

Structural Ceramics Fundamentals And Case Studies

Ceramic powder synthesis and processing are two of the most important technologies in chemical engineering and the ceramics-related area of materials science. This book covers both the processing and the synthesis of ceramic powders in great depth and is indeed the only up-to-date, comprehensive source on the subject available. The application of modern scientific and engineering methods to the field of ceramic powder synthesis has resulted in much greater control of properties. *Fundamentals of Ceramic Powder Processing and Synthesis* presents examples of these modern methods as they apply to ceramic powders. The book is organized to describe the natural and synthetic raw materials that comprise contemporary ceramics. It covers the three reactant processes used in synthetic ceramic powder synthesis: solid, liquid, and gas. Ceramic powder processing, as a field of materials processing, is undergoing rapid expansion. The present volume is intended as a complete and useful source on this subject of great current interest. It provides comprehensive coverage from a strong chemistry and chemical engineering perspective and is especially applicable to materials scientists, chemical engineers, and applied

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chemists. Key Features * The most complete and updated reference source on the subject * Comprehensive coverage from a strong chemical engineering and chemistry perspective * Emphasis on both natural and synthetic raw materials in ceramic powder synthesis * Information on reaction kinetics * Superior, more comprehensive coverage than that in existing texts * Sample problems and exercises * Problems at the end of each chapter which supplement the material

All Refractories Are Ceramics but Not All Ceramics Are Refractories Ceramics and refractories cover a wide range of fields and applications, and their relevance can be traced as far back as 24,000 BC to the first man-made piece of earthenware, and as recently as the late 1900s when ceramics and ceramic matrix composites were developed to withstand ultra-high temperatures. Beginning with a detailed history of ceramics, *An Introduction to Ceramics and Refractories* examines every aspect of ceramics and refractories, and explores the connection between them. The book establishes refractories as a class of ceramics with high fusion points, introduces the fundamentals of refractories and ceramics, and also addresses several applications for each. *Understand Ceramic Properties and Refractory Behavior* The book details applications for natural and synthetic ceramics, as well as traditional and engineering applications. It

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focuses on the various thermal and thermo-mechanical properties of ceramics, classifies refractories, describes the principles of thermodynamics as applied to refractories, and highlights new developments and applications in the ceramic and refractory fields. It also presents end-of-chapter problems and a relevant case study. Divided into three sections, this text: Introduces and details the applications of ceramics and refractories Discusses the selection of materials and the two stages in selection Describes the phase equilibriums in ceramic and refractory systems Outlines the three important systems: unary, binary, and ternary Considers corrosion of ceramics and refractories, failures in ceramics and refractories, and the design aspects Addresses bonding, structures of ceramics, defects in ceramics, and ceramics' microstructures Covers the production of ceramic powders starting from the raw materials Explains four forming methods Highlights three types of thermal treatments Defines mechanical properties, and thermal and thermo-mechanical properties Classifies materials and designates classes Addressing topics that include corrosion, applications, thermal properties, and types of refractories, An Introduction to Ceramics and Refractories provides you with a basic knowledge of the fundamentals of refractories and ceramics, and presents a clear connection between refractory behavior and ceramic properties to the

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practicing engineer.

This textbook entitled *Fundamentals of Perovskite Oxides: Synthesis, Structure, Properties and Applications* summarizes the structure, synthesis routes, and potential applications of perovskite oxide materials. Since these perovskite-type ceramic materials offer opportunities in a wide range of fields of science and engineering, the chapters are broadly organized into four sections of perovskite-type oxide materials and technology. Covers recent developments in perovskite oxides Serves as a quick reference of perovskite oxides information Describes novel synthesis routes for nanostructured perovskites Discusses comprehensive details for various crystal structures, synthesis methods, properties, and applications Applies to academic education, scientific research, and industrial R&D for materials research in real-world applications like bioengineering, catalysis, energy conversion, energy storage, environmental engineering, and data storage and sensing This book serves as a handy and practical guideline suitable for students, engineers, and researchers working with advanced ceramic materials.

