cross-sectional area of the specimen.

Deformation (engineering) - Wikipedia

Plastic Deformation When the plot of stress versus strain is linear, the system is said to be in the elastic state. However, when the stress is high the plot passes a small jump on the axes. This is the limit at which it becomes plastic deformation.

Difference Between Elastic and Plastic Deformation ...

At high strain rates, the dislocation sources in a crystal tend to be localized in one active slip system, and the presence of active dislocation sources in rapidly deforming crystalline material can serve as the focus of localized plastic flow and associated energy concentrations that in turn determine the mechanical response of a material.

High Strain Rate - an overview | ScienceDirect Topics

Plastic deformation is observed in most materials, particularly metals, soils, rocks, concrete, foams. However, the physical mechanisms that cause plastic deformation can vary widely. At a crystalline scale, plasticity in metals is usually a consequence of dislocations.

Plasticity (physics) - Wikipedia

Strain is a measure of deformation representing the displacement between particles in the body relative to a reference length. A general deformation of a body can be expressed in the form x = F(X) where X is the reference position of material points in the body. Such a measure does not distinguish between rigid body motions (translations and rotations) and changes in shape (and size) of the body.

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.

A series of tests is described in which tubular specimens of a commercially pure polycrystalline aluminum were loaded in torsion up to shear strains of about 2 and 4% respectively, over the temperature range -180C to 250C. The experimental results give the flow stress in shear, the strain and the strain rate against time. They also give stress-strain curves which are compared to the corrresponding static curves obtained by testing similar specimens in torsion at about 0.001/sec. A graph showing the dependence of flow stress on temperature indicates that there are three different temperature ranges for polycrystalline aluminum within each of which a different deformation mechanism presumably dominates the flow process. (Modified author abstract).

Discover a novel, self-contained approach to an important technical area, providing both theoretical background and practical details. Coverage includes mechanics and physical metallurgy, as well as study of both established and novel procedures such as indentation plastometry. Numerical simulation (FEM modelling) is explored thoroughly, and issues of scale are discussed in depth. Discusses procedures designed to explore plasticity under various conditions, and relates sample responses to deformation mechanisms, including microstructural effects. Features references throughout to industrial processing and component usage conditions, to a wide range of metallic alloys, and to effects of residual stresses, anisotropy and inhomogeneity within samples. A perfect tool for materials scientists, engineers and researchers involved in mechanical testing (of metals), and those involved in the development of novel materials and components.

The dynamic stress intensity factor and energy release rate are determined for the configuration in which a semi-infinite, constant velocity crack is propagating in a finite plate subjected to pure bending about the direction of propagation. In addition, a constant extension at the edges of the plate is imposed in the direction normal to the direction of crack propagation. In one case, zero shear stress is imposed at the edges of the plate and, in another case, zero displacement is imposed at the edges of the plate in the direction of crack propagation. For the case of pure bending alone, the dynamic stress intensity factor is shown to be independent of crack velocity. The problems are formulated in terms of the Poisson-Kirchhoff theory of thin plates in which the Kirchhoff conditions for a free edge are applied. The stress intensity factors are solved for directly by application of Laplace transform methods, the Wiener-Hopf technique, and asymptotic analysis. (Author).

Treatise on Materials Science and Technology, Volume 6: Plastic Deformation of Materials covers the fundamental properties and characterization of materials, ranging from simple solids to complex heterophase systems. The book presents articles on the low temperature of deformation of bcc metals and their solid-solution alloys; the cyclic deformation of metals and alloys; and the high-temperature diffusion-controlled creep of some metals and alloys, with particular reference to the various creep mechanisms. The text also includes articles on superplasticity; the fatigue deformation of polymers; the low temperature deformation of crystalline nonmetals; and the recovery and recrystallization during high temperature deformation. Professional scientists and engineers, as well as graduate students in materials science and associated fields will find the book invaluable.