H. Altenbach, Martin-Luther-Universität, Germany; **S. Kruch,** ONERA, Chatillon Cedex, France (Eds)

Advanced Materials Modeling for Structures

Contents

Micromechanical Modelling of Void Healing.- Surface Viscoelasticity and Effective Properties of Materials and Structures.- High-temperature inelastic behavior of the austenitic steel AISI type 316.- Finite Element Modelling of the Thermo-Mechanical Behaviour of a 9Cr Martensitic Steel.- Enhanced Global Digital Image Correlation for accurate measurement of microbeam bending.- An Investigation of the Mechanical Properties of Open Cell Aluminium Foam Struts: Microtensile Testing and Modelling.- Multiscale Optimization of Joints of Dissimilar Materials in Nature and Lessons for Engineering Applications.- Some consequences of stress range dependent constitutive models in creep.- Micro-mechanical numerical studies on the stress state dependence of ductile damage.- Characterization of load sensitive fatigue crack initiation in Ti-alloys using crystal plasticity based FE simulations.- Creep Crack Growth Modelling in 316H Stainless Steel.- On the non saturation of cyclic plasticity law: a power law for kinematic hardening.- Micromechanical studies of deformation, stress and crack nucleation in polycrystal materials.- Modeling of coupled dissipative phenomena in engineering materials.- Damage Deactivation of Engineering Materials and Structures.- Effect of orientation and overaging on the creep and creep crack growth properties of 2xxx aluminium alloy forgings.- Dislocation-Induced Internal Stresses.- A strain rate sensitive formulation to account for the effect of γ' rafting on the high temperature mechanical properties of Ni-based single crystal superalloys.

Fields of interest

Characterization and Evaluation of Materials; Continuum Mechanics and Mechanics of Materials; Computational Science and Engineering

Target groups

Research

Product category

Monograph

L. Priester, University of Paris South 11, France

Grain Boundaries

From Theory to Engineering

Grain boundaries are a main feature of crystalline materials. They play a key role in determining the properties of materials, especially when grain size decreases and even more so with the current improvements of processing tools and methods that allow us to control various elements in a polycrystal.

Features

► Written by an expert in the field ► Offers the first complete overview of grain boundaries ► Leads researchers working on macroscopic aspects, closely related to materials properties, to approach the scale of description of grain boundaries ► Explores opportunities emerging through "grain boundary engineering" to control of morphological and crystallographic features

Contents

From the Contents: Part 1: From intergranular order to disorder.- Introduction: brief history of the intergranular order concept.- Geometrical order.- Mechanical stress order.- Atomic order.- Order or disorder at high temperature.- Grain boundary order and energy.- Grain boundary order or disorder: what conclusion?.- Part 2: From the ideal grain boundary to the real grain boundary.- Defects in the grain boundary structure.- Intergranular segregation.- Precipitation at grain boundaries.- Interactions between dislocations and grain boundaries.- Relaxation of the intergranular stresses.- Part 3: From the free grain boundary to the constrained grain boundary.- The triple junction.- Grain boundary network - grain boundary texture.

Fields of interest

Surfaces and Interfaces, Thin Films; Crystallography; Physical Chemistry

Target groups

Research

Product category

Monograph

G. F. Tavadze, Tbilisi, Georgia; **A. S. Shteinberg,** Berkeley, CA, USA

Production of Advanced Materials by Methods of Self-Propagating High-Temperature Synthesis

This translation from the original Russian book outlines the production of a variety of materials by methods of self-propagating high-temperature synthesis (SHS). The types of materials discussed include: hard, refractory, corrosion and wear-resistant materials, as well as other advanced and specialty materials. The authors address the issue of optimal parameters for SHS reactions occurring during processes involving a preliminary metallothermic reduction stage, and they calculate these using thermodynamic approaches. In order to confirm the effectiveness of this approach, the authors describe experiments focusing on the synthesis of elemental crystalline boron, boron carbides and nitrides.

Features

► Outlines the production of a unique composite material (Ti - TiB) ► Describes a new method of synthesis of elemental boron and refractory borides

Contents

Synthesis of elemental boron and its refractory compounds by self-propagating high-temperature synthesis with metallothermic reduction.- Hard titanium and zirconium boride alloys and items manufactured from them by SHS-compaction.- Production and analysis of TiB2-based hard alloys.- Macrokinetics of degassing during SHS.- Macrokinetics of SHS compaction.

Fields of interest

Structural Materials; Industrial Chemistry/Chemical Engineering; Inorganic Chemistry

Target groups

Research

Product category

Brief

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