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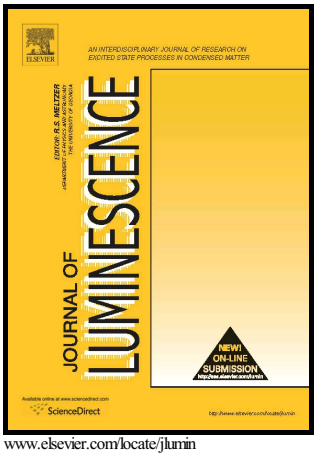

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Spectroscopic properties of $K_4SrSi_3O_9$ doped with Sm^{3+}

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Abstract

Sm^{3+} doped $K_4SrSi_3O_9$ red phosphor, was synthesized for the first time by the conventional solid state method. The X-ray powder diffraction confirmed that obtained phosphor was single phase. Excitation and emission spectra and decay curves were measured to characterize the luminescent properties of the obtained material. $K_4SrSi_3O_9$: Sm^{3+} exhibits red-orange luminescence originating mainly from equally intense $^4G_{5/2} \rightarrow {}^6H_{7/2}$ (with its maximum at 598.5 nm) and $^4G_{5/2} \rightarrow {}^6H_{9/2}$ (at 651 nm) transitions. The luminescence is quenched in the samples doped above 2% of Sm^{3+} due to non-radiative energy transfer between Sm ions at different sites. The interaction between Sm^{3+} ions is dipole-quadrupole type and the critical radius for energy transfer was calculated from Inokuti-Hirayama model to be 15.0 Å and 14.2 Å for 300 K and 77 K respectively.

Keywords: Silicates, luminescence, red phosphor, Sm^{3+}, $K_4SrSi_3O_9$

1. Introduction

White LEDs (WLEDs) have many advantages compared to incandescent bulbs and even to so called "*energy efficient compact fluorescent light bulbs*", used in every household. Ones of the most significant advantages are longer service lifetime, lower working temperature and