

Tailoring Spectroscopic Properties of Er³⁺ doped Zinc Sodium Tellurite Glass via Gold Nanoparticles

Abstract

Tailoring the spectroscopic properties of rare earth (RE) doped inorganic glasses mediated via surface plasmon resonance (SPR) by embedding metallic nanoparticles (NPs) with controlled concentration is prerequisite for photonic applications. Erbium (Er³⁺) doped tellurite glasses containing gold (Au) NPs are prepared and systematic characterizations are made to inspect the impacts of Au NPs of spectral features for desired tailoring. X-ray diffraction pattern confirm the amorphous nature of the glass samples and EDX analysis detects elemental traces. The UV-Vis spectra exhibit six absorption bands centered at 488, 523, 655, 800, 973 and 1533 nm corresponding to 4f-4f transitions of Er³⁺ ions. Glass sample containing 0.4 mol% Au (without Er₂O₃) reveals Au plasmon band at around 629 nm. The EDX spectra display elemental traces of Te, Er, Zn, Na and Au. Glass sample containing 0.2 mol% Au demonstrates maximum enhancement in the emission band intensity by a factor of 20.23 (orange), 18.35 (strong green), 16.80 (moderate green) and 15.46 (blue). The enhancement is attributed to the Au NPs assisted SPR effect. The beneficial features of proposed glasses nominate them as potential candidate for photonic devices and solid state lasers.