A NOVEL BLUE PHOSPHOR FOR SOLID STATE LIGHTING

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Abstract

The direct conversion of electrical power into light by semiconductor LEDs has brought a significant revolution in lighting technology[1]. The first white LEDs have been commercialized by Nichia Co., and it consist of InGaN blue LED ($\lambda_{em.}$ = 470 nm) and a yellow YAG:Ce^{3+} phosphor[2]. Blue, green and red (RBG) emitting phosphors with UV LED (λ_{em} = 300 – 370 nm) is the alternative way to mimic efficient white light with good color rendering index (CRI)[3]. Conventional phosphors used in fluorescent lighting are not ideal / suitable for solid state lighting (SSL) because they have poor absorption in the near UV to blue region. Hence, there is a growing interest in the development of novel families of phosphors with high absorption in the near UV region. Since the Ce^{3+} electronic transitions are dipole allowed and the absorption and emission bands are very broad and it is well suited for LED characteristics.

Ce^{3+} luminescence is studied for the first time in Sr_2LiSiO_4F and the excitation band is very broad and it is due to dipole allowed electronic transition of $4f^1 \rightarrow 4f^05d^1$ of Ce^{3+}. The emission spectrum shows intense and broad blue emission band at around 400 nm with shoulder at around 430 nm under near UV excitation (Fig.1). The two emission bands are due to Ce^{3+} present in the two crystallographic distinct Sr sites in the lattice. Sr_2LiSiO_4F: Ce^{3+} with bright blue emission can find potential application as a blue phosphor for SSL-LED technology.

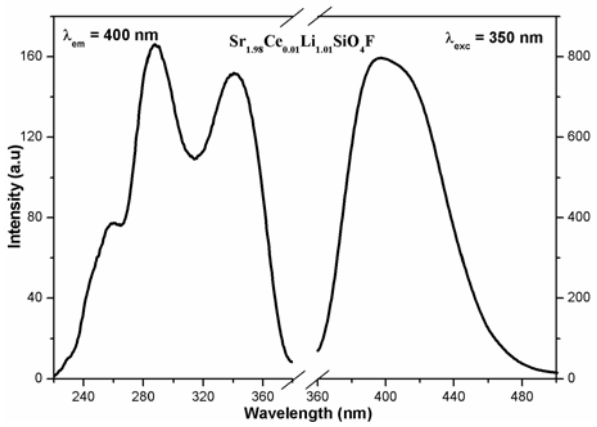

Figure 1. The excitation and emission spectra of $Sr_{1.98}Ce_{0.01}Li_{0.01}LiSiO_4F$

References:

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