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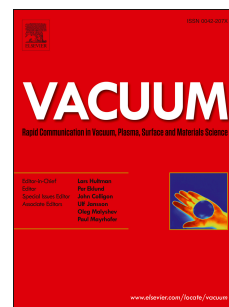
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Dy³⁺-, Tb³⁺-, and Eu³⁺-activated NaCa₄(BO₃)₃ phosphors for lighting based on near ultraviolet light emitting diodes

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ABSTRACT

A variety of Dy³⁺-, Tb³⁺- and Eu³⁺-singly or doubly or triply activated NaCa₄(BO₃)₃ phosphors for light emitting diodes applications were synthesized via a high temperature solid state reaction technique under an ambient atmosphere. These phosphors were studied by X-ray diffraction, scanning electron microscopy, photoluminescence excitation and emission spectra, Commission International de l'Eclairage chromaticity coordinates, and correlated color temperatures. The emission colors of Dy³⁺-, Tb³⁺-, and Eu³⁺-doped phosphors can be successfully tuned from green to yellow and then to white by appropriately changing the Tb³⁺ content and the excitation wavelengths. The correlated color temperatures can also be tailored from cold color to warm color. Furthermore, the energy transfer process from Dy³⁺ to Tb³⁺ in the Dy³⁺/Tb³⁺ codoped phosphors exists, which is discussed based on the luminescence spectra and energy level diagram analysis. The NaCa₄(BO₃)₃:Dy³⁺, Tb³⁺, Eu³⁺ phosphors reported here demonstrate promising applications in the fields of near ultraviolet based light emitting diodes.

Keywords: Phosphor; Light emitting diode; Luminescence; Energy transfer

1. Introduction

Nowadays, white light emitting diodes (W-LEDs) as green illumination technology have aroused increasing attentions due to their superior advantages of environmental friendliness, long

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