Smart Biomaterials

This book provides comprehensive coverage of smart biomaterials and their potential applications, a field that is developing at a very rapid pace. Because smart biomaterials are an emerging class of biomaterials that respond to small changes in external stimuli with large discontinuous changes in their physical properties, they have been designed to act as an “on–off” switch for, among others, bioseparation, immunoanalysis, drug delivery technologies, gene therapy, diagnostics, biosensors, and artificial muscles. After an introduction to the topic and the history of smart biomaterials, the author gives the reader an in-depth look at the properties, mechanics, and characterization of smart biomaterials including hydrogels, particles, assemblies, surfaces, fibers, and conjugates. Information on the wide range of applications for these materials follows, including drug delivery, tissue engineering, and bioseparation. In addition, recent advances in shape memory biomaterials as active components of medical devices are also presented.

Features
► Provides comprehensive coverage of the principles and applications of all classes of smart biomaterials
► Introduces key new topics including shape memory materials
► Serves as a catalyst for new research to lead the field in the coming decade

Contents
Introduction to Smart Biomaterials.
- Hydrogels.
- Nanoparticles.
- Nanoassemblies.
- Surfaces.
- Nanofibers.
- Conjugates.
- Shape Memory Materials.

Fields of interest
Biomaterials; Gene Therapy; Polymer Sciences

Target groups
Research

Discount group
Professional Non-Medical

Microstructure, Properties and Degradation

This book gives an introduction to the mechanical behavior and degradation of dental ceramics and guides the reader through their performance under effect of oral environments. It addresses the different kinds of dental ceramics, their properties, degradation and mechanical aspects with less emphasis on the physics and chemistry involved, which makes the reading interesting for beginners in the field. In each chapter, the reader will learn about the mechanical behavior of dental ceramics and each phenomenon involved in their application, besides finding some practical examples of their use in dental clinics, their manufacturing procedures and types of degradation.

Features
► Treats the strengths and weaknesses of ceramics as dental materials
► Takes into account the aggressive intraoral environment
► Stresses the imperative of proper manufacturing for mechanical strength and reduction of degradation

Contents
- INTRODUCTION
- BIOMATERIALS
- CERAMIC MATERIALS FOR PROSTHETIC AND RESTORATION USE
- CERAMIC MATERIALS FOR ORTHODONTIC USE
- MICROSTRUCTURE OF CERAMIC MATERIALS
- MECHANICAL BEHAVIOR OF CERAMIC MATERIALS
- DENTAL ALUMINA: MICROSTRUCTURE AND PROPERTIES
- DEGRADATION OF DENTAL CERAMICS

Fields of interest
Biomaterials; Dentistry; Ceramics, Glass, Composites, Natural Materials

Target groups
Research

Discount group
Professional Non-Medical

Materials that Change Color

This book presents a design-driven investigation into smart materials developed by chemists, physicists, materials and chemical engineers, and applied by designers to consumer products. Introducing a class of smart materials, that change colors, the book presents their characteristics, advantages, potentialities and difficulties of applications of this to help understanding what they are, how they work, how they are applied. The books also present a number of case studies: products, projects, concepts and experiments using smart materials, thus mapping out new design territories for these innovative materials. These case studies involve different fields of design, including product, interior, fashion and communication design.

Features
► Detailed and up-to-date coverage of chromogenic materials
► Case studies discussing significant design-lead applications of chromogenic materials
► Easy to read and understand by design professionals, engineers, scientists and students

Contents
- Introduction to smart materials.
- Chromogenic materials.
- Types of chromogenic materials.
- Manufacturing and processes related to chromogenic materials and applications.
- Applications of chromogenic materials (products, projects, concepts).

