Optical performance of neodymium nanoparticles doped tellurite glasses

ABSTRACT

A series of neodymium NPs doped tellurite glass with composition of (TeO2)0.7(B2O3)0.3]0.7 (ZnO)0.3}1- x (Nd2O3 NPs) x (x = 0.005, 0.01, 0.02, 0.03, 0.04 and 0.05 mol%) was fabricated via melt-quenching method. Density and molar volume were measured and analyzed for the glass series. The optical properties of neodymium NPs doped tellurite glass were measured by UV–Vis spectrometer, photoluminescence and Z-scan technique. The optical band gap energy of the glass network was in the range of 3.178–3.209 eV. The upconversion emission of the laser glass excited at 800 nm was found in the ultraviolet region. Electronic polarizability, oxide ion polarizability, optical basicity and metallization criterion were calculated. Moreover, linear absorption coefficient, α, nonlinear refractive index η (cm2/W), nonlinear absorption, β (x 10−3) and third order susceptibilities, χ (x 10−6) were measured. The optical efficiency of neodymium NPs doped tellurite glass exhibited excellent properties for its application in laser glass.

Keyword: Glass; Tellurite; Neodymium; Nanoparticles; Optical properties