Structural and optical characteristics of erbium doped ternary TeO_2-TiO_2-Bi_2O_3 glasses

ABSTRACT

In this work we investigated both structural and optical characteristic of erbium doped ternary TeO_2-TiO_2-Bi_2O_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 [TeO_4] trigonal bi-pyramid units and fraction of [TeO_3, TeO_{3+1}] trigonal pyramids. From optical absorption measurement both optical band gap and Judd-Ofelt analysis (intensity parameters $\Omega_{t\ (t=2,\ 4,\ 6)}$, 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