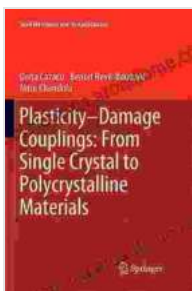


From Single Crystal to Polycrystalline Materials: Solid Mechanics and Its Applications

In the realm of materials science, the structure and properties of materials hold paramount importance. 'From Single Crystal to Polycrystalline Materials: Solid Mechanics and Its Applications' delves into the fascinating world of material evolution, exploring the intricate relationship between material structure and mechanical behavior.

This comprehensive book provides a thorough understanding of the mechanics of materials, focusing on the transition from single crystals to polycrystalline materials. It offers a comprehensive treatment of the fundamental principles governing the mechanical behavior of materials, from their atomic-scale structure to their macroscopic properties.



Plasticity-Damage Couplings: From Single Crystal to Polycrystalline Materials (Solid Mechanics and Its Applications Book 253)

★★★★★ 5 out of 5

Language : English
File size : 128178 KB
Text-to-Speech : Enabled
Screen Reader : Supported
Enhanced typesetting : Enabled
Print length : 911 pages



Chapter Overview

The book is meticulously organized into chapters, each delving into specific aspects of material evolution and its impact on mechanical properties.

Chapter 1: Crystallography and Single Crystal Elasticity

This chapter establishes a foundation in crystallography, providing an in-depth examination of the atomic arrangements and symmetries that characterize single crystals. It explores the fundamental concepts of crystal elasticity, including tensorial representations and stiffness constants, laying the groundwork for understanding material behavior.

Chapter 2: Plasticity and Dislocations in Single Crystals

Chapter 2 investigates the mechanisms of plastic deformation in single crystals, focusing on the role of dislocations. It explores dislocation motion, multiplication, and interactions, providing insights into the fundamental processes that govern material yield and hardening behavior.

Chapter 3: Fracture in Single Crystals

This chapter delves into the nature of fracture in single crystals, examining the different mechanisms that lead to material failure. It explores the concepts of cleavage, brittle fracture, and ductile fracture, providing a comprehensive understanding of fracture mechanics.

Chapter 4: Microstructure and Mechanical Behavior of Polycrystalline Materials

Chapter 4 introduces the concept of polycrystalline materials, which are composed of multiple crystal grains with varying orientations. It explores the relationship between microstructure, grain boundaries, and mechanical

properties, providing insights into the effects of grain size, shape, and distribution on material performance.

Chapter 5: Yielding and Plastic Deformation of Polycrystalline Materials

This chapter examines the mechanisms of plastic deformation in polycrystalline materials, focusing on the role of grain boundaries and their interaction with dislocations. It explores the effects of grain size, grain shape, and crystallographic texture on the material's yield strength and plastic behavior.

Chapter 6: Fracture in Polycrystalline Materials

Chapter 6 investigates the fracture behavior of polycrystalline materials, considering the influence of microstructure and grain boundaries. It explores the concepts of intergranular fracture, transgranular fracture, and fatigue failure, providing a comprehensive understanding of fracture mechanics in these materials.

Chapter 7: Applications in Engineering and Materials Science

This final chapter explores the practical applications of the principles discussed throughout the book. It showcases how the understanding of single crystal and polycrystalline materials can be leveraged in various engineering and materials science fields, including aerospace, automotive, energy, and biomedical applications.

Audience

'From Single Crystal to Polycrystalline Materials: Solid Mechanics and Its Applications' is an invaluable resource for a wide range of professionals

and researchers in the field of materials science and engineering. It is particularly relevant for:

- Materials scientists and engineers
- Mechanical engineers
- Metallurgists
- Physics of materials researchers
- Students and researchers in materials science and engineering
- Engineers in aerospace, automotive, energy, and biomedical fields

Benefits of Reading

By delving into this comprehensive book, readers will gain a deep understanding of the following:

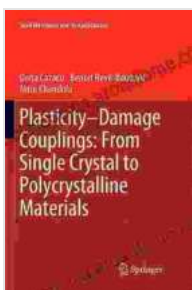
- The fundamental principles of solid mechanics and their application to materials science
- The relationship between material structure and mechanical behavior, from single crystals to polycrystalline materials
- The mechanisms of plastic deformation and fracture in both single crystals and polycrystalline materials
- The effects of microstructure on the mechanical properties of polycrystalline materials
- The practical applications of material evolution principles in engineering and materials science

Furthermore, 'From Single Crystal to Polycrystalline Materials: Solid Mechanics and Its Applications' serves as an excellent textbook for graduate-level courses in materials science, mechanics of materials, and materials engineering.

'From Single Crystal to Polycrystalline Materials: Solid Mechanics and Its Applications' is a seminal work that provides a comprehensive and authoritative treatment of the mechanics of materials evolution. It offers invaluable insights into the relationship between material structure and mechanical behavior, empowering readers with a deep understanding of the principles that govern the performance of materials.

Whether you are a seasoned professional, a budding researcher, or a curious student, this book is an essential addition to your library. It will undoubtedly broaden your knowledge and equip you with the tools necessary to advance the field of materials science and engineering.

Free Download your copy today and embark on a journey that will reshape your understanding of materials and their applications.



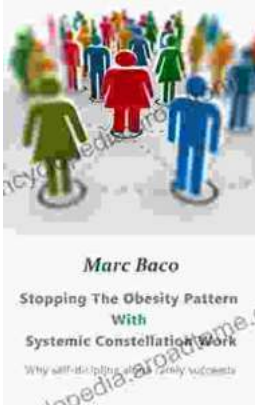
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