Fields of interest
Surfaces and Interfaces, Thin Films; Industrial Chemistry/Chemical Engineering; Physical Chemistry

Target groups
Research

Discount group
Professional Non-Medical
Tungsten Carbides
Structure, Properties and Application in Hardmetals

This book embraces the entire range of problems associated with phase equilibria in "tungsten – carbon" binary system and related ternary systems, nonstoichiometry, disorder and order in different tungsten carbides, electronic and crystal structure of these carbides. The main application of tungsten carbides is constitutive in hardmetals for cutting tools. In the last 20 years, the most active efforts were made in synthesis and application of nanocrystalline tungsten carbide for the production of nanostructured hardmetals. The present book describes in detail different methods for production of nanocrystalline tungsten carbide. The peculiarities of sintering of hardmetals from nanocrystalline powders having different particle sizes are discussed.

Features
► Provides a survey of structure and properties of tungsten carbides
► Contains detailed description of different applied methods for production of nanocrystalline tungsten carbide powders and nanostructured hardmetals
► Analyses the effect of particle size of tungsten carbide powders on the peculiarities of sintering nanopowders, thermal stability, phase and chemical composition

Contents
Introduction.- Phases and Equilibria in the W – C and W – Co – C Systems.- Ordering of Tungsten Carbides.- Nanocrystalline Tungsten Carbide.- Hardmetals WC – Co Based on Nanocrystalline Powders of Tungsten Carbide WC.

Fields of interest
Ceramics, Glass, Composites, Natural Materials; Physical Chemistry; Applied and Technical Physics

Target groups
Research

Discount group
Professional Non-Medical

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2013. 250 p. 105 illus., 6 in color. (Springer Series in Materials Science, Volume 184) Hardcover
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ISBN 978-3-319-00782-3

P. G. Oppenheimer, University of Cambridge, UK
Electrohydrodynamic Patterning of Functional Materials

This thesis explores a route to induce and control the structure formation process in thin films by the use of strong electric fields. We investigate, establish and apply the use of the electrohydrodynamic (EHD) lithography as a versatile patterning tool on the sub-micrometre and nanometre length scales for functional materials. Thin films are ubiquitous, they are found in nature and used in almost every aspect of daily life.

Features
► Nominated as an outstanding Ph.D. thesis by the University of Cambridge, UK
► Provides a detailed introduction to electrohydrodynamic lithography and its principles
► Describes a novel and unique lithographic method of inducing and exploiting surface instabilities
► Seeds interdisciplinary cooperation and represents technology development at the interface of physical, biomaterials and materials science

Contents

Fields of interest
Surfaces and Interfaces, Thin Films; Surface and Interface Science, Thin Films; Nanotechnology

Target groups
Research

Discount group
Professional Non-Medical

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K. A. Padmanabhan, University of Hyderabad, India; R. R. Mulyukov, Director IMSP, Ufa, Russia; S. G. Chowdhury, National Metallurgical Laboratory, Jamshedpur, India
Superplasticity
Common Basis for an Ubiquitous Phenomenon

This book combines the perspectives of materials science of Superplasticity, on the one hand, and those of design and mechanics, on the other, in order to provide a holistic view of materials, design, mechanics and performance which will lead to useful solutions of societal benefits, in addition to providing great intellectual challenges. After considering the experimental evidence for superplasticity in different classes of materials, the book discusses the physics-based models, along with their advantages and limitations. Then, the analyses for superplastic forming available in the framework of continuum mechanics, finite element analysis and numerical simulations are presented.

Features
► Combines the perspectives of materials science of Superplasticity with those of design and mechanics
► Highlights successful industrial applications
► Addresses superplasticity from a universal physical origin

Contents
Historical Introduction.- Mechanics of Superplastic Deformation and Assessment of Superplastic Performance.- Structural Superplasticity in Different Classes of Materials.- Environmental Superplasticity.- Theories of Superplasticity.- Industrial Applications of Superplasticity.

Fields of interest
Characterization and Evaluation of Materials; Continuum Mechanics and Mechanics of Materials; Soft and Granular Matter, Complex Fluids and Microfluidics

Target groups
Research

Discount group
Professional Non-Medical

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