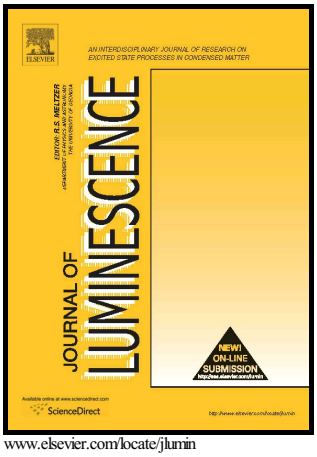
Tunable color emitting of $Ba_{1-x-y}SiO_3:xEu,yBi^{3+}$ phosphors with the self-reduction of Eu^{3+} ions calcined in air

Lingxiang Yang, Da-chuan Zhu, Shasha Liu, Jin-shan Wang, Cong Zhao, Yong Pu



www.elsevier.com/locate/jlumin

PII: S0022-2313(18)30501-5
DOI: https://doi.org/10.1016/j.jlumin.2018.06.067
Reference: LUMIN15729

To appear in: *Journal of Luminescence*

Received date: 19 March 2018
Revised date: 5 June 2018
Accepted date: 21 June 2018

Cite this article as: Lingxiang Yang, Da-chuan Zhu, Shasha Liu, Jin-shan Wang, Cong Zhao and Yong Pu, Tunable color emitting of $Ba_{1-x-y}SiO_3:xEu,yBi^{3+}$ phosphors with the self-reduction of Eu^{3+} ions calcined in air, *Journal of Luminescence,* https://doi.org/10.1016/j.jlumin.2018.06.067

Tunable color emitting of $Ba_{1-x-y}SiO_3$:xEu,yBi^{3+} phosphors with the self-reduction of Eu^{3+} ions calcined in air

Lingxiang Yang[a], Da-chuan Zhu[a], Shasha Liu[a], Jin-shan Wang[a], Cong Zhao[b], Yong Pu[b]

[a]College of Material Science & Engineering, Sichuan University, Sichuan Chengdu, 610065, China;

[b]Research Institute for New Materials Technology, Chongqing University of Arts and Sciences, Yongchuan Chongqing 402160, China;

Abstract:

A series of $Ba_{1-x}SiO_3$:xEu and $Ba_{0.92-y}SiO_3$:0.08Eu, yBi^{3+} phosphors have been synthesized using one-step calcination of a precursor prepared by chemical co-precipitation. The self-reduction phenomenon of Eu^{3+} is observed and verified by photoluminescence (PL), excitation (PLE) spectra and X-ray photoelectron spectroscopy (XPS). Under 353 nm excitation, the $Ba_{1-x-y}SiO_3$:xEu,yBi^{3+} phosphors exhibit a broad band ranging from 390 nm to 560 nm with a peak centered at 499 nm originating from the $4f^65d \rightarrow 4f^7$ transition of Eu^{2+} 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 Eu^{3+}, respectively. The self-reduction of $Eu^{3+} \rightarrow Eu^{2+}$ in $BaSiO_3$:Eu calcined in air has been explained from the following aspects: the charge compensation mechanism and the structures of 3-D networks composed by SiO_4 tetrahedra, helpful for maintaining of the reduction ($Eu^{3+} \rightarrow Eu^{2+}$) at a high temperature. Co-doping Bi^{3+} ions can both enhance the emissions from Eu^{2+} and Eu^{3+} because the doped Bi^{3+} ions not only can make vacancy for Eu^{2+} but also can enhance the emitting for Eu^{3+} in $BaSiO_3$. Moreover, when excited by 370 nm, the CIE chromaticity