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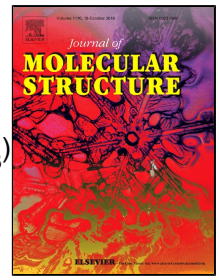

Synthesis, structure and luminescent properties of a new white phosphor $Ba_7(BO_3)_3(SiO_4)Cl:Dy^{3+}$ for light-emitting diodes

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Synthesis, structure and luminescent properties of a new white phosphor $Ba_7(BO_3)_3(SiO_4)Cl:Dy^{3+}$ for light-emitting diodes

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Abstract

A new Dy^{3+} activated $Ba_7(BO_3)_3(SiO_4)Cl$ phosphor with complex anionic groups was synthesized by the high temperature solid state reaction technique. The X-ray powder diffraction analysis showed that the phosphors crystallized in polar space group *P6₃mc* of the hexagonal system. The excitation and emission spectra, decay curves and chromaticity coordinates were characterized to investigate the photoluminescence properties. The $Ba_7(BO_3)_3(SiO_4)Cl:Dy^{3+}$ phosphors could be effectively excited by UV-visible light from 280 to 500 nm. The emission spectra exhibited three emission bands peaking at 480 (blue light), 576 (yellow light) and 665 nm (red light), which were due to the $^4F_{9/2}$-$^6H_{15/2}$, $^4F_{9/2}$-$^6H_{13/2}$ and $^4F_{9/2}$-$^6H_{11/2}$ transitions of Dy^{3+}, respectively. When Dy^{3+} concentration exceeded 12 mol%, the concentration quenching occurred. The critical distance between Dy^{3+} ions was calculated to be about 9.22 Å. In addition, the chromaticity coordinates of the phosphor are (0.33, 0.37), and the point is in the white region.

Keywords: Phosphor; $Ba_7(BO_3)_3(SiO_4)Cl$; Luminescent properties; Complex anionic groups

1. Introduction

Phosphors as light-conversion materials for white light-emitting diodes (WLED) have become increasingly important in the past two decades with the rapid development of solid state lighting [1-5]. $Y_3Al_5O_{12}:Ce^{3+}$, $Sr_3SiO_5:Eu^{2+}$ have been commercially manufactured and widely used [6]. However,

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