

1. Record Nr.	UNINA9911019869603321
Titolo	Continuum scale simulation of engineering materials : fundamentals, microstructures, process applications / / edited by Dierk Raabe ... [et al.]
Pubbl/distr/stampa	Weinheim, : Wiley-VCH Chichester, : John Wiley, 2004
ISBN	9786610519613 9781280519611 1280519614 9783527603787 3527603786 9783527604210 3527604219
Descrizione fisica	1 online resource (889 p.)
Altri autori (Persone)	RaabeDierk
Disciplina	620.110113
Soggetti	Materials - Computer simulation Manufacturing processes - Computer simulation
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Continuum Scale Simulation of Engineering Materials; Contents; Preface; List of Contributors; I Fundamentals and Basic Methods; 1 Computer Simulation of Diffusion Controlled Phase Transformations; 1.1 Introduction; 1.2 Numerical Treatment of Diffusion Controlled Transformations; 1.2.1 Diffusion; 1.2.2 Boundary Conditions; 1.2.3 Cell Size; 1.3 Typical Applications; 1.3.1 LE, LENP and PE in Fe-Mn-C; 1.3.2 LE, LENP and PE in Fe-Si-C; 1.3.3 PE in Fe-Ni-C; 1.3.4 Effect of Traces on the Growth of Grain Boundary Cementite; 1.3.5 Continuous Cooling 1.3.6 Competitive Growth of Phases: Multi-Cell Calculations1.3.7 Gas-Metal-Reactions: Carburization; 1.4 Outlook; References; 2 Introduction to the Phase-Field Method of Microstructure Evolution; 2.1 Introduction; 2.2 Origin of the Model; 2.3 Theoretical Fundamentals of the Method; 2.3.1 Representation of a Microstructure; 2.3.2 Thermodynamics of Microstructures; 2.3.3 The Evolution Equations; 2.4

Advantages and Disadvantages of the Method; 2.5 Typical Fields of Applications and Examples; 2.6 Summary and Opportunities; References; 3 Cellular, Lattice Gas, and Boltzmann Automata 3.1 Cellular Automata 3.1.1 Introduction; 3.1.2 Formal Description and Classes of Cellular Automata; 3.1.3 Cellular Automata in Materials Science; 3.1.4 Recrystallization Simulations with Cellular Automata; 3.2 Cellular Automata for Fluid Dynamics; 3.2.1 Introduction; 3.2.2 The HPP and FHP Lattice Gas Cellular Automata; 3.2.3 The Lattice Boltzmann Automaton; 3.3 Conclusions and Outlook; References; 4 The Monte Carlo Method; 4.1 Introduction; 4.2 History of the Monte Carlo Method; 4.2.1 Ising and Potts Models; 4.2.2 Metropolis Algorithm; 4.2.3 n-fold Way Algorithm 4.3 Description of the Monte Carlo Method for Grain Growth & Recrystallization 4.3.1 Discretization of Microstructure; 4.3.2 Evolution of the Microstructure; 4.3.3 Inert Particles; 4.3.4 Lattices; 4.3.5 Boundary Conditions; 4.3.6 Parallelization of the Monte Carlo Algorithm; 4.4 Nucleation in Recrystallization; 4.5 Initialization of MC Simulations; 4.6 Verification of the Monte Carlo Model; 4.7 Scaling of Simulated Grain Size to Physical Grain Size; 4.8 Recrystallization Kinetics in the Monte Carlo model; 4.9 Results of Simulation of Recrystallization by Monte Carlo Method 4.9.1 Abnormal Grain Growth 4.9.2 Static Recrystallization; 4.9.3 Grain Growth in the Presence of Particles; 4.9.4 Recrystallization in the Presence of Particles; 4.9.5 Texture Development; 4.9.6 Texture; 4.9.7 Dynamic Recrystallization; 4.10 Summary; References; 5 Crystal Plasticity; 5.1 Introduction; 5.2 Theoretical Background; 5.2.1 Mechanical Response of Single Crystals; 5.2.2 Lattice Orientation Distributions for Polycrystals; 5.2.3 Mechanical Response of Polycrystals; 5.3 Macroscopic Criteria for Anisotropic Strength; 5.3.1 Generalities; 5.3.2 Yield Surfaces Defined by Expansions 5.3.3 Yield Surfaces Defined by Hyperplanes

Sommario/riassunto

This book fills a gap by presenting our current knowledge and understanding of continuum-based concepts behind computational methods used for microstructure and process simulation of engineering materials above the atomic scale. The volume provides an excellent overview on the different methods, comparing the different methods in terms of their respective particular weaknesses and advantages. This trains readers to identify appropriate approaches to the new challenges that emerge every day in this exciting domain. Divided into three main parts, the first is a basic overview covering fu