This book proposes a wide overview of the research and development of proton-conducting solid oxide materials. It is the first to approach the topic on proton-conducting ceramics and presents analysis studies from the fundamental to the most promising

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applied domains. It describes theoretical studies to enhance understanding of proton-transport mechanisms through materials and focuses on the main families of materials referred in the literature, highlighting their structure and their electrical and physicochemical properties. It lists the various routes of synthesis and processing methods used to develop such materials and deals with their main performances and prospects with respect to electromotive force, electrochemical hydrogen transport, and reactors. The book will be helpful for students from academic sciences as well as industrials dealing with applications of such materials.

This 1979 book presents the scientific foundations of mechanical behaviour and demonstrates how these can be used in engineering situations in relation to ceramics.

The first textbook to provide in-depth treatment of electroceramics with emphasis on applications in microelectronics, magneto-electronics, spintronics, energy storage and harvesting, sensors and detectors, magnetics, and in electro-optics and acousto-optics Electroceramics is a class of ceramic materials used primarily for their electrical properties. This book covers the important topics relevant to this growing field and places great emphasis on devices and applications. It provides sufficient background in theory and mathematics so that readers can gain

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insight into phenomena that are unique to electroceramics. Each chapter has its own brief introduction with an explanation of how the said content impacts technology. Multiple examples are provided to reinforce the content as well as numerous end-of-chapter problems for students to solve and learn. The book also includes suggestions for advanced study and key words relevant to each chapter. Fundamentals of Electroceramics:

Materials, Devices and Applications offers eleven chapters covering: 1. Nature and types of solid materials; 2. Processing of Materials; 3. Methods for Materials Characterization; 4. Binding Forces in Solids and Essential Elements of Crystallography; 5. Dominant Forces and Effects in Electroceramics; 6. Coupled Nonlinear Effects in Electroceramics; 7. Elements of Semiconductor; 8. Electroceramic Semiconductor Devices; 9. Electroceramics and Green Energy; 10. Electroceramic Magnetics; and 11. Electro-optics and Acousto-optics. Provides an in-depth treatment of electroceramics with the emphasis on fundamental theoretical concepts, devices, and applications with focus on non-linear dielectrics Emphasizes applications in microelectronics, magneto-electronics, spintronics, energy storage and harvesting, sensors and detectors, magnetics and in electro-optics and acousto-optics Introductory textbook for students to learn and make an impact on technology Motivates

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students to get interested in research on various aspects of electroceramics at undergraduate and graduate levels leading to a challenging career path. Includes examples and problem questions within every chapter that prepare students well for independent thinking and learning. Fundamentals of Electroceramics: Materials, Devices and Applications is an invaluable academic textbook that will benefit all students, professors, researchers, scientists, engineers, and teachers of ceramic engineering, electrical engineering, applied physics, materials science, and engineering.

The only book to provide a complete survey -- from the crystallographic fundamentals right up to recent high-tech applications in aerospace technology. Following a general introduction to the topic, the authors go on to cover the crystal chemistry of mullite and related phases, as well as its basic properties, phase equilibria and stability. One whole section is devoted to the synthesis and processing of mullite ceramics, while later ones cover mullite coatings, fibers and matrix composites. For materials scientists, solid state chemists and physicists, crystallographers and mineralogists.

The first book completely devoted to the subject, this volume describes the analysis of the composition and structure of glass and glass ceramics. Although conceived as a monograph, the individual chapters are written by leading Schott experts on the

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corresponding subjects.

The book covers the most important materials (naturals, metals, ceramics, polymers and composites) to be used mainly as structural engineering materials. Their main applications based on the properties are described in the first chapters of the book: mechanical, physical and chemical. The second part of the book is dedicated to the conceptual design by properties for a certain structural application: stiffness, mechanical strength, toughness, fatigue resistance, creep, etc., taking into account the weight and the cost. One of the chapters of the second part of the book is focused on the heat treatments of steels in order to improve their resistance to fatigue. The book concludes with a critical comparison between materials considering their production, properties and cost, and the forecast about the utilization of the different fields of materials in structural applications.

