

Characterization Techniques of Glasses and Ceramics

ACERP: Vol. 3, No. 2, (Spring 2017) 7-13



Fabrication and Structural Characterization of Se-Ge Chalcogenide Glasses by Means of Melt Quenching Technique

M. Ghayebloo^a, M. Rezvani^{a*}, M. Tavoois^b

^aDepartment of Materials Science and Engineering, University of Tabriz, Tabriz, Iran.
^bDepartment of Materials Engineering, Malek-Ashtar University of Technology (MUT), Tehran, Iran.

PAPER INFO ABSTRACT

Paper history:
Received 19 December 2016
Accepted in revised form 03 October 2017

Keywords:
Chalcogenide glass
Se-Ge
IR transmittance

In this study, the structural and optical characterization of Se-Ge alloys during melt quenching technique have been investigated. For this purpose, five different samples of $\text{Se}_{100-x}\text{Ge}_x$ ($x=10, 20, 30, 40, 50$) were prepared by conventional melt quenching in quartz ampoule. The produced samples were characterized using X-ray diffraction (XRD), Scanning Electron Microscopy (SEM), Differential Scanning Calorimetry (DSC), Fourier Transform Infrared Spectroscopy (FTIR), IR Variable Angle Spectroscopic Ellipsometry (IR-VASE) and Raman Spectroscopy. The results showed that the glass forming ability of $\text{Se}_x\text{Ge}_{100-x}$ and $\text{Se}_{50}\text{Ge}_{50}$ is so low and the structures of these alloys after quenching are combination of amorphous, GeSe_2 and Ge_2Se_3 compounds. Although the structure of as-prepared $\text{Se}_{100-x}\text{Ge}_x$, $\text{Se}_{50}\text{Ge}_{50}$ and $\text{Se}_{20}\text{Ge}_{80}$ is fully amorphous, only $\text{Se}_{50}\text{Ge}_{50}$ shows IR transmittance (with transmittance higher than 55% between 0.8-11 μm). The refractive index of this glass was in the range of 2.0 to 2.6 and it was decreased with increasing the wavelength. The Fermi energy, Urbach energy, indirect and direct band gaps values of $\text{Se}_{50}\text{Ge}_{50}$ glass were estimated about 0.3879, 0.1526, 1.345 and 1.28 eV, respectively.

glasses has been demonstrated recently for the Ge_2Se_3 system [3, 4].

Although there are a lot of studies about the formation and characterization of Se-Ge chalcogenide glasses, the formation and characterization of bulk Se-Ge glasses has not been properly investigated. So, in this study, the structural and optical characterizations of $\text{Se}_{100-x}\text{Ge}_x$ ($x=10, 20, 30, 40, 50$) has been investigated. The exact effect of Ge on optical properties of bulk Se-Ge glasses and the relation between network connectivity and optical properties of these alloys is another issue that is studied in this work.

2. MATERIALS, METHOD

Bulk $\text{Se}_{100-x}\text{Ge}_x$ ($x=10, 20, 30, 40, 50$) samples were prepared through conventional melt quenching technique using high purity Se (Changsha Santech material, 99.99% purity) and Ge (Changsha Santech material, 99.999% purity) elements. Pure Mg element (Merck, 99.99% purity) was also used as gathering material. About 20 g of each batch was transferred to a high purity quartz ampoule (with internal diameter of about 11 mm and cleaned with 6-%HF), evacuated under vacuum and then sealed. The prepared samples were homogenized at 900°C for 8 h in a rocking furnace and then they were subsequently quenched at quenching

1. INTRODUCTION

Chalcogenide glasses have attracted the attention of many investigators due to the fact that they are potential candidates for applications in infrared optics, photonics devices, reversible optical recording, memory switching, inorganic photoresists and anti-refraction coatings. The main applications of this kind of glasses are for transmission in infrared (IR) range for optical communications systems [1]. Selenium is an excellent glass former, however, pure Se has disadvantages such as low physical (glass forming ability, optical properties and etc.) and mechanical properties [2]. It is well-known that the amorphous forming composition of Ge-Se alloys ranges from pure Se to Ge-Se₂ by a rapidly melt-quenching method. It has become apparent that the 4(Ge)-2(Se) folded structural model with covalent nature is applicable for amorphous samples in this composition range. Crystalline GeSe_2 is constructed by GeSe_2 tetrahedral units connecting each other at the corners or edges, in which a central Ge is covalently bonded to four Se. The importance of optical methods to the study of local structure in binary chalcogenide

