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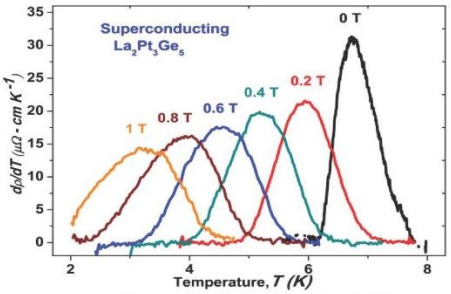
Volume 2115 A

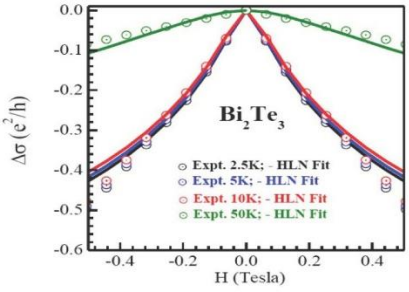
DAE Solid State Physics Symposium 2018

Hisar, Haryana, India • 18–22 December 2018

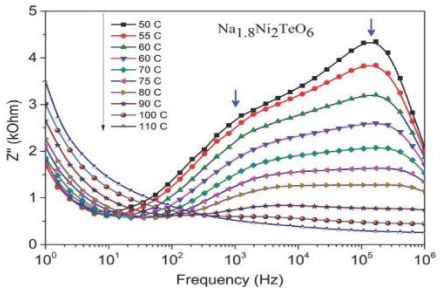
Editors • Arup Biswas, Veerendra K. Sharma and S. M. Yusuf



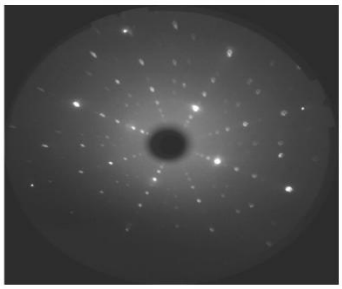
First order derivative of resistivity



Magneto-conductivity



Imaginary part of impedance (Z")



Laue diffraction pattern of SnTe(100)

RESEARCH ARTICLE | JULY 11 2019

Influence of praseodymium on alumino-germanate glasses containing Nd and La inclusions

Benedict P. Soares ; J. A. Erwin Desa; P. S. R. Krishna

— Author & Article Information

Benedict P. Soares [1,a], **J. A. Erwin Desa** [1], **P. S. R. Krishna** [2]

[1] Department of Physics Goa University, Goa, Taleigao Plateau, Goa, India

[2] Solid State Physics Division, Bhabha Atomic Research Centre, Mumbai, India

[a] Corresponding author:bentopaul1234@gmail.com

AIP Conf. Proc. 2115, 030247 (2019)

https://doi.org/10.1063/1.5113086

Oxides of La, Nd and Pr have been included both singly and as pairs in Alumino-Germanate glasses at molar percentages varying from 5% to 10%. The glass transition temperatures were found by differential thermal analysis in this series of five glasses. Band gap energies were obtained from the absorption coefficient using UV-Visible spectra. The glass transition temperatures and densities of the glasses were found to increase while the band gap energies were found to decrease on addition of rare earth from La to Nd to Pr. The presence of Pr^{4+} ions in the network formation could be used to explain the

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Crystal structure of Sb_8Te_3 and $Sb_{10}Te_3$

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Namrata Yaduvanshi; Shilpa Kapoor; Sadhna Singh

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V. L. Usharani; B. Eraiah

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Avishek Roy; Arun Kumar Mukhopadhyay; Shilabati Hembram; Manojit Ghosh; Abhijit Majumdar

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M. Mariyappan; S. Arunkumar; K. Marimuthu

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Structural disordering and refractive index measurements of B^+ implanted polycarbonate in the mid-infrared region

Influence of Praseodymium on Alumino-Germanate Glasses Containing Nd and La Inclusions

Benedict P. Soares[1,a)], J.A. Erwin Desa[1] and P.S.R. Krishna[2]

[1]*Department of Physics Goa University, Goa, Taleigao Plateau, Goa, India*
[2] *Solid State Physics Division, Bhabha Atomic Research Centre, Mumbai, India*

[a)]*Corresponding author:bentopaul1234@gmail.com*

Abstract. Oxides of La, Nd and Pr have been included both singly and as pairs in Alumino-Germanate glasses at molar percentages varying from 5% to 10%. The glass transition temperatures were found by differential thermal analysis in this series of five glasses. Band gap energies were obtained from the absorption coefficient using UV-Visible spectra. The glass transition temperatures and densities of the glasses were found to increase while the band gap energies were found to decrease on addition of rare earth from La to Nd to Pr. The presence of Pr^{4+} ions in the network formation could be used to explain the variation of density, glass transition temperature and band gap energy in these samples.

INTRODUCTION

Germanium glasses with rare earth dopants have excellent applications as laser materials since they have better optical non-linearity (1). It is well known that the structure of vitreous GeO_2 consists of a continuous random network formed by corner sharing of tetrahedral GeO_4 units. All oxygen atoms are bridging and are bonded to two Ge atoms (2). The coordination number of oxygen around Ge goes on increasing with increase in the molar % of the modifier oxide. This coordination number becomes maximum for about 20 mole % of the modifier alkali oxide during which there is conversion of tetrahedral coordination (GeO_4 units) to octahedral coordination (GeO_6 units). Further increase of the alkali oxide content in the glass composition encourages the reconversion of GeO_6 units to GeO_4 units by breaking Ge-O bonds and the formation of non-bridging oxygens (3). Henderson et al. did not find any evidence for the formation of six-fold coordinated germanium atoms. The changes in the thermo-physical properties due to the germanate anomaly could result from the formation of three membered rings of GeO_4 tetrahedra. The maximum in the anomaly occurs due to saturation of the three membered rings of GeO_4 tetrahedra in the network. The formation of Q^3 tetrahedral units having one non-bridging oxygen leads to the change in the properties due to higher content of modifier oxides (4). Hannon et al. developed a model for cesium germanate glasses to study the dependence of the Ge-O coordination number on the composition. According to that model the formation of GeO_5 units leads to the increase in the coordination number (5). The present study examines the effect of the addition of oxides of La, Nd and Pr both singly and in pairs on alumino-germanate glass.

EXPERIMENTAL

The glass samples were prepared by melting the finely ground powders as per the compositions listed in Table 1, at 1400^{o}C and quenching the melt onto a metal plate in air. The prepared glasses were immediately transferred to an annealing furnace at 450^{o}C and kept for 1hr after which the furnace was put off and the glass was allowed to cool to ambient temperature with the furnace.

Shimadzu DTG-60 differential thermal analyser was used to estimate the glass transition temperature T_g of the glass samples. Each of the glass samples were taken in powder form in a platinum crucible for thermal analysis with an

DAE Solid State Physics Symposium 2018
AIP Conf. Proc. 2115, 030247-1–030247-4; https://doi.org/10.1063/1.5113086
Published by AIP Publishing. 978-0-7354-1851-6/$30.00