Shell structures is a term defining concrete or steel vaults of present century architecture that derive from the masonry vaults and domes of the past.

Particulate products make up around 80% of chemical products, from all industry sectors. Examples given in this book include the construction materials, fine ceramics and concrete; the delicacies, chocolate and ice cream; pharmaceutical, powders, medical inhalers and sun screen; liquid and powder paints. Size distribution and the shape of the particles provide for different functionalities in these products. Some functions are general, others specific. General functions are powder flow and require – at the typical particulate

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concentrations of these products – that the particles cause adequate rheological behavior during processing and/or for product performance. Therefore, this book addresses particle packing as well as its relation to powder flow and rheological behavior. Moreover, general relationships to particle size are discussed for e.g. color and sensorial aspects of particulate products. Product-specific functionalities are often relevant for comparable product groups. Particle size distribution and shape provide, for example, the following functionalities: - dense particle packing in relation to sufficient strength is required in concrete construction, ceramic objects and pharmaceutical tablets - good sensorial properties (mouthfeel) to chocolate and ice cream - effective dissolution, flow and compression properties for pharmaceutical powders - adequate hiding power and effective coloring of paints for protection and the desired esthetical appeal of the objects - adequate protection of our body against sun light by sunscreen - effective particle transport and deposition to desired locations for medical inhalers and powder paints. Adequate particle size distribution, shape and porosity of particulate products have to be achieved in order to reach optimum product performance. This requires adequate management of design and development as well as sufficient knowledge of the underlying principles of physics and chemistry. Moreover, flammability, explosivity and other health hazards from powders, during handling, are taken into account. This is necessary, since great risks may be involved. In all aspects, the most relevant parameters of the size

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distribution (and particle shape) have to be selected. In this book, experts in the different product fields have contributed to the product chapters. This provides optimum information on what particulate aspects are most relevant for behavior and performance within specified industrial products and how optimum results can be obtained. It differs from other books in the way that the critical aspects of different products are reported, so that similarities and differences can be identified. We trust that this approach will lead to improved optimization in design, development and quality of many particulate products.

Alumina Ceramics: Biomedical and Clinical Applications examines the extraordinary material, Alumina, and its use in biomedicine and industry. Sections discuss the fundamentals of Alumina Ceramics, look at the various industrial applications, and examine a variety of medical applications. Readers will find this to be an invaluable and unique resource for researchers, clinical professionals, engineers, and advanced level students. Alumina ceramics are a leading biomaterial used for specialist medical applications, such as bionic implants and tissue engineering, and the only biomaterial commercially viable for use as bearings for orthopedic hip replacements. As such, this book is a timely resource on the topics discussed. Provides a unique and thorough review of Alumina ceramics Written by one of the world's leading experts in bioceramics and advanced industrial ceramics, especially alumina Targeted to researchers in the materials, clinical and dental fields Enables the non-expert with an overview of the

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underlying alumina technology, major challenges, major successes and future directions

The book covers self-healing concepts for all important material classes and their applications: polymers, ceramics, non-metallic and metallic coatings, alloys, nanocomposites, concretes and cements, as well as ionomers. Beginning with the inspiration from biological self-healing, its mimicry and conceptual transfer into approaches for the self-repair of artificially created materials, this book explains the strategies and mechanisms for the readers' basic understanding, then covers the different material classes and suitable self-healing concepts, giving examples for their application in practical situations. As the first book in this swiftly growing research field, it is of great interest to readers from many scientific and engineering disciplines, such as physics and chemistry, civil, architectural, mechanical, electronics and aerospace engineering.