*Corresponding Author's Email: M_Rezvani@tabrizu.ac.ir (M. Rezvani)

Editorial Reviews. From the Back Cover. This monograph deals with the most useful and modern methods for characterising the inorganic materials such as. This monograph deals with the most useful and modern methods for characterising the inorganic materials such as glasses and glass-ceramics. Characterization Techniques of Glasses and Ceramics. Front Cover. Jesus Ma. Rincon, Maximina Romero. Springer Science & Business. This book covers a wide range of lectures given at the Short Summer Course celebrated at La Laguna University about the new trends in the modern character. Buy Characterization Techniques of Glasses and Ceramics by Jesus M. Rincon, Maximina Romero from Waterstones today! Click and Collect from your local. This book also looks also at the zeolite thermal characterization methods as well as methods which can be used in the investigation of ceramics and glasses. Download and Read Characterization Techniques Of Glasses And Ceramics 1st Edition And Ceramics 1st Edition Are Listed. Below: PDF. Booktopia has Characterization Techniques of Glasses and Ceramics by Jesus M. Rincon. Buy a discounted Hardcover of Characterization Techniques of. Characterization Techniques Of Glasses And Ceramics - In this site is not the thesame as a solution directory you purchase in a record amassing or download off. [DOWNLOAD BOOKS] Characterization Techniques Of Glasses And Ceramics PDF Books this is the book you are looking for, from the many. II: SELECTED CHARACTERIZATION TECHNIQUES . and other electronic materials, amorphous materials including glasses, and high-temperature ceramics. ABSTRACT Indentation undoubtedly represents the most widely used technique for fracture and fatigue characterization of glasses, ceramics and, in general. Preface to the Reissue of Characterization of Ceramics Preface xiv xvii Powder Production by Thermal Decomposition Techniques . Raw materials for ceramic and glass manufacture traditionally are earthy, oxide materials that are mined. the form of glass disks after a previous qualitative study to choose the standard Chemical and mineralogical characterization of ceramic supports is of and voltammetric techniques to the study of ancient ceramics. Anal Bioanal Chem. Materials and Methods. Characterization of the Glass-Ceramic Samples using the impulse excitation technique, which is based on the. CHARACTERIZATION OF GLASSES AND CERAMICS. Bengt Kasemo. Mellerud and evaluation of the existing surface sensitive methods. Conclusions are. characterization of ancient pottery, porcelain and mosaic glass .. Among these methods, Raman spectroscopy certainly has a non negligible. Glass? ceramic fibers containing Cr³⁺?doped ZnAl₂O₄ nanocrystals were fabricated by the melt?in?tube method and successive heat treatment. Characterization of the Structural Properties of Zinc Phosphate Glass Ceramics Doped with Manganese Ions Following Thermal Treatment were prepared by the melt-quenching technique and thermally treated for 2 h at C. To describe. Characterization Techniques of Glasses and Ceramics J. Ma. Rincon, M. Romero ISBN: Kostenloser Versand fur alle Bucher mit Versand.

[\[PDF\] La Ultima Profecia \(Spanish Edition\)](#)

[\[PDF\] Zen and The Art of Retirement: A Frugalistas Guide to Living an Untroubled Retirement in Troubled Ti](#)

[\[PDF\] How To GET MORE New Customers, Clients And Patients With Direct Mail](#)

[\[PDF\] Proceedings of the Third International Workshop on Real-Time Ada Issues, Nemaquin Woodlands, Farin](#)

[\[PDF\] Ramon Recuerda](#)

[\[PDF\] In Pieces \(Finding Peace\) \(Volume 1\)](#)

[\[PDF\] The Scientist and Engineers Guide to Digital Signal Processing](#)