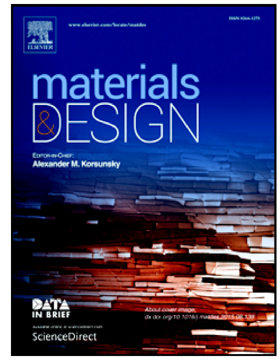
Accepted Manuscript



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PII: S0264-1275(17)30537-3
DOI: doi: 10.1016/j.matdes.2017.05.056
Reference: JMADE 3080

To appear in: *Materials & Design*

Received date: 31 March 2017
Revised date: 17 May 2017
Accepted date: 21 May 2017

Please cite this article as: Santosh K. Gupta, K. Sudarshan, R.M. Kadam , Tunable white light emitting Sr2V2O7:Bi3+phosphors: Role of bismuth ion, *Materials & Design* (2017), doi: 10.1016/j.matdes.2017.05.056

Tunable white light emitting $Sr_2V_2O_7$:Bi^{3+}phosphors: Role of Bismuth ion

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Abstract

Phase purity, optical properties and defects in new near white light emitting rare earth free $Sr_2V_2O_7$:Bi^{3+}phosphors were investigated. Emission spectrum of $Sr_2V_2O_7$ displayed two peaks at all excitation wavelength approximately around 450 (P_1) and 600 nm (P_2). With increase in the excitation wavelength; emission intensity increases and there is a red and blue shift in Peak P_1 and P_2, respectively. On bismuth doping, the two Peaks P_1 and P_2 slowly starts merging and become a single broad peak at 5% doping. Bismuth doping also reduces the emission peak energy. This is attributed to substitution of Bi^{3+} at Sr^{2+} site which would distort VO_4 tetrahedra, thereby reducing the energy difference between the ^3T and ^1A levels of VO_4^{3-} distorted tetrahedral. This dual role of bismuth doping and excitation energy leads to interesting tunability in white emission from cool to warm white. This opens a new arena in phosphor research because of great role of white LEDs (both warm and cool) in outdoor and indoor lighting.

Keywords: White light; Pyrovanadate; Photoluminescence; Positron annihilation; Phosphors; Tunable.

1. Introduction

White light emitting materials have attracted considerable research interest as alternate light sources to fluorescent lamps due to their favorable properties, like, high energy output, environment benignness, and lower power consumption **[1-4]**. Many of the white light emitting materials are based on the multi component mixing with optimized light emissions in different regions. The tunability in the emission properties is often achieved by rare earth doping **[5-7].** Non-rare earth dopants are also being tried to circumvent the problems associated with rare earth based phosphors, like, strong luminescence reabsorption leading to distortions in the emission spectra **[8]**. All the commercial phosphors are based on lanthanide ion doping in inorganic materials and availability of lanthanides is the scarce (10^6 times less