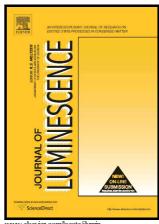
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ACCEPTED MANUSCRIPT

Tunable color emitting of Ba_{1-x-y}SiO₃:xEu,yBi³⁺ phosphors with the self-reduction of Eu³⁺ ions calcined in air

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Abstract:

A series of Ba_{1-x}SiO₃:xEu and Ba_{0.92-y}SiO₃:0.08Eu, yBi³⁺ phosphors have been synthesized using one-step calcination of a precursor prepared by chemical co-precipitation. The self-reduction phenomenon of Eu³⁺ is observed and verified by photoluminescence (PL), excitation (PLE) spectra and X-ray photoelectron spectroscopy (XPS). Under 353 nm excitation, the Ba_{1-x-v}SiO₃:xEu,yBi³⁺ phosphors exhibit a broad band ranging from 390 nm to 560 nm with a peak centered at 499 nm originating from the 4f⁶5d → 4f⁷ transition of Eu²⁺ ions and several narrow band emissions peaked at 464 nm, 537 nm, 581 nm, 590 nm, 615nm, 660nm and 705nm can be attributed to ${}^5D_2 \rightarrow {}^7F_0$, ${}^5D_1 \rightarrow {}^7F_1$, ${}^5D_0 \rightarrow {}^7F_0$, ${}^5D_0 \rightarrow {}^7F_1$, ${}^5D_0 \rightarrow {}^7F_2$, ${}^5D_0 \rightarrow {}^7F_3$ and $^5D_0 \rightarrow ^7F_4$ transition of Eu³⁺, respectively. The self-reduction of Eu³⁺ \rightarrow Eu²⁺ in BaSiO₃:Eu calcined in air has been explained from the following aspects: the charge compensation mechanism and the structures of 3-D networks composed by SiO₄ tetrahedra, helpful for maintaining of the reduction ($Eu^{3+} \rightarrow Eu^{2+}$) at a high temperature. Co-doping Bi³⁺ ions can both enhance the emissions from Eu²⁺ and Eu³⁺ because the doped Bi³⁺ ions not only can make vacancy for Eu²⁺ but also can enhance the emitting for Eu³⁺ in BaSiO₃. Moreover, when excited by 370 nm, the CIE chromaticity

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