

Effect of erbium nanoparticles on optical properties of zinc borotellurite glass system

ABSTRACT

Erbium nanoparticles (NPs) doped zinc borotellurite glasses have been prepared by conventional melt-quenching technique with the chemical composition $\{ [(T e O_2)_{0.70} (B_2 O_3)_{0.30}]_{1-x} (Z n O)_x \}_{1-y} (E r_3 O_2)_y$ (where $y = 0.005, 0.01, 0.02, 0.03, 0.04, 0.05$). The structural properties of the prepared glasses were determined via X-ray diffraction (XRD) analysis and FTIR analysis. It was confirmed that the prepared glasses are amorphous. The bonding parameters of the glasses were analyzed by using FTIR analysis and were confirmed to be ionic in nature. The refractive index increases as the content of erbium NPs increases. The optical absorption spectra revealed that fundamental absorption edge shifts to longer wavelength as the content of erbium NPs increases. The value of band gap had been calculated and shown to be decreased with an increase content of erbium NPs. The Urbach energy was shown to be linearly increased with an increase content of erbium NPs oxides.

Keyword: Bonding parameters; Chemical compositions; Fundamental absorption edge; Glass systems; Melt quenching techniques; Nanoparticle (NPs); Refractive index increase; Urbach energy.