

## Principles Of Ceramics Processing 2nd Edition

This book presents a broad, general introduction to the processing of Sol-Gel technologies. This updated volume serves as a general handbook for researchers and students entering the field. This new edition provides updates in fields that have undergone rapid developments, such as Ceramics, Catalysis, Chromatography, biomaterials, glass science, and optics. It provides a simple, compact resource that can also be used in graduate-level materials science courses.

Glass-ceramic materials share many properties with both glass and more traditional crystalline ceramics. This new edition examines the various types of glass-ceramic materials, the methods of their development, and their countless applications. With expanded sections on biomaterials and highly bioactive products (i.e., Bioglass and related glass ceramics), as well as the newest mechanisms for the development of dental ceramics and theories on the development of nano-scaled glass-ceramics, here is a must-have guide for ceramic and materials engineers, managers, and designers in the ceramic and glass industry.

Examines the latest processing and fabrication methods There is increasing interest in the application of advanced ceramic materials in diverse areas such as transportation, energy, environmental protection and remediation, communications, health, and aerospace. This book guides readers through a broad selection of key processing techniques for ceramics and their composites, enabling them to manufacture ceramic products and components with the properties needed for various industrial applications. With chapters contributed by internationally recognized experts in the field of ceramics, the book includes traditional fabrication routes as well as new and emerging approaches in order to meet the increasing demand for more reliable ceramic materials. Ceramics and Composites Processing Methods is divided into three sections: Densification, covering the fundamentals and practice of sintering, pulsed electric current sintering, and viscous phase silicate processing Chemical Methods, examining colloidal methods, sol-gel, gel casting, polymer processing, chemical vapor deposition, chemical vapor infiltration, reactive melt infiltration, and combustion synthesis Physical Methods, including directional solidification, solid free-form fabrication, microwave processing, electrophoretic deposition, and plasma spraying Each chapter focuses on a particular processing method or approach. Collectively, these chapters offer readers comprehensive, state-of-the-science information on the many approaches, techniques, and methods for the processing and fabrication of advanced ceramics and ceramic composites. With its coverage of the latest processing methods, Ceramics and Composites Processing Methods is recommended for researchers and students in ceramics, materials science, structural materials, biomedical engineering, and nanotechnology.

Part I: Process design -- Introduction to design -- Process flowsheet development -- Utilities and energy efficient design -- Process simulation -- Instrumentation and process control -- Materials of construction -- Capital cost estimating -- Estimating revenues and production costs -- Economic evaluation of projects -- Safety and loss prevention -- General site considerations -- Optimization in design -- Part II: Plant design -- Equipment selection, specification and design -- Design of pressure vessels -- Design of reactors and mixers -- Separation of fluids -- Separation columns (distillation, absorption and extraction) -- Specification and design of solids-handling equipment -- Heat transfer equipment -- Transport and storage of fluids.

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

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 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.

Ceramic Processing is the first comprehensive, stand alone, multi-authored book on advanced ceramic processing. It provides an overview of the important processing steps involved in the fabrication of advanced ceramics for structural and functional applications.

Designed to provide students with the core understanding necessary to pursue the subject of ceramics as it now exists and to be prepared for any surprises likely to emerge. Key concepts are developed in a sequence which builds on firm foundations, using the material learned so that its significance is continuously reinforced. The nature of defects which intrudes upon the perfect geometry of ideal crystal structures, migration of matter and charge, chemical and phase equilibria are among the subjects discussed.

This book provides a comprehensive overview of contemporary basic research, emerging technology, and commercial and industrial applications associated with the electrophoretic deposition of nanomaterials. This presentation of the subject includes an historical survey, the underlying theory of electrophoresis, dielectrophoresis, and the colloidal deposition of materials. This is followed by an assessment of the experimental equipment and procedures for electrophoretic and dielectrophoretic aggregation, manipulation, and deposition of nanoparticles, nanotubes, and other nanomaterials. Additional chapters explore the specific science and technology of electrophoretic film formation, using widely studied and application-driven nanomaterials, such as carbon nanotubes, luminescent nanocrystals, and nano-ceramics. The concluding chapters explore industrial applications and procedures associated with electrophoretic deposition of nanomaterials.

