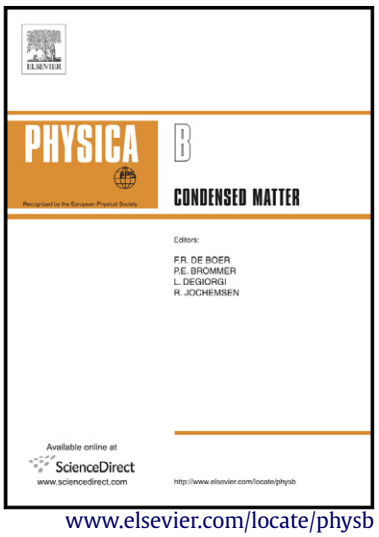

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Rajesh Parmar, R.S. Kundu, R. Punia, P. Aghamkar, N. Kishore

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Iron modified structural and optical spectral properties of bismuth silicate glasses

Rajesh Parmar[1], R.S.Kundu[2], R.Punia[2]*, P.Aghamkar[3] and N.Kishore[2]

[1]*Department of Physics, Maharishi Dayanand University, Rohtak, Haryana- 124001, India.*

[2]*Department of Applied Physics, Guru Jambheshwar University of Science & Technology, Hisar-125001, India*

[3]*Department of Physics, Chaudhary Devi Lal University, Sirsa-125055, India*

**corresponding author's E-mail: rajeshpoonia13@gmail.com*

**corresponding author's contact no: +919215701113*

Abstract

Iron bismuth silicate glasses have been successfully synthesized by melt quenching technique. The amorphous nature of the glass samples is ascertained by the XRD patterns. The values of density, molar volume and crystalline volume have been measured and are found to decrease with increase in iron content. The glass transition temperature measured using Differential Scanning Calorimetry (DSC) also varies with increase in Fe_2O_3 content. The Raman and FTIR spectra of the studied glass system were taken at room temperature suggests that Fe_2O_3 modifies the structure of bismuth silicate glasses and it acts as both network modifier as well as network former. Bismuth also plays the role of both network modifier (BiO_6 octahedra) as well as network former (BiO_3 pyramids) and SiO_2 exists in SiO_4 tetrahedral structural units with two non- bridging oxygens. The Hydrogenic excitonic model is found to be applicable to the studied glass compositions.The variation in Urbach energy value observed for the studied glass samples suggests the possibility of increase in the number of glass defects. The metallization criterion for the synthesized glass samples is determined and found to be in the range 0.30 -0.38.

Key words: X-ray diffraction, DSC, Raman spectroscopy, FTIR, Hydrogenic excitonic model.