

Optical properties of zinc borotellurite glass system doped with erbium and erbium nanoparticles for photonic applications

ABSTRACT

Comparative analysis on optical properties between two glass series (a ordinary glass, b glass with nanoparticles) have been estimated. The two glass series (a ordinary glass, b glass with nanoparticles) with compositions $\{[(\text{TeO}_2)_{0.70} (\text{B}_2\text{O}_3)_{0.30}]_{0.70} (\text{ZnO})_{0.30}\}_{1-y} (\text{Er}_2\text{O}_3/\text{Er}_2\text{O}_3 \text{ nanoparticles})_y$; $y = 0.005, 0.01, 0.02, 0.03, 0.04, 0.05$ mol% were successfully prepared by using melt-quenching method. The TEM, EDX and XRD have been used to confirm the existence of nanoparticles and all elements in the glass system. The density of b glass with nanoparticles are found greater than a ordinary glass. The optical properties of the glass series were characterized by using Ellipsometer and UV-Vis spectrophotometer. There is a linear increasing trend in refractive index of the glass series along with concentration of erbium and erbium nanoparticles oxide. The refractive index of b glass with nanoparticles is greater than a ordinary glass. Moreover, the absorption peaks of a ordinary glass are more intense than b glass with nanoparticles. The glass with nanoparticles will offer a potential materials for nanophotonic devices.

Keyword: Optical properties; Erbium; Nanoparticles; Glass; Photonic application; Zinc borotellurite glass