This collection of papers describes the various innovative techniques and approaches for synthesis and processing of

novel ceramics, glass, and composite materials and their fabrication in various forms, shapes, and complex structures. Special emphasis is given to state-of-the-art methods such as reaction bonding, microwave, CVD, CVI, electrophoresis, sol-gel, plasma, combustion, and more. Proceedings of the symposium held at the 104th Annual Meeting of The American Ceramic Society, April 28-May1, 2002 in Missouri; Ceramic Transactions, Volume 135.

This popular reference offers a clear understanding of the scientific principles of ceramics processing required for the development and production of new advanced ceramics. In the latest edition significant new material has been added to the chapters on raw materials, liquids and surfactants, vapor deposition, printing, coating processes and firing. Contains several new features including processing flow diagrams, tables summarizing important points, 100+ new figures as well as descriptions of defects and their causes which are either itemized in the text or summarized in a table. Also includes numerous problems and examples following each chapter. An Instructor's Manual presenting detailed solutions to all the problems in the book is available from the Wiley editorial department.

This book gives a comprehensive account on the manufacturing techniques to synchronize the desired properties of both traditional and advanced ceramics. Offers exclusive and up to date information on industrial ceramic processing equipment and approaches and discusses actual industrial practices taking a product-oriented approach. It should serve as a text to answer the processing of ceramics and achieve targeted product in industrial environment.

Frank Handle ? 1.1 What to Expect For some time now, I have been toying around with the idea of writing a book about "Ceramic Extrusion", because to my amazement I have been unable to locate a single existing, comprehensive rundown on the subject – much in contrast to, say, plastic extrusion and despite the fact that there are some outstanding contributions to be found about certain, individual topics, such as those in textbooks by Reed [1], Krause [2], Bender/Handle ? [3] et al. By way of analogy to Woody Allen's wonderfully ironic movie entitled "Everything You Always Wanted to Know about Sex", I originally intended to call this book "Everything You Always Wanted to Know about Ceramic Extrusion", but - ter giving it some extra thought, I eventually decided on a somewhat soberer title.

Nevertheless, my companion writers and I have done our best – considering our target group and their motives – not to revert to the kind of jargon that people use when they think the less understandable it sounds, the more scientific it appears. This book addresses all those who are looking for a lot or a little general or selective information about ceramic extrusion and its sundry aspects. We realize that most of our readers will not be perusing this book just for fun or out of intellectual curiosity, but because they hope to get some use out of it for their own endeavours.

This multivolume work covers all aspects of membrane science and technology - from basic phenomena to the most advanced applications and future perspectives. Modern membrane engineering is critical to the development of process-intensification strategies and to the stimulation of industrial growth. The work presents researchers and industrial managers with an indispensable tool toward achieving these aims. Covers membrane science theory and economics, as well as applications ranging from chemical purification and natural gas enrichment to potable water. Includes contributions and case studies from internationally recognized experts and from up-and-coming researchers working in this multi-billion dollar field. Takes a unique, multidisciplinary approach that stimulates research in hybrid technologies for current (and future) life-saving applications (artificial organs, drug delivery).

Since the publication of its Third Edition, there have been many notable advances in ceramic engineering. Modern Ceramic Engineering, Fourth Edition serves as an authoritative text and reference for both professionals and students seeking to understand key concepts of ceramics engineering by introducing the interrelationships among the structure, properties, processing, design concepts, and applications of advanced ceramics. Written in the same clear manner that made the previous editions so accessible, this latest edition has been expanded to include new information in almost every chapter, as well as two new chapters that present a variety of relevant case studies. The new edition now includes updated content on nanotechnology, the use of ceramics in integrated circuits, flash drives, and digital cameras, and the role of miniaturization that has made our modern digital devices possible, as well as information on electrochemical ceramics, updated discussions on LEDs, lasers and optical applications, and the role of ceramics in energy and pollution control technologies. It also highlights the increasing importance of modeling and simulation.

