

Glasses And Glass Ceramics For Medical Applications

The E-book "Nucleation and Crystallization of Glasses and Glass-Ceramics" highlights historic perspectives and current research in the field of glass-ceramic technology. Glass-ceramic technology is promising to provide us with materials of high strength, high toughness, unique electrical/electronic or magnetic properties, exceptional optical or unusual thermal or chemical properties. The greater diversity of microstructure-property arrangements and processing routes over glasses and ceramics are responsible that glass-ceramics are the preferred choice of materials in many technical, consumer, optical, medical/dental, electrical/electronic, and architectural fields. This includes increasing uses of glass-ceramic materials for environment and energy applications in the last decades. The positive development of glass-ceramic technology has become true in particular due to the pioneering spirit, resourcefulness, and courage of researchers of the first generation. Extraordinary and, therefore, to be distinguished is the work of the glass-ceramic inventor S. Donald Stookey to whom this Research Topic is dedicated. The authors, all experts in the field of glass-ceramics and based in industry, academia and governmental institutions, contributed to this E-book under the guidance of the Technical Committee 07 "Crystallization and Glass-Ceramics" of the International Commission on Glass (ICG).

This completely revised edition features new sections on glass-ceramic applications and their performance, CDC-grinding, and laser gyroscopes containing Zerodur®, providing an overview of Schott's activities for scientists, engineers, and managers. Advanced Ceramics for Dentistry

Glasses and Glass Ceramics from Gels. Proceedings of the International Workshop ; 3
Encyclopedia of Glass Science, Technology, History, and Culture Two Volume Set
Glasses and Glass-Ceramics

Photosensitive Glass and Glass-Ceramics

Bioactive Glasses and Glass-Ceramics Fundamentals and Applications A

Comprehensive and Critical Overview of Bioactive Glasses and Glass-Ceramics

Bioactive glasses and glass-ceramics are a versatile class of biocompatible materials that have an astonishing impact in biomedicine. Bioactive Glasses and Glass-Ceramics: Fundamentals and Applications presents topics on the functional properties, processing, and applications of bioactive glasses and glass-ceramics. The primary use of bioactive glasses and glass-ceramics is to repair bone and dental defects; however, their full potential is yet to be fulfilled. Many of today's achievements in regenerative medicine and soft tissue healing were unthinkable when research began. As a result, the research involving bioactive glasses and glass-ceramics is highly stimulating and continuously progresses across many different disciplines including chemistry, materials science, bioengineering, biology, and medicine. Topics relating to these disciplines and covered within the work include: Fundamentals on bioactive glasses and glass-ceramics, bioactive glasses in today's market, and improvements and challenges for the future Scalability and other issues when taking bioactive glass from lab to industry/commercialization applications, plus clinical challenges Trending topics such as bioactive glass porous scaffolds, additive manufacturing of bioactive glasses, and nano-engineering of bioactive glasses The various bioactive glass compositions which have been developed as medical products in an expanding range of forms and applications Bioactive Glasses and Glass-Ceramics: Fundamentals and Applications serves as a comprehensive and complete reference work on bioactive glasses and

glass-ceramics for research and development (R&D) materials scientists, surgeons, and physicians, and leadership at glass and medical companies. Students and professors in fields of study pertaining to the aforementioned disciplines will also derive value from the work.

Glass ceramics are a special group of materials in which a base glass can be crystallized under carefully controlled conditions, which in turn determine the properties of the material. These materials offer a wide range of physical and mechanical properties combining the distinctive characteristics of sintered ceramics and glasses. This book provides readers with an interest in medical ceramics with the ability to start making their own glasses and glass ceramics, together with an understanding of the various factors that control the final properties of these medical and dental materials. In addition, the authors describe various industrial problems with current, clinically-used medical glass ceramics and discuss appropriate scientific solutions. *Glasses and Glass Ceramics for Medical Applications* will appeal to a broad audience of biomaterials scientists, ceramists, and bioengineers, particularly those with an interest in orthopedic and dental applications, as well as scientists and engineers involved in the manufacture of glasses, glazes, enamels, and other glass coatings for the medical materials industry. The book will also be of interest to undergraduate and graduate students in materials engineering and dentistry, and is suitable for use in courses on medical and dental materials.

