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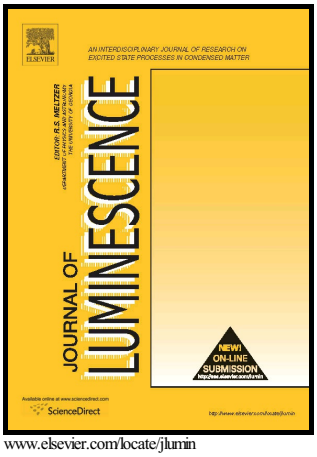

www.elsevier.com/locate/jlumin

PII: S0022-2313(18)30555-6
DOI: https://doi.org/10.1016/j.jlumin.2018.06.002
Reference: LUMIN15664

To appear in: *Journal of Luminescence*

Received date: 27 March 2018
Revised date: 29 May 2018
Accepted date: 2 June 2018

Cite this article as: Mukesh K. Sahu, M. Jayasimhadri, Kaushal Jha, B. Sivaiah, A.S. Rao and D. Haranath, Synthesis and enhancement of photoluminescent properties in spherical shaped Sm^{3+}/Eu^{3+} co-doped $NaCaPO_4$ phosphor particles for w-LEDs, *Journal of Luminescence,* https://doi.org/10.1016/j.jlumin.2018.06.002

Synthesis and enhancement of photoluminescent properties in spherical shaped Sm^{3+}/Eu^{3+} co-doped $NaCaPO_4$ phosphor particles for w-LEDs

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Abstract

A series of Sm^{3+} doped and Sm^{3+}/Eu^{3+}co-doped $NaCaPO_4$ phosphors have been successfully synthesized via molten salt method. The structural, morphological, optical, photoluminescence and decay properties of the synthesized phosphors were investigated. Sm^{3+} doped phosphor exhibits excellent emission properties in the orangish-red region under n-UV excitation (403 nm), and the optimized doping concentration of Sm^{3+} was found to be 1.0 mol%. The excitation spectrum confirms that Sm^{3+}/Eu^{3+} co-doped $NaCaPO_4$ phosphors can be efficiently excited by both n-UV and blue LED chips. In the co-doped $NaCaPO_4$:Sm^{3+}/Eu^{3+} phosphors, the intensity of main characteristic emission peaks of Sm^{3+} decreased and Eu^{3+} increased with increasing Eu^{3+} ion concentration. The energy transfer (ET) from Sm^{3+} to Eu^{3+} was demonstrated to be quadrupole-quadrupole in nature by applying Dexter's ET formula and Reisfeld's approximation. Commission Internationale de l'Eclairage (CIE) chromaticity coordinates for co-doped samples lie in the red region. The decay time for the $^4G_{5/2}$ level of Sm^{3+} decreases with increasing Eu^{3+} concentration, which also indicate the energy transfer from Sm^{3+} to Eu^{3+}. These