A two-volume reference set for all ceramicists, both in research and working in industry. The only definitive reference covering the entire field of advanced ceramics from fundamental science and processing to application. Contributions from over 50 leading researchers from around the world. This new Handbook will be an essential resource for ceramicists. It includes contributions from leading researchers around the world, and includes sections on: Basic Science of Advanced Ceramic, Functional Ceramics (electro-ceramics and optoelectro-ceramics) and engineering ceramics. Contributions from over 50 leading researchers from around the world.

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 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.

Handbook of Chemical Vapor Deposition: Principles, Technology and Applications provides information pertinent to the fundamental aspects of chemical vapor deposition. This book discusses the applications of chemical vapor deposition, which is a relatively flexible technology that can accommodate many variations. Organized into 12 chapters, this book

begins with an overview of the theoretical examination of the chemical vapor deposition process. This text then describes the major chemical reactions and reviews the chemical vapor deposition systems and equipment used in research and production. Other chapters consider the materials deposited by chemical vapor deposition. This book discusses as well the potential applications of chemical vapor deposition in semiconductors and electronics. The final chapter deals with ion implantation as a major process in the fabrication of semiconductors. This book is a valuable resource for scientists, engineers, and students. Production and marketing managers and suppliers of equipment, materials, and services will also find this book useful.

This book provides a concise and inexpensive introduction for an undergraduate course in glass science and technology. The level of the book has deliberately been maintained at the introductory level to avoid confusion of the student by inclusion of more advanced material, and is unique in that its text is limited to the amount suitable for a one term course for students in materials science, ceramics or inorganic chemistry. The contents cover the fundamental topics of importance in glass science and technology, including glass formation, crystallization, phase separation and structure of glasses. Additional chapters discuss the most important properties of glasses, including discussion of physical, optical, electrical, chemical and mechanical properties. A final chapter provides an introduction to a number of methods used to form technical glasses, including glass sheet, bottles, insulation fibre, optical fibres and other common commercial products. In addition, the book contains discussion of the effects of phase separation and crystallization on the properties of glasses, which is neglected in other texts. Although intended primarily as a textbook, *Introduction to Glass Science and Technology* will also be invaluable to the engineer or scientist who desires more knowledge regarding the formation, properties and production of glass.

Here is the first multidisciplinary overview of the scientific principles and engineering technology involved in processing ceramic powders and granular materials into fired ceramic products. It presents a systematic development of the chemistry underlying modern materials, such as glass, porcelain, enamels, abrasives, and refractories. Explains their characterization and specification, selection of processing additives, testing requirements, causes and prevention of product defects, and all other areas of development. Each process involved in producing ceramic products is clearly detailed; these include packing, mixing, separation, granulation, forming and molding, drying, finishing, and much more. Now in its eleventh edition, *DeGarmo's Materials and Processes in Manufacturing* has been a market-leading text on manufacturing and manufacturing processes courses for more than fifty years. Authors J T. Black and Ron Kohser have continued this book's long and distinguished tradition of exceedingly clear presentation and highly practical approach to materials and processes, presenting mathematical models and analytical equations only when they enhance the basic understanding of the material. Completely revised and updated to reflect all current practices, standards, and materials, the eleventh edition has new coverage of additive manufacturing, lean engineering, and processes related to ceramics, polymers, and plastics.