Glass-Ceramics and Photo-Sitalls

Inorganic Glasses and Glass-ceramics

3rd International Workshop, Montpellier, Sept. 1985, Proceedings

Analysis of the Composition and Structure of Glass and Glass Ceramics

Functional Glasses and Glass-Ceramics

Functional Glasses and Glass-Ceramics: Processing, Properties and Applications provides comprehensive coverage of the current state-of-the-art on a range of material synthesis. This work discusses the functional properties and applications of both oxide and non-oxide glasses and glass-ceramics. Part One provides an introduction to the basic concept of functional glasses and glass-ceramics, while Part Two describes the functional glasses and glass-ceramics of oxide systems, covering functionalization of glasses by 3d transition metal ion doping, 4f rare earth metal ion doping, crystallization, laser irradiation micro fabrication, incorporation of nanometals, the incorporation of semiconductor coatings, the functionalization for biomedical applications, solid oxide fuel cell (SOFC) sealants, and display devices, and from waste materials. Part Three describes functional glasses and glass-ceramics of non-oxide systems, covering functional chalcogenide and functional halide glasses, glass-ceramics, and functional bulk metallic glasses. The book contains future outlooks and exercises at the end of each chapter, and can be used as a reference for researchers and practitioners in the industry and those in post graduate studies. Provides a comprehensive text that explores the field of both functional glass and glass ceramics Presents an in-depth discussion on the definition of a functional glass

Includes discussions of advanced processing, functional properties, and functional applications of a wide array of functional glasses and glass-ceramics. Written using a systematic approach that can only be accomplished through an authored work. This monograph stems from lectures given during the summer course at the University of La Laguna. It includes the main characterization techniques useful nowadays for ceramics, glasses and glass-ceramics, reviews the new microscopes for characterizing materials, and gives an overview of inorganic materials such as zeolites.

Materials, Processing, New Developments
Bioactive Glasses and Glass-Ceramics

From glass to crystal

From Early Manufacturing Steps Towards Modern Frontiers

Feldspathic porcelains, leucite, and lithium disilicate glass-ceramics are important materials used in restorative dentistry for their biocompatibility, excellent aesthetic properties, good mechanical strength, and relative ease of use. As a general rule in clinical practice, the choice of material should be dictated by the specific clinical situation. It depends on the space available to build the aesthetic and functional restoration, but also on the nature of the underlying tooth or restorative structure. The best aesthetic results are obtained with feldspathic porcelain restorations directly resin-bonded to the tooth, whereas the best function is obtained with the stronger and tougher fully anatomical or veneered glass-ceramic crowns and bridges. The main limitation with these ceramics is their insufficient strength for use as posterior crowns and bridges. Possible means to obtain aesthetically pleasing and long-term performing posterior restorations are the development of stronger glass-ceramics, the use of translucent colored zirconia, or the use of the new class of more elastic hybrid polymer-ceramic materials.

Glass-ceramics are now commonplace in our daily lives, despite having only been discovered for less than a century. It presents an update on the recent developments concerning the mechanisms of nucleation, crystal growth and phase separation, bringing together theoretical aspects and characterization methods.

Glass Ceramic Technology

Glasses and Glass Ceramics from Gels. Proceedings of the International Workshop ; 2

Glasses and Glass Ceramics from Gels. Proceedings of the International Workshop ; 4

Glasses and Glass Ceramics from Gels. Proceedings of the International Workshop ; 1981

Glasses and Glass Ceramics from Gels

This book will discuss how glass and glass ceramic interact with light, both transiently and permanently. Ways that light permanently alter the properties of glass and glass ceramic like the color, refractive index, and mechanical and chemical behaviors will be included. Each photochromatic phenomenon will be discussed in detail from the physical and chemical origin to the method fabrication and ultimately to their utilization. The reprocessing of nuclear spent fuel generates highly radioactive liquid wastes (HLW) that must be isolated from the biosphere in very durable solid matrices. In the first part of this book, generalities are presented on the radionuclides occurring in HLW and on the main characteristics and preparation methods of waste forms (glasses, ceramics, glass-ceramics) for the immobilisation of separated or non-separated wastes. In the second part, the characteristics of two categories of long-lived radionuclides (^{135}Cs and minor actinides Np , Am , Cm) and the main matrices proposed for their specific immobilisation are reviewed. Results are presented on ceramic and glass-ceramic matrices developed for the conditioning of Cs (hollandite) and minor actinides (zirconolite, zirconolite-based glass-ceramic) and studied in the authors' laboratory.

GLASSES AND GLASS CERAMICS with INCREASED MECHANICAL AND/OR THERMAL RESISTANCE

Elastic Properties Of Glasses And Glass Ceramics At High Pressures And High Temperatures

Chapter 12. Dental Glasses and Glass-ceramics

Glasses and Glass Ceramics from Gels. Proceedings of the International Workshop ; 6 Glasses, Glass-ceramics and Ceramics for Immobilization of Highly Radioactive Nuclear Wastes

This Encyclopedia begins with an introduction summarizing its scope and content. Glassmaking; Structure of Glass, Glass Physics, Transport Properties, Chemistry of Glass, Glass and Light, Inorganic Glass Families, Organic Glasses, Glass and the Environment, Historical and Economical Aspect of Glassmaking, History of Glass, Glass and Art, and outline possible new developments and uses as presented by the best known people in the field (C.A. Angell, for example). Sections and chapters are arranged in a logical order to ensure overall consistency and avoid useless repetitions. All sections are introduced by a brief introduction and attractive illustration. Newly investigated topics will be addressed, with the goal of ensuring that this Encyclopedia remains a reference work for years to come.

