

Effect of dysprosium nanoparticles on the optical properties of zinc borotellurite glass systems

ABSTRACT

The glass samples of zinc borotellurite glass doped with dysprosium nanoparticles with chemical formula $\text{TeO}_{20.7}\text{B}_2\text{O}_{30.30.7}\text{ZnO}_{0.31-x}\text{Dy}_2\text{O}_{3x}$ (where $x = 0.01, 0.02, 0.03, 0.04$ and 0.05 molar fraction) have been fabricated by using melt quenching technique. In this study, the structural and optical properties of the zinc borotellurite glass doped with dysprosium nanoparticles were characterized by using X-ray diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR) and UV-Vis spectroscopy. From the XRD, the amorphous nature of the glass samples has been confirmed. The infrared spectra revealed four obvious bands which are assigned for BO_3 , BO_4 and TeO_4 vibrational groups. The direct and indirect optical band gap, as well as Urbach energy, was calculated through absorption spectra obtained from UV-Vis spectroscopy. From the spectra, it is observed that both direct and indirect optical band gap decreases as the concentration of dysprosium nanoparticles increase. Other than that, the Urbach energy is observed to have an inverse trend with the optical band gap. The Urbach energy is increases as the concentration of dysprosium nanoparticles increases.

Keyword: Optical properties; Zinc borotellurite glass; Dysprosium nanoparticles