Although sintering is an essential process in the manufacture of ceramics and certain metals, as well as several other industrial operations, until now, no single book has treated both the background theory and the practical application of this complex and often delicate procedure. In *Sintering Theory and Practice*, leading researcher and materials engineer Randall M. German presents a comprehensive treatment of this subject that will be of great use to manufacturers and scientists alike. This practical guide to sintering considers the fact that while the bonding process improves strength and other engineering properties of the compacted material, inappropriate methods of control may lead to cracking, distortion, and other defects. It provides a working knowledge of sintering, and shows how to avoid problems while accounting for variables such as particle size, maximum temperature, time at that temperature, and other problems that may cause changes in processing. The book describes the fundamental atomic events that govern the transformation from particles to solid, covers all forms of the sintering process, and provides a summary of many actual production cycles. Building from the ground up, it begins with definitions and progresses to measurement techniques, easing the transition, especially for students, into advanced topics such as single-phase solid-state sintering, microstructure changes, the complications of mixed particles, and pressure-assisted sintering. German draws on some six thousand references to provide a coherent and lucid treatment of the subject, making scientific principles and practical applications accessible to both students and professionals. In the process, he also points out and avoids the pitfalls found in various competing theories, concepts, and mathematical disputes within the field. A unique opportunity to discover what sintering is all about--both in theory and in practice

What is sintering? We see the end product of this thermal process all around us--in manufactured objects from metals, ceramics, polymers, and many compounds. From a vast professional literature, *Sintering Theory and Practice* emerges as the only comprehensive, systematic, and self-contained volume on the subject. Covering all aspects of sintering as a processing topic, including materials, processes, theories, and the overall state of the art, the book

- \* Offers numerous examples, illustrations, and tables that detail actual processing cycles, and that stress existing knowledge in the field
- \* Uses the specifics of various consolidation cycles to illustrate the basics
- \* Leads the reader from the fundamentals to advanced topics, without getting bogged down in various mathematical disputes over treatments and measurements
- \* Supports the discussion with critically selected references from thousands of sources
- \* Examines the sintering behavior of a wide variety of engineered materials--metals, alloys, oxide ceramics, composites, carbides, intermetallics, glasses, and polymers
- \* Guides the reader through the sintering processes for several important industrial materials and demonstrates how to control these processes effectively and improve present techniques
- \* Provides a helpful reference for specific information on materials, processing problems, and concepts

For practitioners and researchers in ceramics, powder metallurgy, and other areas, and for students and faculty in materials science and engineering, this book provides the know-how and understanding crucial to many industrial operations, offers many ideas for further research, and suggests future applications of this important technology. This book offers an

unprecedented opportunity to explore sintering in both practical and theoretical terms, whether at the lab or in real-world applications, and to acquire a broad, yet thorough, understanding of this important technology.

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High-temperature Solid Oxide Fuel Cells, Second Edition, explores the growing interest in fuel cells as a sustainable source of energy. The text brings the topic of green energy front and center, illustrating the need for new books that provide comprehensive and practical information on specific types of fuel cells and their applications. This landmark volume on solid oxide fuel cells contains contributions from experts of international repute, and provides a single source of the latest knowledge on this topic. A single source for all the latest information on solid oxide fuel cells and their applications Illustrates the need for new, more comprehensive books and study on the topic Explores the growing interest in fuel cells as viable, sustainable sources of energy

An Introduction to Materials Engineering and Science for Chemical and Materials Engineers provides a solid background in materials engineering and science for chemical and materials engineering students. This book: Organizes topics on two levels; by engineering subject area and by materials class. Incorporates instructional objectives, active-learning principles, design-oriented problems, and web-based information and visualization to provide a unique educational experience for the student. Provides a foundation for understanding the structure and properties of materials such as ceramics/glass, polymers, composites, bio-materials, as well as metals and alloys. Takes an integrated approach to the subject, rather than a "metals first" approach.

The second edition of Principles of Polymer Engineering brings up-to-date coverage for undergraduates studying materials and polymer science. The opening chapters show why plastics and rubbers have such distinctive properties and how they are affected by temperature, strain rate, and other factors. The rest of the book concentrates on how these properties can be exploited to produce functional components within the constraints placed on them. The main changes for the second edition are a new chapter on environmental issues and substantially rewritten sections on yield and fracture and forming. To request a copy of the Solutions Manual, visit:

<http://global.oup.com/uk/academic/physics/admin/solutions>

Annotation Comprehensive reference examines all aspects of mineral processing from the handling of raw materials to separation strategies to the remediation of waste products. Shows how developments in engrg., chemistry, computer science, and environmental science contribute to the ultimate goal of producing minerals and metals economically from ores.