Although ceramics have been known to mankind literally for millennia, research has never ceased. Apart from the classic uses as a bulk material in pottery, construction, and decoration, the latter half of the twentieth century saw an explosive growth of application fields, such as electrical and thermal insulators, wear-resistant bearings, surface coatings, lightweight armour, or aerospace materials. In addition to plain, hard solids, modern ceramics come in many new guises such as fabrics, ultrathin films, microstructures and hybrid composites. Built on the solid foundations laid down by the 20-volume series *Materials Science and Technology*, *Ceramics Science and Technology* picks out this exciting material

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class and illuminates it from all sides. Materials scientists, engineers, chemists, biochemists, physicists and medical researchers alike will find this work a treasure trove for a wide range of ceramics knowledge from theory and fundamentals to practical approaches and problem solutions.

Updated and improved, this revised edition of Michel Barsoum's classic text *Fundamentals of Ceramics* presents readers with an exceptionally clear and comprehensive introduction to ceramic science.

Barsoum offers introductory coverage of ceramics, their structures, and properties, with a distinct emphasis on solid state physics and chemistry. Key equations are derived from first principles to ensure a thorough understanding of the concepts involved. The book divides naturally into two parts. Chapters 1 to 9 consider bonding in ceramics and their resultant physical structures, and the electrical, thermal, and other properties that are dependent on bonding type. The second part (Chapters 11 to 16) deals with those factors that are determined by microstructure, such as fracture and fatigue, and thermal, dielectric, magnetic, and optical properties. Linking the two sections is Chapter 10, which describes sintering, grain growth, and the development of microstructure. *Fundamentals of Ceramics* is ideally suited to senior undergraduate and graduate students of materials science and engineering and related subjects. The growth of implant and fixed prosthodontics practices in dentistry has created a rapidly increasing demand for advanced ceramics and ceramic processes. Innovations in ceramics and ceramic processes are vital to ensure

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reliable and affordable dental-restoration solutions with aesthetically pleasing outcomes. The work aims to engage the bioceramics and engineering communities to meet the challenges of modern dental restoration using advanced ceramics. Incorporating fundamental science, advanced engineering concepts, and clinical outcomes, the work is suitable for bioceramicists, ceramics manufacturers, dental clinicians and biologists. State-of-the-art-coverage encompasses bioresorbable ceramics for bone regeneration and bioactivating surfaces of inert, high-strength ceramics for implantation, keeping research knowledge appropriately updated Discusses transition from the baseline stable and physically stiff ceramics research into engineering of highly coherent laminate composites for prosthetic crowns and bridges Showcases current feasible techniques for producing, in cost-effective and materials-saving ways, long-lasting individualized ceramic components with biocompatibility, complexity and high precision

Ceramic engineering deals with the science and technology of creating objects from inorganic and non-metallic materials. It combines the principles of chemistry, physics and engineering. Fiber-optic devices, microprocessors and solar panels are just a few of the examples of ceramic engineering being applied in everyday life. Advanced ceramics such as alumina, aluminum nitride, zirconia, ZnO, silicon carbide, silicon nitride and titania-based materials, each have their own specific characteristics, and offer an economic and high-performance alternative to more conventional materials such as glass, metals and plastics. In the current world of industry and academia it is imperative that we have more detailed knowledge on the established properties and categorization

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of these materials. Ceramic Engineering: Fundamentals to Recent Advancements is divided over two parts, the first part focuses on the basics of ceramic materials which will include chapters on the fundamentals, classification and applications. There is also an extensive review of the current published literature on established ceramic materials too. As ceramics constitute a multi-billion dollar a year industry, ceramic engineering is currently an alluring field of research. Engineering of ceramic materials is needed for production of ceramic teeth, bones, and fiber optic cables used for surgery as well as ceramic superconductors and lasers. The second part of this book presents an extensive review of up-to-date research on new innovative ceramic materials. It reviews recent published articles and presents case studies and latest research outputs. The book will be an essential reference resource for materials scientists, physicists, chemists and engineers, Postgraduate students and early career researchers as well as industrial researchers working in R&D in the development of ceramic materials. Comprehensive coverage on the fundamentals, classifications and applications of a wide spectrum of ceramics Covers environmental barrier ceramic coatings, advanced ceramic conductive fuel cells, processing and machining technology in ceramic and composite materials, photoluminescent ceramic materials, perovskite ceramics and bioinspired ceramic materials Review of both conventional established ceramics and innovative new advanced ceramics too

