

Germanate Glasses

These glasses have a low T_g and are used in a wide range of applications. They are also used in the production of optical fibers.



Fig. 1. Refractive index of Germanate glasses.
The glasses are of the type $GeO_2 - SiO_2 - Na_2O - K_2O$.

Germanate Glasses Structure Spectroscopy And Properties

Sergei Votyakov, Daria Kiseleva, Viktor Grokhovsky, Yulia Shchapova



Germanate Glasses Structure Spectroscopy And Properties:

Germanate Glasses Alfred Margaryan, Michael A. Piliavin, 1993 Here is a coherent discussion of the structure physical properties and current applications of germanium oxide glasses including fabrication techniques in the form of fibers

Ligands And Modifiers In Vitreous Materials: The Spectroscopy Of Condensed Systems

Alfred Margaryan, 1999-07-06 The study of the effect of ligand and modifier ions on the spectroscopic properties of dⁿ or fⁿ elements in vitreous materials is important for the development of controllable lasers and amplifiers The spectroscopic characteristics of inorganic compounds of transition elements and their solutions are well understood theoretically in the spectrochemistry of complexes but developments for vitreous materials in these conditions have not been well documented This book fills the gap by applying the ligand field theory of solid materials to the vitreous state and presenting the data obtained from luminescence electron absorption spectra and electron paramagnetic resonance This unique book is a valuable addition to the field of spectroscopy of doped vitreous materials and optical glasses It will benefit all materials scientists solid state physicists spectroscopists and physical chemists as well as graduate students

Structural Chemistry of Glasses

K.J. Rao, 2002-06-26 Structural Chemistry of Glasses provides detailed coverage of the subject for students and professionals involved in the physical chemistry aspects of glass research Starting with the historical background and importance of glasses it follows on with methods of preparation structural and bonding theories and criteria for glass formation including new approaches such as the constraint model Glass transition is considered as well as the wide range of theoretical approaches that are used to understand this phenomenon The author provides a detailed discussion of Boson peaks FSDP Polymorphism fragility structural techniques and theoretical modelling methods such as Monte Carlo and Molecular Dynamics simulation The book covers ion and electron transport in glasses mixed alkali effect fast ion conduction power law and scaling behaviour electron localization charged defects photo structural effects elastic properties pressure induced transitions switching behaviour colour and optical properties of glasses Special features of a variety of oxide chalcogenide halide oxy nitride and metallic glasses are discussed With over 140 sections this book captures most of the important and topical aspects of glass science and will be useful for both newcomers to the subject and the experienced practitioner

Minerals: Structure, Properties, Methods of Investigation

Sergei Votyakov, Daria Kiseleva, Viktor Grokhovsky, Yulia Shchapova, 2019-04-23 The book comprises the proceedings of the 9th Geoscience Conference for Young Scientists co organized by the Institute of Geology and Geochemistry and the Institute of Mineralogy Urals Branch of Russian Academy of Sciences and Ural Federal University and held in Ekaterinburg Russia on February 5-8 2018 The book is devoted to the relevant issues of crystal chemistry and mineral typomorphism the structure and physico chemical and technological properties of minerals the computational modeling of mineral structure and properties Much attention is drawn to the latest advances and applications of physical methods of investigation of mineral structure and composition in particular X Ray

diffraction spectroscopic optical vibrational ESR Moessbauer etc and microscopic SEM TEM AFM etc studies as well as the methods of chemical and isotopic analysis This book presents the current research trends of space and planetary mineralogy meteorites regoliths tektites The book is intended explicitly for the specialists in the earth and planetary sciences

Introduction to Glass Science and Technology James E Shelby, 2015-11-06 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

Introduction to Glass Science and Technology, 3rd Edition James E. Shelby, 2020-10-06 This introductory text is ideal for undergraduates and graduates presenting the fundamental topics in glass science and technology