Materials scientists continue to develop stronger, more versatile ceramics for advanced technological applications, such as electronic components, fuel cells, engines, sensors, catalysts, superconductors, and space shuttles. From the start of the fabrication process to the final fabricated microstructure, Ceramic Processing covers all aspects of modern processing for polycrystalline ceramics. Stemming from chapters in the author's bestselling text, Ceramic Processing and Sintering, this book gathers additional information selected from many sources and review articles in a single, well-researched resource. The author outlines the most commonly employed ceramic fabrication processes by the consolidation and sintering of powders. A systematic approach highlights the importance of each step as well as the interconnection between the various steps in the overall fabrication route. The in-depth treatment of production methods includes powder, colloidal, and sol-gel processing as well as chemical synthesis of powders, forming, sintering, and microstructure control. The book covers powder preparation and characterization, organic additives in ceramic processing, mixing and packing of particles, drying, and debinding. It also describes recent technologies such as the synthesis of nanoscale powders and solid freeform fabrication. Ceramic Processing provides a thorough foundation and reference in the production of ceramic materials for advanced undergraduates and graduate students as well as professionals in corporate training or professional courses.

APC International, Ltd.'s textbook on the principles and applications of piezoelectric ceramics covers: general principles of piezoelectricity and behavior of piezoelectric ceramic elements fundamental mathematics of piezoelectricity traditional and experimental applications for piezoelectric materials, and related physical principles for each application: audible sound producers, flow meters, fluid level sensors, motors, pumps, delay lines, transformers, other apparatus introduction to single crystals, composites, and other latest-generation piezoelectric materials Contents Introduction piezoelectricity / piezoelectric constants behavior / stability of piezoelectric ceramic elements new materials: relaxors / single crystals / others characteristics of piezoelectric materials from APC International, Ltd. Generators generators solid state batteries Sensors axial sensors flexional sensors special designs and applications: composites / SAW sensors / others Actuators axial and transverse actuators: simple / compound (stack) / multilayer flexional actuators / flextensional devices applications for piezoelectric actuators Transducers audible sound transducers generating ultrasonic vibrations in liquids or solids transmitting ultrasonic signals in air or water flow meters / fluid level sensors / delay lines / transformers / composites Miscellaneous securing a piezoelectric ceramic element attaching electrical leads testing performance Note: This is a 2nd edition to APC's textbook published in 2002. Updates in the 2nd edition reflect changes to APC's product lines and corrections outlined on the errata sheet distributed with the 2002 edition.

Electroceramics, Materials, Properties, Applications, Second Edition provides a comprehensive treatment of the many aspects of ceramics and their electrical applications. The fundamentals of how electroceramics function are carefully introduced with their properties and applications also considered. Starting from elementary principles, the physical, chemical and mathematical background of the subject are discussed and wherever appropriate, a strong emphasis is placed on the relationship between microstructure and properties. The Second Edition has been fully revised and updated, building on the foundation of the earlier book to provide a concise text for all those working in the growing field of electroceramics. fully revised and updated to include the latest technological changes and developments in the field includes end of chapter problems and an extensive bibliography an Invaluable text for all Materials Science students. a useful reference for physicists, chemists and engineers involved in the area of electroceramics.

Second edition of successful materials science text for final year undergraduate and graduate students.

Organic Additives and Ceramic Processing: With Applications in Powder Metallurgy, Ink, and Paint describes the major manufacturing processes, such as slip casting, tape casting, injection molding, etc. The book covers each subject, including the ceramic processes, organic chemical structures, polymers, colloid science and others, starting from fundamental principles, with many literature references for further reading. After the fundamentals, detailed case studies from industrial applications are described for the optimization of solvents, dispersants, binders, plasticizers, lubricants and some minor additives. A wide range of information is covered, beginning with fundamental equations for students, and extending to advanced applications for development workers and factory problem solvers. Shanefield undertook this ambitious task only because of the previous lack of resources that address the growing need for detailed information on organic additives for ceramics. Suitable for use as a textbook and as a reference source for working ceramists and chemists who wish to supply the ceramics industry with additives.

