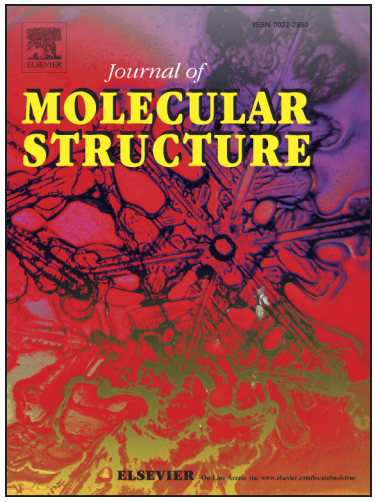

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Physical, Structural and Optical Characterizations of Borate Modified Bismuth-Silicate-Tellurite Glasses

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Abstract

Quaternary bismuthate glasses with compositions xB_2O_3-(80-x) Bi_2O_3-15SiO_2-5TeO_2 have been prepared by melt-quench technique. X-ray diffraction studies were performed to ascertain the amorphous nature of samples. The density, molar volume and crystalline volume decrease with increase in B_2O_3 content whereas the glass transition temperature shows the reverse trend. The Raman and FTIR spectra of the studied glasses indicate that B_2O_3 has been found to exist in the form of BO_3 trigonal and BO_4 tetrahedral structural units and vibrations corresponding to these structural units increase with increase in B_2O_3 content. SiO_2 is present in the form of SiO_4 tetrahedral structural units and TeO_2 in the form of TeO_3 structural units. Bismuth plays the role of network modifier [BiO_6 octahedra] as well as network former [BiO_3 pyramids] for all the glass compositions. The optical band gap energy has been calculated from the fitting of both Mott and Davis's model and Hydrogenic excitonic model with the experimentally observed absorption spectra. A good fitting of experimental data with HEM indicates the excitonic formation in the studies glass system. The values of optical band gap