This book helps students and practicing scientists alike understand that a comprehensive knowledge about the friction and wear properties of advanced materials is essential to further design and development of new materials. With important introductory chapters on the fundamentals, processing, and applications of tribology, the book then examines in detail the nature and properties of materials, the

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friction and wear of structural ceramics, bioceramics, biocomposites, and nanoceramics, as well as lightweight composites and the friction and wear of ceramics in a cryogenic environment.

Proceedings containing 231 manuscripts that were submitted and approved for the 13th biennial worldwide refractories congress recognized as the Unified International Technical Conference on Refractories (UNITECR), held September 10-13, 2013.

This book details the rigorous requirements for refractories designed for aluminium metallurgical processes: reduction, cast house, and anode production. The author describes requirements specific to the properties and structure of refractory materials that differentiate it from materials used for ferrous metallurgy, among others. A comparison is drawn between the properties and structure of refractories and carbon cathode materials from different points of view: from the perspective of physical chemistry and chemical interactions during the metallurgical process and from the aspect of designing reduction pots and furnaces to accommodate the lifetime of metallurgical aggregates that are a part of aluminum refractory processes.

The Light Metals symposia are a key part of the TMS Annual Meeting & Exhibition, presenting the most recent developments, discoveries, and practices in primary aluminum science and technology. Publishing the proceedings from these important symposia, the Light Metals volume has become the definitive reference in the field of aluminum production and related light metal technologies. The 2014 collection includes papers from the following symposia: •Alumina and Bauxite •Aluminum Alloys: Fabrication, Characterization and Applications •Aluminum Processing •Aluminum Reduction Technology •Cast Shop for Aluminum Production •Electrode Technology for Aluminum

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Production •Light-metal Matrix (Nano)-composites

This book covers the area of tribology broadly, providing important introductory chapters to fundamentals, processing, and applications of tribology. The book is designed primarily for easy and cohesive understanding for students and practicing scientists pursuing the area of tribology with focus on materials. This book helps students and practicing scientists alike understand that a comprehensive knowledge about the friction and wear properties of advanced materials is essential to further design and development of new materials. The description of the wear micromechanisms of various materials will provide a strong background to the readers as how to design and develop new tribological materials. This book also places importance on the development of new ceramic composites in the context of tribological applications. Some of the key features of the book include: Fundamentals section highlights the salient issues of ceramic processing and mechanical properties of important oxide and non-oxide ceramic systems; State of the art research findings on important ceramic composites are included and an understanding on the behavior of silicon carbide (SiC) based ceramic composites in dry sliding wear conditions is presented as a case study; Erosion wear behavior of ceramics, in which case studies on high temperature erosion behavior of SiC based composites and zirconium diboride (ZrB₂) based composites is also covered; Wear behavior of ceramic coatings is rarely discussed in any tribology related books therefore a case study explaining the abrasion wear behavior of WC-Co coating is provided. Finally an appendix chapter is included in which a collection of several types of questions including multiple choice, short answer and long answer are provided.