This is a concise, up-to-date book that covers a wide range of important ceramic materials used in modern technology. Chapters provide essential information on the nature of these key ceramic raw materials including their structure, properties, processing methods and applications in engineering and technology. Treatment is provided on materials such as alumina, aluminates, Andalusite, kyanite, and sillimanite. The chapter authors are leading experts in the field of ceramic materials. An ideal text for graduate students and practising engineers in ceramic engineering, metallurgy, and materials science and engineering.

Ceramic Materials: Science and Engineering is an up-to-date treatment of ceramic science, engineering, and applications in a single, integrated 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 broad 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. The text concludes with discussions of ceramics in biology and medicine, ceramics as gemstones and the role of ceramics in the interplay between industry and the environment. Extensively illustrated, the text also includes questions for the student and recommendations for additional reading. **KEY FEATURES:** Combines the treatment of bioceramics, furnaces, glass, optics, pores, gemstones, and point defects in a single text Provides abundant examples and illustrations relating theory to practical applications Suitable for advanced undergraduate and graduate teaching and as a reference for researchers in materials science Written by established and successful teachers and authors with experience in both research and industry

As the field's premiere source, this reference is extensively revised and expanded to collect hard-to-find applications, equations, derivations, and examples illustrating the latest developments in ceramic processing technology. This book is concerned primarily with the processing of polycrystalline ceramics and focuses on the widespread fabrication of ceramics by the firing of consolidated powders forms. A brief treatment of sol-gel processing is also included. Ceramic Processing and Sintering, Second Edition provides clear and intensive discussions on colloidal and sol-gel processing, sintering of ceramics, and kinetic processes in materials. From powder synthesis and consolidation to sintering and densification behavior, this latest edition emphasizes the impact of each processing procedure on ceramic properties. The second edition also contains new and extended discussions on colloid stability, polymer growth and gelation, additives in ceramic forming, diffusion and defect structure, normal and abnormal grain growth, microwave sintering, Rayleigh instability effects, and Ostwald ripening. Illustrating the interconnectedness between the various steps in the overall fabrication route, Ceramic Processing and Sintering, Second Edition approaches the fundamental issues of each process and show how they are applied to the practical fabrication of ceramics. Freedoms in material choice based on combinatorial design, different directions of process optimization, and computational tools are a significant advantage of additive manufacturing technology. The combination of additive and information technologies enables rapid prototyping and rapid manufacturing models on the design stage, thereby significantly accelerating the design cycle in mechanical engineering. Modern and high-demand powder bed fusion and directed energy deposition methods allow obtaining functional complex shapes and functionally graded structures. Until now, the experimental parametric analysis remains as the main method during AM optimization. Therefore, an additional goal of this book is to introduce readers to new modeling and material's optimization approaches in the rapidly changing world of additive manufacturing of high-performance metals and alloys.

Many of the properties critical to the engineering applications of ceramics are strongly dependent on their microstructure which, in turn, is dependent on the processing methods used to produce the ceramic material. Ceramic Processing, Second Edition provides a comprehensive treatment of the principles and practical methods used in producing ceramics with controlled microstructure. Covering the main steps in the production of ceramics from powders, the book also provides succinct coverage of other methods for fabricating ceramics, such as sol-gel processing, reaction bonding, chemical vapor deposition and polymer pyrolysis. While maintaining the objectives of the successful first edition, this new edition has been revised and updated to include recent developments and expanded to feature new chapters on additives used in ceramic processing; rheological properties of suspensions, slurries, and pastes; granulation, mixing, and packing of particles; and sintering theory and principles. Intended as a textbook for undergraduate and graduate courses in ceramic processing, the book also provides an indispensable resource for research and development engineers in industry who are involved in the production of ceramics or who would like to develop a background in the processing of ceramics.

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