Effect of flux on luminescence of Eu^{2+} activated yellow oxynitride phosphor

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Synthesis of pure nitrides or nitrogen rich oxynitrides are often challenging due to highly reactive and unstable alkaline earth nitride starting materials. Having the right choice of starting materials and sintering temperatures are important to achieve the desired compound with good luminescence properties. To our knowledge, there are not many reports available, which addresses the choice of fluxes for better sintering in nitrides and oxynitrides. In this report, we discuss the role of different fluxes in improving synthesis and luminescence properties of a novel composition, $Ba_4Si_9(O,N)_{16-\delta}:Eu^{2+}$. The Eu^{2+} activated material shows efficient yellow emission peaking around ~580nm under UV/blue excitation. (Figure 1). Addition of small quantities of chloride fluxes such as $BaCl_2$ or LiCl or $BaCl_2$-LiCl mixtures reduces the sintering temperature, enhances luminescence intensity (Figure 2) and shows crystalline morphology (Figure 3). The emission intensity and position can further be tuned by Mg^{2+} substitution in the Ba^{2+} site. We further investigate the nature of their emission and excitation bands at different Eu^{2+} concentration levels and at elevated temperatures. These results will be compared to other yellow emitting oxide phosphors.

Acknowledgements: Authors thank GE Lighting Solutions for supporting this work. Authors also want to thank Swarnagowri Addepalli (GE India Technology Centre) for SEM micrographs.

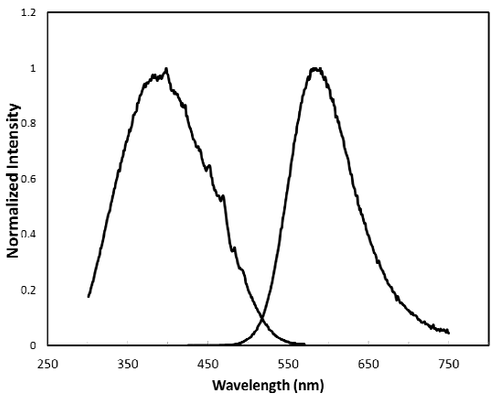

Figure 1. Excitation (λ_{em}=583 nm), emission (λ_{ex}=405 nm) spectra of $Ba_4Si_9(O,N)_{16-\delta}:Eu^{2+}$ recorded at room temperature.

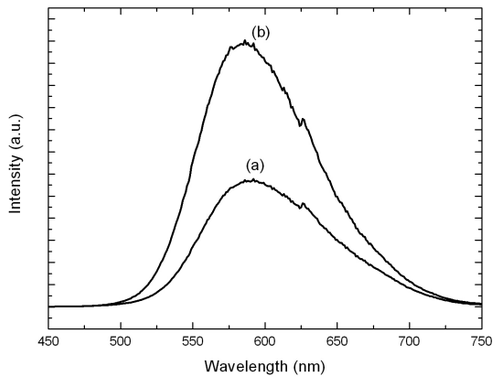

Figure 2. Photoluminescence emission of $Ba_4Si_9(O,N)_{16-\delta}:Eu_{0.06}$ (λ_{ex} = 405nm) synthesized with (a) no flux and (b) $BaCl_2$-LiCl flux

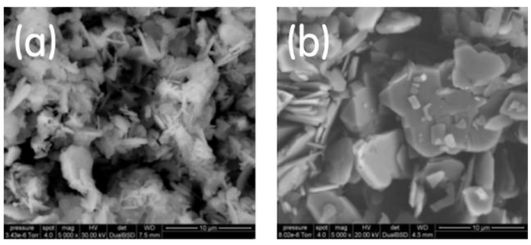

Figure 3. SEM micrograph of $Ba_4Si_9(O,N)_{16-\delta}:Eu_{0.06}$ synthesized with (a) no flux (b) $BaCl_2$-LiCl flux