Handbook of Ceramics Grinding and Polishing meets the growing need in manufacturing industries for a clear

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understanding of the latest techniques in ceramics processing. The properties of ceramics make them very useful as components—they withstand high temperatures and are durable, resistant to wear, chemical degradation, and light. In recent years the use of ceramics has been expanding, with applications in most industry sectors that use machined parts, especially where corrosion-resistance is required, and in high temperature environments. However, they are challenging to produce and their use in high-precision manufacturing often requires adjustments to be made at the micro and nano scale. This book helps ceramics component producers to do cost-effective, highly precise machining. It provides a thorough grounding in the fundamentals of ceramics—their properties and characteristics—and of the abrasive processes used to manipulate their final shape as well as the test procedures vital for success. The second edition has been updated throughout, with the latest developments in technologies, techniques, and materials. The practical nature of the book has also been enhanced; numerous case studies illustrating how manufacturing (machining) problems have been handled are complemented by a highly practical new chapter on the selection and efficient use of machine tools. Provides readers with experience-based insights into complex and expensive processes, leading to improved quality control, lower failure rates, and cost savings Covers the fundamentals of ceramics side-by-side with processing issues and machinery selection, making this book an invaluable guide for downstream sectors evaluating the use of ceramics, as well as those involved in the manufacturing of structural ceramics Numerous case studies from a wide range of applications (automotive, aerospace, electronics, medical devices)

This text is an unbound, three hole punched version.

Fundamentals of Materials Science and Engineering: An

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Integrated Approach, Binder Ready Version, 5th Edition takes an integrated approach to the sequence of topics – one specific structure, characteristic, or property type is covered in turn for all three basic material types: metals, ceramics, and polymeric materials. This presentation permits the early introduction of non-metals and supports the engineer's role in choosing materials based upon their characteristics. Using clear, concise terminology that is familiar to students, Fundamentals presents material at an appropriate level for both student comprehension and instructors who may not have a materials background. This text is an unbound, three hole punched version. Access to WileyPLUS sold separately.

Ceramic Materials: Science and Engineering is an up-to-date treatment of ceramic science, engineering, and applications in a single, comprehensive text. Building on a foundation of crystal structures, phase equilibria, defects, and the mechanical properties of ceramic materials, students are shown how these materials are processed for a wide diversity of applications in today's society. Concepts such as how and why ions move, how ceramics interact with light and magnetic fields, and how they respond to temperature changes are discussed in the context of their applications. References to the art and history of ceramics are included throughout the text, and a chapter is devoted to ceramics as gemstones. This course-tested text now includes expanded chapters on the role of ceramics in industry and their impact on the environment as well as a chapter devoted to

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applications of ceramic materials in clean energy technologies. Also new are expanded sets of text-specific homework problems and other resources for instructors. The revised and updated Second Edition is further enhanced with color illustrations throughout the text.

Reflecting the many changes in the field since the publication of the second edition, *Corrosion of Ceramic Materials, Third Edition* incorporates more information on bioceramics, including nanomaterials, as well as the weathering of construction materials. Adhering to the original plan of classification by chemistry, this edition reorganizes the topics into four main sections: Fundamentals, Corrosion Analysis, Corrosion of Specific Materials, and Properties and Corrosion. New to the Third Edition

- New chapters on corrosion by biological sources
- New chapter on corrosion of architectural materials
- Additional material on thermal and environmental barrier coatings
- Expanded chapter on composites
- More questions and examples
- New literature sources in each chapter where appropriate

With an abundance of practical features and new information, this expanded and completely reorganized third edition helps readers address corrosion problems and create the most corrosion-resistant systems possible. Designed as a reference, it could also be used as a text in a graduate or senior undergraduate course.

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Fundamentals of Ceramics presents readers with an exceptionally clear and comprehensive introduction to ceramic science. This Second Edition updates problems and adds more worked examples, as well as adding new chapter sections on Computational Materials Science and Case Studies. The Computational Materials Science sections describe how today density functional theory and molecular dynamics calculations can shed valuable light on properties, especially ones that are not easy to measure or visualize otherwise such as surface energies, elastic constants, point defect energies, phonon modes, etc. The Case Studies sections focus more on applications, such as solid oxide fuel cells, optical fibers, alumina forming materials, ultra-strong and thin glasses, glass-ceramics, strong and tough ceramics, fiber-reinforced ceramic matrix composites, thermal barrier coatings, the space shuttle tiles, electrochemical impedance spectroscopy, two-dimensional solids, field-assisted and microwave sintering, colossal magnetoresistance, among others. The book presents the fundamentals and the role of powder metallurgy in contemporary technologies and the state of the art of classical powder metallurgy technologies and a general description of new variants and special and hybrid technologies used in powder metallurgy. The next part includes over a dozen case studies provided in the following

