

Enhanced optical performance of tellurite glass doped with samarium nanoparticles for fiber optics application

ABSTRACT

We report on the optical efficiency of samarium nanoparticles (NPs) doped tellurite glasses experimentally, for the first time to the best of our knowledge. A high optical efficiency of samarium NPs doped tellurite glasses stable against crystallization was fabricated via melt-quenched technique. In particular, this work underlines the enhancement of optical properties with increasing samarium NPs concentration and the change of polarizability of tellurite glass network with the presence of samarium NPs. Using X-ray diffraction (XRD) analysis, Fourier transform infrared (FTIR) analysis and transmission electron spectra (TEM), the amorphous arrangement, structural assignments and particle size had been revealed. The optical performance of samarium NPs doped tellurite glass was characterized by EL X-02C high accuracy ellipsometer and UV-Vis spectrophotometer. Based on ellipsometer and UV-Vis spectrophotometer, the refractive index was found slightly increases meanwhile the optical band gap is reduced with the presence of samarium NPs. The obtained value of electronic polarizability revealed that samarium NPs affect greatly on polarizability of tellurite glass network. The slightly increases and nonlinear variations of polarizability were found with increasing amount of samarium NPs. The metallization criterion was found to decreased which suggest that the samarium NPs doped tellurite glass tends to be more semiconductor. This is a first step towards high optical performance of tellurite glass with future applications in fiber optics and laser glass.

Keyword: Tellurite glass; Optical band gap; Samarium nanoparticles; Electronic polarizability
