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Mukesh K. Sahu, M. Jayasimhadri, Kaushal Jha, B. Sivaiah, A.S. Rao, D. Haranath



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

Mukesh K. Sahu¹, M. Jayasimhadri^{*1}, Kaushal Jha¹, B. Sivaiah^{1,2}, A.S. Rao¹, D. Haranath²

¹*Luminescent Materials Research Lab, Department of Applied Physics, Delhi Technological University, Delhi 110 042, India*

²*CSIR-National Physical Laboratory, Dr. K.S. Krishnan Road, New Delhi 110 012, India*

***Corresponding author:** Tel: +91- 9013553360. jayaphysics@yahoo.com (M. Jayasimhadri)

Abstract

A series of Sm^{3+} doped and $\text{Sm}^{3+}/\text{Eu}^{3+}$ 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 $\text{Sm}^{3+}/\text{Eu}^{3+}$ co-doped NaCaPO_4 phosphors can be efficiently excited by both n-UV and blue LED chips. In the co-doped $\text{NaCaPO}_4:\text{Sm}^{3+}/\text{Eu}^{3+}$ 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 $^4\text{G}_{5/2}$ level of Sm^{3+} decreases with increasing Eu^{3+} concentration, which also indicate the energy transfer from Sm^{3+} to Eu^{3+} . These

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