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chapters, comprehensively describing authors' accomplishments of numerous teams from different countries across the world in advanced research areas relating to powder metallurgy and to special and hybrid technologies. The detailed information, largely deriving from own and original research and R

This book details the peculiarities of the requirements for refractories designed for aluminium metallurgical process: reduction, cast house, and anode production. The author describes requirements specific to the properties and structure of refractory materials that differentiate it from the refractories for ferrous metallurgy and other refractories. A comparison is drawn between the properties and structure of refractories and carbon cathode materials from different points of view: from the point of physical chemistry and chemistry interactions during the metallurgical process and from the point of design of reduction pots and furnaces with the aspect to the service life time of metallurgical aggregates.

This book covers the area of advanced ceramic composites broadly, providing important introductory chapters to fundamentals, processing, and applications of advanced ceramic composites. Within each section, specific topics covered highlight the state of the art research within one of the above sections. The organization of the book is designed to

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provide easy understanding by students as well as professionals interested in advanced ceramic composites. The various sections discuss fundamentals of nature and characteristics of ceramics, processing of ceramics, processing and properties of toughened ceramics, high temperature ceramics, nanoceramics and nanoceramic composites, and bioceramics and biocomposites. A Comprehensive and Self-Contained Treatment of the Theory and Practical Applications of Ceramic Materials When failure occurs in ceramic materials, it is often catastrophic, instantaneous, and total. Now in its Second Edition, this important book arms readers with a thorough and accurate understanding of the causes of these failures and how to design ceramics for failure avoidance. It systematically covers:

- Stress and strain
- Types of mechanical behavior
- Strength of defect-free solids
- Linear elastic fracture mechanics
- Measurements of elasticity, strength, and fracture toughness
- Subcritical crack propagation
- Toughening mechanisms in ceramics
- Effects of microstructure on toughness and strength
- Cyclic fatigue of ceramics
- Thermal stress and thermal shock in ceramics
- Fractography
- Dislocation and plastic deformation in ceramics
- Creep and superplasticity of ceramics
- Creep rupture at high temperatures and safe life design
- Hardness and wear

And more While maintaining the first edition's reputation for being an indispensable professional

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resource, this new edition has been updated with sketches, explanations, figures, tables, summaries, and problem sets to make it more student-friendly as a textbook in undergraduate and graduate courses on the mechanical properties of ceramics.

Describes advances, key information, case studies, and examples that can broaden your knowledge of composites materials and manufacturing methods. This text deals with composites manufacturing methods, providing tips for getting the best results that weigh the required material properties against cost and production efficiency. An Instructor's Guide is also available.

Comprehensive Hard Materials deals with the production, uses and properties of the carbides, nitrides and borides of these metals and those of titanium, as well as tools of ceramics, the superhard boron nitrides and diamond and related compounds. Articles include the technologies of powder production (including their precursor materials), milling, granulation, cold and hot compaction, sintering, hot isostatic pressing, hot-pressing, injection moulding, as well as on the coating technologies for refractory metals, hard metals and hard materials. The characterization, testing, quality assurance and applications are also covered.

Comprehensive Hard Materials provides meaningful insights on materials at the leading edge of technology. It aids continued research and

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development of these materials and as such it is a critical information resource to academics and industry professionals facing the technological challenges of the future. Hard materials operate at the leading edge of technology, and continued research and development of such materials is critical to meet the technological challenges of the future. Users of this work can improve their knowledge of basic principles and gain a better understanding of process/structure/property relationships. With the convergence of nanotechnology, coating techniques, and functionally graded materials to the cognitive science of cemented carbides, cermets, advanced ceramics, super-hard materials and composites, it is evident that the full potential of this class of materials is far from exhausted. This work unites these important areas of research and will provide useful insights to users through its extensive cross-referencing and thematic presentation. To link academic to industrial usage of hard materials and vice versa, this work deals with the production, uses and properties of the carbides, nitrides and borides of these metals and those of titanium, as well as tools of ceramics, the superhard boron nitrides and diamond and related compounds.