Metal Nanostructures for Photonics Luciana Reyes Pires Kassab, Cid Bartolomeu De Araujo, 2018-08-21 *Metal Nanostructures for Photonics* presents updates on the development of materials with enhanced optical properties and the demand for novel metal dielectric nanocomposites and nanostructured materials The book covers various aspects of metal dielectric nanocomposites and metallic nanostructures and illustrates techniques used to prepare and characterize materials and their physical properties It focuses on three main sections nanocomposites with enhanced luminescence properties due to contributions of metal nanoparticles hosted in photonic glasses near and far field optical phenomena and the optical response of single nanoparticles that reveal quantum phenomena in the nanoscale amongst other topics This book will serve as an important research reference for materials scientists who want to learn more on how a range of metallic nanostructured materials are used in photonics Sets out the properties of a range of metal dielectric nanostructures and nanocomposites along with the use cases for each in photonics Discusses the pros and cons of using different metallic nanostructures for different photonic applications Includes case studies that illustrate how metallic nanostructures have successfully been applied in photonics

MID-IRRED FIBER PHOTONICS Stuart Jackson, Real Vallee, Martin Bernier, 2021-11-26 *Mid Infrared Fibre Photonics* Glass Materials Fibre Fabrication and Processing Laser Sources and Devices combines the latest glass chemistry fibre fabrication and post processing techniques to provide a

comprehensive reference on the fundamental science and latest research in fibre photonics for the mid infrared range The book systematically reviews the key glass materials systems including fluorides chalcogenides and oxides Each materials chapter includes discussion of composition structure thermal optical and mechanical properties extrinsic and intrinsic loss mechanisms materials preparation and purification techniques Then Mid Infrared Fibre Photonics Glass Materials Fibre Fabrication and Processing Laser Sources and Devices covers the most relevant fabrication post processing and spectroscopy techniques Fibre sources are also addressed including fibre sources for continuous wave emission pulsed emission and broadband emission The book concludes with a brief overview of important medical sensing and defence applications Systematic coverage of the most relevant materials for mid infrared fibre photonics including discussion of composition structure thermal optical and mechanical properties loss mechanisms materials preparation and purification techniques Reviews the key fabrication and processing techniques of mid infrared fibre technologies Addresses the important medical sensing and defence applications

Spectroscopic Properties of Inorganic and Organometallic Compounds G Davidson, E A V Ebsworth, 2007-10-31 Spectroscopic Properties of Inorganic and Organometallic Compounds provides a unique source of information on an important area of chemistry Divided into sections mainly according to the particular spectroscopic technique used coverage in each volume includes NMR with reference to stereochemistry dynamic systems paramagnetic complexes solid state NMR and Groups 13 18 nuclear quadrupole resonance spectroscopy vibrational spectroscopy of main group and transition element compounds and coordinated ligands and electron diffraction Reflecting the growing volume of published work in this field researchers will find this Specialist Periodical Report an invaluable source of information on current methods and applications Specialist Periodical Reports provide systematic and detailed review coverage in major areas of chemical research Compiled by teams of leading experts in their specialist fields this series is designed to help the chemistry community keep current with the latest developments in their field Each volume in the series is published either annually or biennially and is a superb reference point for researchers

Molecular Spectroscopy—Experiment and Theory Andrzej Koleżyński, Magdalena Król, 2018-10-10 This book reviews various aspects of molecular spectroscopy and its application in materials science chemistry physics medicine the arts and the earth sciences Written by an international group of recognized experts it examines how complementary applications of diverse spectroscopic methods can be used to study the structure and properties of different materials The chapters cover the whole spectrum of topics related to theoretical and computational methods as well as the practical application of spectroscopic techniques to study the structure and dynamics of molecular systems solid state crystalline and amorphous materials surfaces and interfaces and biological systems As such the book offers an invaluable resource for all researchers and postgraduate students interested in the latest developments in the theory experimentation measurement and application of various advanced spectroscopic methods for the study of materials

