

## Structural and optical properties of Tm<sub>2</sub>O<sub>3</sub>-doped zinc borotellurite glass system

### ABSTRACT

Thulium doped zinc borotellurite glasses with composition  $\{[(\text{TeO}_2)_{0.7}(\text{B}_2\text{O}_3)_{0.3}]_{0.7}[\text{ZnO}]_{0.3}\}_{1-x}\{\text{Tm}_2\text{O}_3\}_x$  were synthesized using melt-quenching technique. The values of x varied from 0.01 to 0.05 mol. The density and molar volume of the glass samples were found to increase with increased concentration of thulium oxide. FTIR analysis showed the existence of TeO<sub>4</sub>, BO<sub>3</sub> and BO<sub>4</sub> structural units in the glass network as well as the formation of bridging oxygens. XRD patterns confirmed the amorphous nature of the glass and were supported by the absence of sharp edges in the absorption spectra. All the optical data was found to vary with the concentration of Tm<sub>2</sub>O<sub>3</sub>. The direct and indirect optical band gap was in the range of 4.19 to 4.38 eV and 3.62 to 3.79 eV respectively. The trend for refractive index, molar refraction and molar polarizability was in opposite trend to the optical band gap and Urbach energy due to the variation of non-bridging oxygens (NBOs), increment of cross-link density, and also the existence of free electrons in the glass system.

**Keyword:** Thulium oxide; Borotellurite glass; Optical properties; Optical band gap; FTIR; XRD