Luminescent properties of $Y_2O_3:Eu^{3+}$ nanocrystals

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Abstract

In the present work, $Y_2O_3:Eu^{3+}$ nanocrystals have been synthesized by tartaric acid assisted sol-gel method. The advantages of low temperature solution based process have been exploited to produce $Y_2O_3:Eu^{3+}$ nanoparticles. Synthesis conditions such as calcinations temperature and tartaric acid concentrations are varied in order to determine the exact optimal conditions for synthesizing nanoparticles with superior optical properties. Scanning electron microscopy (SEM) and transmission electron microscopy (TEM) studies have been carried out to understand surface morphological features and the particle size. Crystal structure of the nanoparticles has been investigated by X-ray diffraction (XRD) technique. Nanoparticles have average crystallite size from 20nm to 45nm. The incorporation of Eu^{3+} activator in these nanoparticles has been checked by luminescence characteristics. These nanoparticles have displayed red color under a UV source. The main emission peak at 612nm corresponds to the hypersensitive transition between $^5D_0$ and $^7F_2$ level of Eu^{3+} ions. IR analysis has also been performed for the analysis of the nanoparticles.

Keywords: Luminescence; Tartaric acid; Sol-gel; Nanoparticles; $Y_2O_3:Eu^{3+}$; Red phosphor.