Synthesis and photoluminescence properties of Sm^{3+} doped $SrLa_2O_4$ nanophosphor

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Abstract

Sm^{3+} doped $SrLa_{2(1-x)}O_4$ nanophosphor was synthesized by microwave assisted combustion synthesis using carbohydrazide as an organic fuel. The synthesized powder was further treated at different temperatures for 3 hrs to increase luminescence intensity and crystallinity of the materials. X-Ray diffraction confirmed the polycrystalline structure, composed of $SrLa_2O_x$ and La_2O_3 phase. The particle size calculated using Debye-Scherrer's formula was found to be 60 nm. The morphological investigation of the nanoparticles were done using SEM and TEM and found to have nearly spherical morphology with diameter 45-60 nm, which is in close agreement with the XRD result. Sm^{3+} doped $SrLa_2O_4$ nanophosphor shows its characteristic emission lines in the range of 550 -720 nm, corresponding to $^4G_{5/2} \rightarrow {}^6H_j$ (J = 5/2, 7/2, 9/2, 11/2) transitions of Sm^{3+} ions. The predominant orange red color can be attributed to $^4G_{5/2} \rightarrow {}^6H_{7/2,}$ located at 605 nm. The dependence of emission intensities of $SrLa_{2(1-x)}O_4 : 2xSm^{3+}$ nanophosphor on the x value and sintering temperature have been also investigated. The photoluminescence was maximum for sample prepared with 5 mole % of samarium ions.

Keywords: Nanophosphor, Microwave, $SrLa_{2(1-x)}O_4 : 2xSm^{3+}$