

11. Photoluminescence Properties of Eu³⁺ Doped Li₃AlMo₃O₁₂ Red Phosphors

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Abstract

Eu³⁺ doped red phosphors Li₃AlMo₃O₁₂ were prepared by the combustion method, and their photo luminescent properties were studied. The photoluminescence spectra results indicate that the excitation spectra of the samples consist of a broad absorption band of 200-350 nm and some sharp lines around 350-420 nm which corresponds to the f-f transitions within 4f⁸ configuration of Eu³⁺. The emission spectra consist of the orange region ⁵D₀→⁷F₁(593 nm) and the red region ⁵D₀→⁷F₂(617 nm). Among these phosphors, Li₃AlMo₃O₁₂ synthesized at 750°C exhibits the strongest red emission under 393 nm excitation and appropriate CIE chromaticity coordinates (x=0.637, y=0.359) close to the NTSC standard value. Al³⁺ was selected as a potential candidate to replace Eu³⁺ in the lithium molybdate host lattices. It was discussed that there is very limited information regarding the impact of Al³⁺ cations on the luminescent properties of molybdate based phosphors. The fact that Al³⁺ has a very small atomic radius in comparison to those of Eu³⁺ and that it has a maximum coordination number of 6 makes it an interesting and potentially good candidate for improving the molybdate phosphors. In addition, Al³⁺ originating in Al(NO₃)₃.9H₂O (the starting material used in this experiment) is much cheaper than any Eu³⁺ starting material.

1. Introduction

Molybdate crystals are presently the subject of considerable interest and detailed evaluation because of their valuable structural, thermal, electrical, and spectroscopic properties