From theory and fundamentals to the latest advances in computational and experimental modal analysis, this is the definitive, updated reference on

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structural dynamics. This edition updates Professor Craig's classic introduction to structural dynamics, which has been an invaluable resource for practicing engineers and a textbook for undergraduate and graduate courses in vibrations and/or structural dynamics. Along with comprehensive coverage of structural dynamics fundamentals, finite-element-based computational methods, and dynamic testing methods, this Second Edition includes new and expanded coverage of computational methods, as well as introductions to more advanced topics, including experimental modal analysis and "active structures." With a systematic approach, it presents solution techniques that apply to various engineering disciplines. It discusses single degree-of-freedom (SDOF) systems, multiple degrees-of-freedom (MDOF) systems, and continuous systems in depth; and includes numeric evaluation of modes and frequency of MDOF systems; direct integration methods for dynamic response of SDOF systems and MDOF systems; and component mode synthesis. Numerous illustrative examples help engineers apply the techniques and methods to challenges they face in the real world. MATLAB(r) is extensively used throughout the book, and many of the .m-files are made available on the book's Web site. Fundamentals of Structural Dynamics, Second Edition is an indispensable reference and "refresher course" for engineering professionals; and a

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textbook for seniors or graduate students in mechanical engineering, civil engineering, engineering mechanics, or aerospace engineering. This book discusses fundamentals of nanostructured ceramics involving functional, structural and high temperature materials. It provides both solved numerical problems and unsolved problems to enable the reader to envisage the correlation between synthesis process and properties in the perspective of new material development. It serves as a concise text to answer the basics and achieve research goals for academia and industry. Key Features Deals with basic strategy on data interpretation for nanostructured ceramics Proposes to bridge the gap between the nano and bulk properties of nanostructured ceramics Discusses brief schematics and equations to understand the different properties of nano to bulk ceramics Presents mode of data acquisition and interpretation through statistical module and solved numerical Includes unsolved numericals based on properties, data acquisition and interpretation This volume is part of the Ceramic Engineering and Science Proceeding (CESP) series. This series contains a collection of papers dealing with issues in both traditional ceramics (i.e., glass, whitewares, refractories, and porcelain enamel) and advanced ceramics. Topics covered in the area of advanced ceramic include bioceramics, nanomaterials,

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composites, solid oxide fuel cells, mechanical properties and structural design, advanced ceramic coatings, ceramic armor, porous ceramics, and more.

Fundamentals of Inorganic Glasses, Third Edition, is a comprehensive reference on the field of glass science and engineering that covers numerous, significant advances. This new edition includes the most recent advances in glass physics and chemistry, also discussing groundbreaking applications of glassy materials. It is suitable for upper level glass science courses and professional glass scientists and engineers at industrial and government labs. Fundamental concepts, chapter-ending problem sets, an emphasis on key ideas, and timely notes on suggested readings are all included.

The book provides the breadth required of a comprehensive reference, offering coverage of the composition, structure and properties of inorganic glasses. Clearly develops fundamental concepts and the basics of glass science and glass chemistry

Provides a comprehensive discussion of the composition, structure and properties of inorganic glasses Features a discussion of the emerging applications of glass, including applications in energy, environment, pharmaceuticals, and more

Concludes chapters with problem sets and suggested readings to facilitate self-study

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StudiesCambridge University Press

Reviews production methods, microstructures, and properties of structural ceramics with important applications, including high voltage insulators, hot gas filters, machining tools, and hip joint replacements.

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