Advanced Materials Modeling for Structures

Contents

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

Target groups
Research

Product category
Monograph

Due January 2013

► € (D) 139,05 | € (A) 142,94 | sFr 173,00
► € 129,95 | £117.00
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Due December 2012

2013. XXII, 441 p. 314 illus. (Springer Series in Materials Science, Volume 172) Hardcover
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2013. XIV, 131 p. 106 illus. (SpringerBriefs in Materials) Softcover
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► € 49,95 | £44.99
ISBN 978-3-642-35204-1

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

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.- Chemical 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

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