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| Titolo                  | Multiscale modeling of heterogenous materials [[electronic resource] ] :<br>from microstructure to macro-scale properties / / edited by Oana<br>Cazacu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| Descrizione fisica      | 1 online resource (361 p.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| Soggetti                | Inhomogeneous materials - Mathematical models<br>Materials<br>Electronic books.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| Nota di contenuto       | <ul> <li>Multiscale Modeling of Heterogenous Materials; Table of Contents;<br/>Foreword; Chapter 1. Accounting for Plastic Strain Heterogenities in<br/>Modeling Polycrystalline Plasticity: Microstructure-based Multi-laminate<br/>Approaches; 1.1. Introduction; 1.2. Polycrystal morphology in terms of<br/>grain and sub-grain boundaries; 1.2.1. Some evidence of piece-wise<br/>regularity for grain boundaries; 1.2.2. Characteristics of plastic-strain<br/>due to sub-grain boundaries; 1.3. Sub-boundaries and multi-laminate<br/>structure for heterogenous plasticity</li> <li>1.3.1. Effective moduli tensor and Green operator of multi-laminate<br/>structures1.3.2. Multi-laminate structures and piece-wise homogenous<br/>plasticity; 1.4. Application to polycrystal plasticity within the affine<br/>approximation; 1.4.1. Constitutive relations; 1.4.2. Fundamental<br/>properties for multi-laminate modeling of plasticity; 1.5. Conclusion;<br/>1.6. Bibliography; Chapter 2. Discrete Dislocation Dynamics: Principles<br/>and Recent Applications; 2.1. Discrete Dislocation Dynamics as a link in</li> </ul> |

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|                    | multiscale modeling; 2.2. Principle of Discrete Dislocation Dynamics<br>2.3. Example of scale transition: from DD to Continuum Mechanics2.<br>3.1. Introduction to a dislocation density model; 2.3.1.1. Constitutive<br>equations of a dislocation based model of crystal plasticity; 2.3.1.2.<br>Parameter identification; 2.3.1.3. Application to copper simulations;<br>2.3.1.4. Taking into account kinematic hardening; 2.4. Example of DD<br>analysis: simulations of crack initiation in fatigue; 2.4.1. Case of single<br>phase AISI 31GL; 2.5. Conclusions; 2.6. Bibliography; Chapter 3.<br>Multiscale Modeling of Large Strain Phenomena in Polycrystalline Metals<br>3.1. Implementation of polycrystal plasticity in finite element analysis3.<br>2. Kinematics and constitutive framework; 3.3. Forward Euler algorithm;<br>3.4. Validation of the forward Euler algorithm; 3.5. Time step issues in<br>the forward Euler scheme; 3.6. Comparisons of CPU times: the rate<br>tangent versus the forward Euler methods; 3.7. Conclusions; 3.8.<br>Acknowledgements; 3.9. Bibliography; Chapter 4. Earth Mantle<br>Rheology Inferred from Homogenization Theories; 4.1. Introduction;<br>4.2. Grain local behavior; 4.3. Full-field reference solutions; 4.4. Mean-<br>field estimates<br>4.4.1. Basic features of mean-field theories4.4.2. Results; 4.5.<br>Concluding observations; 4.6. Bibliography; Chapter 5. Modeling Plastic<br>Anistropy and Strength Differential Effects in Metallic Materials; 5.1.<br>Introduction; 5.2. Isotropic yield criteria; 5.2.1. Pressure insensitive<br>materials deforming by slip; 5.2.2. Pressure insensitive materials<br>deforming by twinning; 5.2.3. Pressure insensitive materials<br>deforming by twinning; 5.2.3. Pressure insensitive materials with non-<br>Schmid effects; 5.2.4. Pressure sensitive materials; 5.2.5. SD effect and<br>elactic flow: 5.2.4. Pressure sensitive materials; 5.2.5. SD effect and<br>elactic flow: 5.2.4. Pressure sensitive materials; 5.2.5. SD effect and |
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|                    | plastic flow; 5.3. Anisotropic yield criteria with SD effects<br>5.3.1. Cazacu and Barlat [CAZ 04] orthotropic yield criterion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Sommario/riassunto | A material's various proprieties is based on its microscopic and<br>nanoscale structures. This book provides an overview of recent<br>advances in computational methods for linking phenomena in systems<br>that span large ranges of time and spatial scales. Particular attention is<br>given to predicting macroscopic properties based on subscale<br>behaviors. Given the book's extensive coverage of multi-scale methods<br>for modeling both metallic and geologic materials, it will be an<br>invaluable reading for graduate students, scientists, and practitioners<br>alike.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |