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Enhanced luminescent properties in Eu^{3+}-activated $SrMo_xW_{1-x}O_4$ red-emitting phosphors for solid-state lighting and field-emission displays

Soo Hyun Lee, L. Krishna Bharat, and Jae Su Yu*

Department of Electronic Engineering, Kyung Hee University, Yongin-si, Gyeonggi-do 17104, Republic of Korea

Abstract

We fabricated the trivalent Eu^{3+}-activated $SrMo_xW_{1-x}O_4$ phosphors by a high-temperature solid-state reaction technique. The prepared phosphors were characterized by X-ray diffraction, field-emission scanning microscopy, luminescence decay curves, photoluminescence (PL) spectra, and cathodoluminescence (CL) spectra. Under the ultraviolet (UV) illumination, the emissions of Eu^{3+} ions with an intense peak at 615 nm were observed, indicating the Eu^{3+} ions occupied at the low symmetry sites without inversion in host lattices. With the addition of the Mo^{6+} ions, the emission intensity of the studied samples was increased and the optimum result was detected when x = 0.9. The temperature-dependent PL emission spectra were measured to explore the thermal stability of the resultant compounds. The final products can emit visible red emissions with high color purity of 95.1%. The CL spectra revealed that the synthesized compounds also exhibited superior CL performance. These characteristics make the Eu^{3+}-activated $SrMo_xW_{1-x}O_4$ red-emitting phosphors a promising candidate for UV-based white light-emitting diode and field-emission display applications.

Keywords: Phosphors, Luminescence, Cathodoluminescence, UV excitation.

* Corresponding author:
E-mail address: jsyu@khu.ac.kr
Tel: 82 31 201 3820
Fax: 82 31 204 8115