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Descrizione fisica	1 online resource (XX, 405 p. 210 illus., 181 illus. in color.)
Disciplina	620.11011
Soggetti	Materials science Ceramics Glass Composite materials Applied mathematics Engineering mathematics Engineering—Materials Sociophysics Econophysics Characterization and Evaluation of Materials Ceramics, Glass, Composites, Natural Materials Mathematical and Computational Engineering Materials Engineering Data-driven Science, Modeling and Theory Building
Lingua di pubblicazione	Inglese
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Note generali	Includes index.
Nota di contenuto	Scale Hierarchical Modeling of Ni-based Superalloys: from sub-grain to polycrystalline scales -- Underpinning and benchmarking multi-scale models with micro-tensile and bending experiments -- Discrete network dynamics: From dislocation to polymer chain simulations -- Survey of ICME methods for Polymer Matrix Composites -- Structure-property measurements: Multi-scale experiments for model calibration and validation for PMC -- Computational micromechanics and multi-

scale modeling of PMCs -- Determining property-based statistically equivalent representative volume elements or P- SERVE for polymer matrix composites using exterior statistics-based boundary conditions -- Quantification of error and uncertainty in materials characterization.

Sommario/riassunto

This book introduces research advances in Integrated Computational Materials Engineering (ICME) that have taken place under the aegis of the Center of Excellence on Integrated Materials Modeling (CEIMM). Its author team consists of leading researchers in ICME from prominent academic institutions and the Air Force Research Laboratory. The book examines state-of-the-art advances in physics-based, multi-scale, computational-experimental methods and models for structural materials like polymer-matrix composites and metallic alloys. The book emphasizes Ni-based superalloys and epoxy matrix carbon-fiber composites and encompasses atomistic scales, meso-scales of coarse-grained models and discrete dislocations, and micro-scales of poly-phase and polycrystalline microstructures. Other critical phenomena investigated include the relationship between microstructural morphology, crystallography, and mechanisms to the material response at different scales; methods of identifying representative volume elements using microstructure and material characterization, and robust deterministic and probabilistic modeling of deformation and damage. Encompassing a slate of topics that enable readers to comprehend and approach ICME-related issues involved in predicting material performance and failure, the book is ideal for mechanical, civil, and aerospace engineers, and materials scientists, in in academic, government, and industrial laboratories. Presents data acquisition, characterization, and image-based virtual models across multiple scales; Adopts a physics-based approach to multi-scale model development for material performance and failure response; Describes experimental methods for constitutive models, response functions, and failure processes; Maximizes reader understanding with probabilistic modeling and uncertainty quantification.