

Structural and optical characteristics of erbium doped ternary $\text{TeO}_2\text{-TiO}_2\text{-Bi}_2\text{O}_3$ glasses

ABSTRACT

In this work we investigated both structural and optical characteristic of erbium doped ternary $\text{TeO}_2\text{-TiO}_2\text{-Bi}_2\text{O}_3$ tellurite oxide based glasses, synthesized via melt-quench method. The X-ray diffraction (XRD) and differential scanning calorimetry (DSC) confirmed its glassy nature and stability. Raman analysis revealed the presence of various coordination state TeO_2 network consisting stretching/bending vibrations of Te-O bonds in the $[\text{TeO}_4]$ trigonal bipyramid units and fraction of $[\text{TeO}_3, \text{TeO}_{3+1}]$ trigonal pyramids. From optical absorption measurement both optical band gap and Judd-Ofelt analysis (intensity parameters Ω_t ($t=2, 4, 6$), transition probabilities, and radiative lifetimes of the Er^{3+} ions) have been performed for both host and doped glasses respectively. Photoluminescence studies for upconversion and near-infrared emissions analysis (under 980 nm excitation at room temperature. Both optical transition mechanism which involved nonradiative energy transfer between Er^{3+} ions through cross-relaxation and energy migration were also explained in detailed.

Keyword: Erbium doped; Judd-Ofelt analysis; Near infra-Red; Photoluminescence; RAMAN; Tellurite glass