Spectroscopic Properties of Inorganic and

Organometallic Compounds George Davidson, 1998 Spectroscopic Properties of Inorganic and Organometallic Compounds provides a unique source of information on an important area of chemistry Divided into sections mainly according to the particular spectroscopic technique used coverage in each volume includes NMR with reference to stereochemistry dynamic systems paramagnetic complexes solid state NMR and Groups 13 18 nuclear quadrupole resonance spectroscopy vibrational spectroscopy of main group and transition element compounds and coordinated ligands and electron diffraction Reflecting the growing volume of published work in this field researchers will find this Specialist Periodical Report an invaluable source of information on current methods and applications Specialist Periodical Reports provide systematic and detailed review coverage in major areas of chemical research Compiled by teams of leading experts in their specialist fields this series is designed to help the chemistry community keep current with the latest developments in their field Each volume in the series is published either annually or biennially and is a superb reference point for researchers www.rsc.org spr

Composition and Temperature Effects on Aluminoborosilicate Glasses Structure and Properties Jingshi Wu, 2011 This work studies the effects of compositional and temperature variations on the structure and properties of aluminoborosilicate glasses Two groups of aluminoborosilicate glasses one that has lower boron content and another that has higher boron content have been studied The structural changes were mainly observed with high field B 11 Al 27 and Na 23 magic angle spinning MAS nuclear magnetic resonance NMR spectroscopy In these glasses boron is either three coordinate BO₃ or four coordinate BO₄ aluminum exists predominately as four coordinate species but there is a small amount of five coordinate aluminum 5 Al The compositional study focused on the effect of the cation field strength of the network modifiers on the glass structure by varying the ratio of the two network modifiers CaO and Na₂O Increasing the ratio of CaO to Na₂O dramatically lowers the fraction of four coordinated boron N₄ increases 5 Al and increases the fraction of non bridging oxygens NBO which was calculated based on the boron and aluminum structural information However variations in these fractions are not linear with respect to the average cation field strength Na 23 spectra reveal that the ratio of bridging to non bridging oxygens in the coordination shell of Na increases with an increasing ratio of CaO to Na₂O in Ca rich glasses These changes can be understood by the tendency of higher field strength modifier cations to facilitate the concentration of negative charges on NBO in their local coordination environment systematically converting BO₄ to BO₃ The effect of temperature on the structure was studied by two ways cooling the glass forming melts at different rates to sample the glass structure at different fictive temperature and using high temperature in situ NMR The abundances of BO₃ and NBO increase with increasing fictive temperature suggesting that the reaction BO₄ logical equivalence BO₃ NBO shifts to the right with increasing temperature The observed temperature dependence of the abundance of BO₄ species allows us to estimate the enthalpy of reaction Delta H which is closely related to the amount of NBO in the glass In situ high T B 11 MAS NMR was used to observe chemical exchange between BO₃ and BO₄ species over the timescale of microseconds to seconds The timescale of

