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Energy Transfer in $\text{Y}_3\text{Al}_5\text{O}_{12}:\text{Ce}^{3+}, \text{Cr}^{3+}$ and $\text{Y}_3\text{Al}_5\text{O}_{12}:\text{Ce}^{3+}, \text{Pr}^{3+}, \text{Cr}^{3+}$ Phosphors

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Abstract: Triply doped $\text{Y}_3\text{Al}_5\text{O}_{12}:\text{Ce}^{3+}, \text{Pr}^{3+}, \text{Cr}^{3+}$ phosphors with Ce^{3+} and Pr^{3+} substituting for Y^{3+} sites and Cr^{3+} substituting for Al^{3+} site are prepared by solid state reaction. A broad emission spectrum composed a yellow emission band from Ce^{3+} , a light red emission line from Pr^{3+} and a deep red emission line from Cr^{3+} , which are generated through energy transfer among the dopant ions. The study of photoluminescence and fluorescence decay indicates that there exist energy transfers from $\text{Ce}^{3+} \rightarrow \text{Cr}^{3+}$ and $\text{Ce}^{3+} \rightarrow \text{Pr}^{3+} \rightarrow \text{Cr}^{3+}$. The effect of energy transfer on relative intensities of the three emissions is analyzed. A white LED is fabricated using a blue LED chip coated with the triply doped phosphor and shows a color rendering index of 81.4 and 80.4, respectively. It is higher than that either using Ce^{3+} and Cr^{3+} doubly doped phosphor or Ce^{3+} singly doped phosphors.

Key words: YAG; energy transfer; WLED

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