

Synthesis and spectral characterization of Sr₄Al₁₄O₂₅: Eu²⁺/Dy³⁺ blue-green phosphorous powders

Selim Demirci¹, Salih Alper Akalın^{1,2}, Serdar Gültekin¹, Özlem Öter^{3,4}, Kadriye Ertekin^{3,4} and Erdal Çelik^{1,2,3}

¹Dokuz Eylul University, Department of Metallurgical and Materials Engineering, Buca, Izmir, Turkey

²Dokuz Eylul University, Department of Nanoscience and Nanoengineering, Buca, Izmir, Turkey

³Dokuz Eylul University, Center for Fabrication and Application of Electronic Materials, Buca, Izmir, Turkey

⁴Dokuz Eylul University, Department of Chemistry, Buca, Izmir, Turkey

Abstract

Highly intense, long persistent Sr₄Al₁₄O₂₅: Eu²⁺/Dy³⁺ phosphorous powders were prepared by sol-gel method. As a fluxing agent, H₃BO₃ was added. Characterization of the powders was carried out by X-ray diffractometer (XRD), scanning electron microscopy (SEM), thermogravimetric (TG). The average particle size of the fabricated phosphor powders was 460 nm. UV- Vis spectroscopy, steady-state and time resolved fluorescence spectroscopy techniques were used for spectral characterization of the powders. It is observed that the position and the intensity of the emission band strongly depends on the excitation wavelength and shifts toward lower energy and intensity with increasing wavelength of the excitation source. The broad band luminescence characteristics of the Sr₄Al₁₄O₂₅:Eu²⁺/Dy³⁺ were observed at 492 nm. The Sr₄Al₁₄O₂₅: Eu²⁺/Dy³⁺ phosphor can be efficiently excited with the visible fraction of the light and show persistent luminescence, long and strong afterglow up to 35 min after removal of the excitation source.

Keywords: Luminescence materials; blue-green phosphor; long persistent Sr₄Al₁₄O₂₅: Eu²⁺/Dy³⁺ phosphorous; sol-gel