BO3 BO4 exchange from NMR data lowercase Tau NMR appears to be decoupled from that of the macroscopic shear relaxation process lowercase Tau s derived from the viscosity data however at higher temperatures lowercase Tau s approaches lowercase Tau NMR The decoupling at lower temperature may be related to intermediate range compositional heterogeneities and or fast modifier cation diffusivities which trigger unsuccessful network exchange events **Handbook of Advanced Materials Testing** Louise Ferrante,1994-11-29 This work discusses techniques for developing new engineering materials such as elastomers plastic blends composites ceramics and high temperature alloys Instrumentation for evaluating their properties and identifying potential end uses are presented The book is intended for materials manufacturing mechanical chemical and metallurgical engi **Optical Engineering** ,1993 Publishes papers reporting on research and development in optical science and engineering and the practical applications of known optical science engineering and technology **Photodetectors and Fiber Optics** Hari Singh Nalwa,2012-12-02 Photodetectors and Fiber Optics is an outgrowth of the recently published 10 volume set Handbook of Advanced Electronic and Photonic Materials and Devices The objective of this book is to present a highly coherent coverage of photodetectors and optical fibers This book covers a broad spectrum of photodetectors including types of materials their fabrication physical properties and industrial applications Many industries around the world are engaged in developing fiber optics technology for the new millennium The applications of photodetectors in fiber optics and the role of optical fibers in present communication technology are extensively discussed Covers a broad spectrum of the photodetectors Include types of materials their fabrication physical properties and industrial applications Applications of photodetectors in fiber optics Role of optical fibers in present communication technology A very special topic presented in a timely manner and in a format *Research on Environmental Radioactivity* Gülçin BİLGİCİ CENGİZ,Mehmet Ertan KÜRKÇÜOĞLU , Özlem ÖNER,Aysel GUVEN,Taylan GÖRKAN,İlyas ÇAĞLAR, Ömer KABAN, İlyas ÇAĞLAR , Gülçin CENGİZ , Gökhan BILIR,Hüseyin ERTAP,2023-12-24 Research on Environmental Radioactivity Natural Photonics and Bioinspiration Olivier Deparis,Sébastien R. Mouchet,2021-09-30 Photonic structures occurring in biological tissues such as butterfly wings beetle elytra or fish scales are responsible for a broad range of optical effects including iridescence narrow band reflection large solid angle scattering polarization effects additive color mixing fluid induced color changes controlled fluorescence Studies have provided understanding of the underlying optical mechanisms and the biological functions as well as inspiration for the design and development of novel photonic devices also called bioinspiration In this forward thinking book the research related to photonic structures in natural organisms is reviewed with a main foPhotonic structures occurring in biological tissues such as butterfly wings beetle elytra or fish scales are responsible for a broad range of optical effects including iridescence narrow band reflection large solid angle scattering polarization additive color mixing fluid induced color changes and controlled fluorescence This book reviews research of biological photonic devices in accordance with the fundamental aspects of physical optics and

environmental biology It provides readers with an understanding of numerical modelling based on morphological and optical characterizations as well as the quantitative treatment of color vision This forward thinking book ties these concepts to the design and synthesis of bioinspired photonic devices and opens the door to the applications of nature s lessons in the technical world This resource introduces a methodology for working with and utilizing bioinspiration It includes the experimental and numerical tools necessary for the characterization and simulation of photonic structures and uses original concepts as examples with a focus on bioinspired hygrochromatic materials Professionals are brought up to speed on a variety of fabrication techniques and methods of synthesis all following a straightforward bottom up or top down approach The reader will gain an understanding of the capability of bioinspiration to meet human needs This book s explanation of how natural photonics structures behave as efficient solar absorbers or thermal management devices makes it a useful resource for technical professionals in the field of energy and environment and the concepts presented in this book also have applications in the designs of optical coatings sensors and light sources

Advances in Glass Science and Technology

Vincenzo Maria Sglavo,2018-06-06 In this book some recent advances in glass science and technology are collected In the first part the structure and crystallization of innovative glass compositions are analysed In the second part innovative applications are described from the use of glass in optical devices and lasers to fibres in composites micropatterned components in sensors and microdevices beads in building walls and sealing in solid oxide fuel cells

Structure, Dynamics, and Properties of Silicate Melts Jonathan F. Stebbins,Paul F. McMillan,Donald B. Dingwell,2018-12-17

Volume 32 of Reviews in Mineralogy introduces the basic concepts of melt physics and relaxation theory as applied to silicate melts then to describe the current state of experimental and computer simulation techniques for exploring the detailed atomic structure and dynamic processes which occur at high temperature and finally to consider the relationships between melt structure thermodynamic properties and rheology within these liquids These fundamental relations serve to bridge the extrapolation from often highly simplified melt compositions studied in the laboratory to the multicomponent systems found in nature This volume focuses on the properties of simple model silicate systems which are usually volatile free The behavior of natural magmas has been summarized in a previous Short Course volume Nicholls and Russell editors 1990 Reviews in Mineralogy Vol 24 and the effect of volatiles on magmatic properties in yet another Carroll and Holloway editors 1994 Vol 30 The Mineralogical Society of America sponsored a short course for which this was the text at Stanford University December 9 and 10 1995 preceding the Fall Meeting of the American Geophysical Union and MSA in San Fransisco with about 100 professionals and graduate students in attendance

Handbook of sol-gel science and technology. 2. Characterization and properties of sol-gel materials and products Sumio Sakka,Rui M. Almeida,2004

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