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| Nota di contenuto | Multiscale Modeling of Heterogenous Materials; Table of Contents; Foreword; Chapter 1. Accounting for Plastic Strain Heterogenities in Modeling Polycrystalline Plasticity: Microstructure-based Multi-laminate Approaches; 1.1. Introduction; 1.2. Polycrystal morphology in terms of grain and sub-grain boundaries; 1.2.1. Some evidence of piece-wise regularity for grain boundaries; 1.2.2. Characteristics of plastic-strain due to sub-grain boundaries; 1.3. Sub-boundaries and multi-laminate structure for heterogenous plasticity<br>1.3.1. Effective moduli tensor and Green operator of multi-laminate structures1.3.2. Multi-laminate structures and piece-wise homogenous plasticity; 1.4. Application to polycrystal plasticity within the affine approximation; 1.4.1. Constitutive relations; 1.4.2. Fundamental properties for multi-laminate modeling of plasticity; 1.5. Conclusion; 1.6. Bibliography; Chapter 2. Discrete Dislocation Dynamics: Principles and Recent Applications; 2.1. Discrete Dislocation Dynamics as a link in multiscale modeling; 2.2. Principle of Discrete Dislocation Dynamics |

2.3. Example of scale transition: from DD to Continuum Mechanics2. 3.1. Introduction to a dislocation density model; 2.3.1.1. Constitutive equations of a dislocation based model of crystal plasticity; 2.3.1.2. Parameter identification; 2.3.1.3. Application to copper simulations; 2.3.1.4. Taking into account kinematic hardening; 2.4. Example of DD analysis: simulations of crack initiation in fatigue; 2.4.1. Case of single phase AISI 31GL; 2.5. Conclusions; 2.6. Bibliography; Chapter 3. Multiscale Modeling of Large Strain Phenomena in Polycrystalline Metals 3.1. Implementation of polycrystal plasticity in finite element analysis3. 2. Kinematics and constitutive framework; 3.3. Forward Euler algorithm; 3.4. Validation of the forward Euler algorithm; 3.5. Time step issues in the forward Euler scheme; 3.6. Comparisons of CPU times: the rate tangent versus the forward Euler methods; 3.7. Conclusions; 3.8. Acknowledgements; 3.9. Bibliography; Chapter 4. Earth Mantle Rheology Inferred from Homogenization Theories; 4.1. Introduction; 4.2. Grain local behavior; 4.3. Full-field reference solutions; 4.4. Mean-field estimates
4.4.1. Basic features of mean-field theories4.4.2. Results; 4.5. Concluding observations; 4.6. Bibliography; Chapter 5. Modeling Plastic Anistropy and Strength Differential Effects in Metallic Materials; 5.1. Introduction; 5.2. Isotropic yield criteria; 5.2.1. Pressure insensitive materials deforming by slip; 5.2.2. Pressure insensitive materials deforming by twinning; 5.2.3. Pressure insensitive materials with non-Schmid effects; 5.2.4. Pressure sensitive materials; 5.2.5. SD effect and plastic flow; 5.3. Anisotropic yield criteria with SD effects
5.3.1. Cazacu and Barlat [CAZ 04] orthotropic yield criterion

Sommario/riassunto

A material's various proprieties is based on its microscopic and nanoscale structures. This book provides an overview of recent advances in computational methods for linking phenomena in systems that span large ranges of time and spatial scales. Particular attention is given to predicting macroscopic properties based on subscale behaviors. Given the book's extensive coverage of multi-scale methods for modeling both metallic and geologic materials, it will be an invaluable reading for graduate students, scientists, and practitioners alike.