

Role of Nd³⁺ nanoparticles on enhanced optical efficiency in borotellurite glass for optical fiber

ABSTRACT

The main problem of commercial silicate glass fiber is its high-loss and weak optical efficiency. It is very important to produce non-silicate glass fiber with low-loss and high optical efficiency. In this work, low-loss and high optical efficiency of Nd³⁺ nanoparticles doped borotellurite glass had been produced. The analysis of FTIR spectra shows the presence of functional vibration of tellurite network. The refractive index of borotellurite glass was enhanced in between 1.947 and 2.045 with the increment of Nd³⁺ nanoparticles. Several excitation bands within UV–Vis range due to the effect of Nd³⁺ nanoparticles was perceived originating from the ground state 4I_{9/2} to the excited states 2P_{3/2}, 4G_{7/2}, 4G_{5/2}, 4F_{9/2}, 4F_{7/2}, 4F_{5/2} and 4F_{3/2}. The glass system shows tendency towards semiconducting behavior as the value of Fermi energy, E_F decreases. The high intensity of red emission was found from Nd³⁺ nanoparticles doped borotellurite glass. Hence, this Nd³⁺ nanoparticles doped borotellurite glass has immense potential for the development of fiber amplifiers and lasers.

Keyword: Borotellurite glass; Neodymium nanoparticles; Rare-earth oxide