

A study on Synthesis of strontium aluminate nanoparticles and doping with dysprosium

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Abstract

In this research, the synthesis of strontium aluminate nanoparticles (SrAl_2O_4) by using of combustion method assisted by microwave and doping them with dysprosium ($\text{SrAl}_2\text{O}_4:\text{Dy}$) have been investigated. Characterization of nanoparticles was performed by XRD, FT-IR, EDS, FESEM, UV-Vis and PL. In the synthesis stage, the data of XRDs confirmed the formation of the monoclinic phase of strontium aluminate with space group P_{1211} , in the sample with the fuel to nitrate ratio of 3 to 1, pH value of 5.5, and microwave irradiation time of 5 minutes, calcination time of an hour and calcination temperature of 600 °C. By using the X-ray powder diffraction data and Scherrer's formula, the average size of nanocrystallites was obtained about 26 nm. In the substitution stage, in order to optimize the luminescence of SrAl_2O_4 nanoparticles, different percentages of doping were investigated. Among the synthesized nanoparticles, the sample of $\text{Sr}_{0.9}\text{Al}_2\text{O}_4:\text{Dy}_{0.1}$ nanoparticles with the average nanoparticles size 34 ± 3 nm; most frequent distribution of nanoparticles between 30 and 35 nm; optical gap energy equal to 4.21 ± 0.01 eV and with the highest emission intensity in photoluminescence spectrum, was chosen as an optimal sample in terms of the structural and optical properties.

Keywords: Nanophosphorescence, Strontium aluminate, Microwave combustion method, Dysprosium.

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