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White Cathodoluminescence Zn_{0.3}Mg_{0.7}Al₂O<sub>4</su phosphor

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Abstract content
   (Max 300 words)

Nowadays, researchers are working to prepare and develop white light emitting phosphors that can be used in solid state lighting applications such as flat panel displays, phosphor lamps and light emitting diodes (LEDs). The white color is the combination of the primary colors namely blue, green and red. It is, however, not easy to have one phosphor to emit these three colors simultaneously. Traditionally, the production of white light by different routes can be achieved by two routes. These routes are combining yellow phosphor such as YAG:Ce3+ with a lnGaN-based blue diode or by combining a UV chip with a three converter system of red, green and blue phosphors. The problems with these are poor rendition and high thermal quenching of the yellow phosphor and reabsorption of the blue emission by the red or green phosphor in the three converter system 1. To overcome these problems, a new generation of single host phosphors prepared mostly by doping alkali earth aluminates with divalent alkali earth and/or trivalent rare-earth ions has been developed. Alkali earth aluminates are chemically stable, environmentally friendly 2 and they can be easily produced cost-effectively. For example, a white emission from a tunable Mg3Al2O5Cl2:Ce3+,Eu2+ phosphor based on energy transfer from Ce3+ to Eu2+ by a down-conversion process was by Song et al 1, while Shaat et al 3 generated white light from CaxSr(1-x)Al2O4:Tb3+;Eu3+ phosphor.

In this study, a white cathodoluminescence was generated from Zn0.3Mg0.7Al2O4:Tb3+;Eu3+ phosphor prepared by combustion route using urea as a fuel metal and nitrates as precursors. The XRD diffraction patterns from the samples showed phases associated with cubic structures of ZnAl2O4 and MgAl2O4. The optical properties of the phosphor were studied with UV-Vis, and cathodoluminescence. White cathodoluminescence was a result of the simultaneous emission of tricolor blue and green from Tb3+, and red from Eu3+ when the phosphor was excited by a low voltage (2 keV) electron beam. White cathodoluminescence with the CIE coordinates (x = 0.343, y = 0.323) was observed.

References

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