

NOVEL AND EFFICIENT BLUE EMITTING PHOSPHORS FOR PHOTOLUMINESCENT LIQUID CRYSTAL DISPLAY APPLICATION

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Abstract

In the simplest PL-LCD arrangement a LCD panel is placed between a UV backlight and a screen composed of an array of RGB emitting Photoluminescent phosphor sub-pixels or stripes. An efficient UV backlight $\text{KMgF}_3:\text{Eu}$ (0.1 mole %) and blue emitting phosphor $\text{CaF}_2:\text{Eu}$ (0.1 mole % , $\text{Sr}_3\text{MgSi}_2\text{O}_8:\text{Eu}^{2+}$) has been reported. In view of the exhibition of Eu transitions in these phosphors and simplicity of their synthesis the findings on these phosphors attracts the attention of frontline researchers. $\text{KMgF}_3:\text{Eu}$ and $\text{CaF}_2:\text{Eu}$ are synthesized using wet-chemical methods and $\text{Sr}_3\text{MgSi}_2\text{O}_8:\text{Eu}^{2+}$ is synthesized by combustion method using low cost fuel and oxidizer composition. The photoluminescent properties are reported.

Looking at the Excitation spectrum for $\text{KMgF}_3:\text{Eu}$ (0.1 mole %), it has well defined absorption at 253 nm. (85 % of Hg discharge LP) and has sharp emission at 356 nm and Interestingly, $\text{CaF}_2:\text{Eu}$ (0.1 mole %) has very good absorption in 340-400 nm range almost flat absorption and has narrow band emission peaking at 423 nm. However in case of $\text{Sr}_3\text{MgSi}_2\text{O}_8:\text{Eu}^{2+}$, the characteristic emission of Eu^{2+} corresponding to $4f^65d^1-4f^7$ transitions, with efficient excitation at 390 nm and the emission at 455 nm is observed.

It is found that the Photoluminescent properties of these new phosphors are very much close to the requirements of blue emitting phosphor for PL-LCD application. It is proposed that $\text{KMgF}_3:\text{Eu}$ (0.1 mole %) could be used as backlight phosphor and $\text{Sr}_3\text{MgSi}_2\text{O}_8:\text{Eu}^{2+}$, $\text{CaF}_2:\text{Eu}$ (0.1 mole %) could be used as PLLCD phosphor for narrow band emission in blue region.