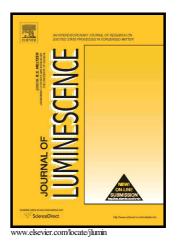
## Author's Accepted Manuscript

High-efficiency and thermal-stable  $Eu^{3+}$ -activated  $Ca_3Y(AlO)_3(BO_3)_4$  red-emitting phosphors for near-UV-excited white LEDs

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## High-efficiency and thermal-stable Eu<sup>3+</sup>-activated

### Ca<sub>3</sub>Y(AlO)<sub>3</sub>(BO<sub>3</sub>)<sub>4</sub> red-emitting phosphors for

#### near-UV-excited white LEDs

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#### Abstract

Red-emitting Ca<sub>3</sub>Y(AlO)<sub>3</sub>(BO<sub>3</sub>)<sub>4</sub>:Eu<sup>3+</sup> (abbreviated as CYAB:Eu<sup>3+</sup>) phosphors with different Eu<sup>3+</sup> doping concentrations were synthesized by a conventional solid-state method and their crystal structure, morphology, luminescence properties, decay curves and quantum efficiency were investigated in detail. The CYAB:Eu<sup>3+</sup> phosphors can emit red light peaking at  $\sim$ 621 nm under 397 nm excitation and the most intense red emission was obtained at the Eu<sup>3+</sup> concentration of 50 mol%. From the concentration-dependent photoluminescence studies of CYAB:Eu<sup>3+</sup> phosphors, the concentration quenching mechanism was dominated by dipole-dipole interaction. The as-prepared CYAB:0.5Eu<sup>3+</sup> sample possessed good color coordinates of (0.653, 0.342) with high color purity of 90%. More importantly, the internal quantum efficiency of CYAB:0.5Eu<sup>3+</sup> sample reached up to 88%. Furthermore, CYAB:Eu<sup>3+</sup> exhibited good thermal stability and its emission intensity at 150 °C was still up to 76.3% of that at room-temperature. In addition, a prototype LED device was fabricated by coating a phosphor blend of  $BaMgAl_{10}O_7:Eu^{2+}$  blue phosphors,  $(Ba,Sr)_2SiO_4:Eu^{2+}$  green phosphors and CYAB:0.5Eu<sup>3+</sup> red phosphors on the surface of 395 nm-emitting InGaN chip, which exhibited bright white light under 120 mA driven current. These good results indicate that the CYAB:Eu<sup>3+</sup> phosphors are very appropriate red-emitting phosphors for applications in near-ultraviolet-excited white light-emitting diodes.

Graphical Abstract

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