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.

Down and Up Conversion in Fluorozirconate Based Glasses and Glass Ceramics for Photovoltaic Application

Nucleation, growth and phase separation, from research to applications

Advances in brazing

Failure Mechanisms in Glasses and Glass Ceramics

Processing, Properties and Applications

In the decade since glass-ceramics first became mass-produced articles of commerce, they have become a popular subject for research and invention, as attested to by the 773 references cited in this book. Discovered almost accidentally during research on photosensitive glasses, thermally crystallized glass ceramics have been distinguished by the rapid pace of their utilization for distinctive new products. This promise has been recognized throughout the world, and original contributions have appeared from nearly every country having an ongoing glassmaking capability. Particularly numerous have been the publications and the ideas, scientific and technological, issuing from the USSR. For several years, the annual All Union Conference on the Glassy State has been dominated by papers on catalyzed crystallization of glasses. With regard to new product lines, we learn about slag-based silicas (glass-ceramics) and also about specialty items derived by radiation-assisted crystallization in glasses, photo-silicas. A. I. Berezhnoi has written a comprehensive review of the publications on this topic, which includes a balanced weighting to the contributions from the USSR and the USA, and also introduces advances from Britain, Czechoslovakia, Romania, Japan, and other centers of activity. 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 corresponding subjects. Proceedings of the Internat. Workshop on Glasses and Glass Ceramics from Gels

Low Thermal Expansion Glass Ceramics

Proceedings

Advanced Glasses and Glass Ceramics

Technical Ceramics and Glasses

This book presents a state-of-the-art overview of the major aspects involved in the science, technology and applications of ceramics, glasses and glass-ceramics. After providing an historical perspective of the development and use of ceramics and glasses along the Silk Road, the theoretical background and fabrication techniques of such materials are described and discussed. A special focus is dedicated to emerging high-tech applications in various fields, including medicine, energy, optics and photonics, sensors, sustainability and circular economy. The chapters are written by leading experts in their respective fields and highlight the contemporary challenges

associated to each topic. This book will serve as a valuable reference for both early-stage and skilled researchers as well as industry professionals interested in the broad field of glasses and ceramics.

Glass-ceramics can be versatile joining materials with tailorable thermal and mechanical properties; they are not affected by oxidation and can be used as pressureless joining materials above their glass softening point. The glassy phase can be minimized by a suitable thermal treatment in order to improve the glass-ceramic creep behaviour. The use of glasses and glass-ceramics as sealants in solid oxide fuel cells and as joining materials for SiC-based materials will be discussed.

Fundamentals and Applications

Ceramics, Glass and Glass-Ceramics

Nucleation and Crystallization of Glasses and Glass-Ceramics

Properties of Glasses and Glass-ceramics

International Workshop on Glasses and Glass Ceramics from Gels

The emergence of synthetic ceramics as a prominent class of materials with a unique combination of properties has been an important part of the materials-science scene over the past 20 years. These 'high-technology' ceramics have varied applications in areas utilizing their exceptional mechanical, thermal, optical, magnetic or electronic properties. A notable development of the 1970s was that of 'Si-based' ceramics (Si₃N₄, SiC and 'Sialons') as high-temperature engineering solids. More recently the zirconia-based ceramics have evolved as a class of material with significant improvements in fracture-toughness. In the 1980s we are on the threshold of development of ceramic-matrix composites with the promise of overcoming major limitations in engineering design with 'brittle' ceramics and the development of novel properties unattainable with monolithic micro structures. Throughout this period there have been significant but less well-publicized developments in the field of glass-ceramics and glasses. It is the purpose of this publication to review selected topics within this important area of materials science. A key element in understanding the relation between properties and microstructure is a knowledge of atomic arrangement in ceramic phases. Recent developments in NMR and X-ray absorption spectroscopies have had considerable impact on studies of atomic co-ordination in glasses and crystalline ceramic materials and are reviewed in Chapters 1 and 2. Glass-ceramics are derived from the parent glasses by controlled crystallization and have properties dictated, in part, by the efficiency of crystal nucleation within the glass volume.

12.2.2 Composite Preparation

Glasses and Glass Ceramics from Gels. Proceedings of the International Workshop ; 5

Glasses and Glass Ceramics for Medical Applications

Photonic Glasses and Glass-ceramics

Encyclopedia of Materials

Characterization Techniques of Glasses and Ceramics