

## **Spectroscopic properties of Eu<sup>3+</sup>/Nd<sup>3+</sup> co-doped phosphate glasses and opaque glass-ceramics**

R. Narro-García, H. Desirena, T. López-Luke, J. Guerrero-Contreras, C.K. Jayasankar, R. Quintero-Torres, E. De la Rosa.

**Optical Materials.** Vol. 46, 34–39, 2015

doi:10.1016/j.optmat.2015.03.051

### **Abstract**

This paper reports the fabrication and characterization of Eu<sup>3+</sup>/Nd<sup>3+</sup> co-doped phosphate (PNE) glasses and glass-ceramics as a function of Eu<sup>3+</sup> concentration. The precursor glasses were prepared by the conventional melt quenching technique and the opaque glass-ceramics were obtained by heating the precursor glasses at 450 °C for 30 h. The structural and optical properties of the glass and glass-ceramics were analyzed by means of X-ray diffraction, Raman spectroscopy, UV-VIS-IR absorption spectroscopy, photoluminescence spectra and lifetimes. The amorphous and crystalline structures of the precursor glass and opaque glass-ceramic were confirmed by X-ray diffraction respectively. The Raman spectra showed that the maximum phonon energy decreased from 1317 cm<sup>-1</sup> to 1277 cm<sup>-1</sup> with the thermal treatment. The luminescence spectra of the glass and glass-ceramic samples were studied under 396 nm and 806 nm excitation. The emission intensity of the bands observed in opaque glass-ceramic is stronger than that of the precursor glass. The luminescence spectra show strong dependence on the Eu<sup>3+</sup> ion concentration in the Nd<sup>3+</sup> ion photoluminescence (PL) intensity, which suggest the presence of energy transfer (ET) and cross-relaxation (CR) processes. The lifetimes of the 4F<sub>3/2</sub> state of Nd<sup>3+</sup> ion in Eu<sup>3+</sup>/Nd<sup>3+</sup> co-doped phosphate glasses and glass-ceramics under 806 nm excitation were measured. It was observed that the lifetimes of the 4F<sub>3/2</sub> level of Nd<sup>3+</sup> of both glasses and glass-ceramics decrease with the increasing Eu<sup>3+</sup> concentration. However in the case of opaque glass-ceramics the lifetimes decrease only 16%.