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The synthesis and photoluminescence properties investigation of a versatile phosphor



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Abstract

A series of versatile phosphors $\text{Sr}_{10}[(\text{PO}_4)_{5.5}(\text{BO}_4)_{0.5}](\text{BO}_2): \text{Sb}^{3+}/\text{Eu}^{3+}/\text{Pr}^{3+}/\text{Dy}^{3+}$ were firstly synthesized by solid-state method. The phase purity was analyzed through X-ray diffraction and their characteristic luminescence properties were investigated. The results showed that $\text{Sr}_{10}[(\text{PO}_4)_{5.5}(\text{BO}_4)_{0.5}](\text{BO}_2): \text{Sb}^{3+}$ exhibited broad blue emission centered at 459 and 467 nm, due to the selective excitation transitions ($^3\text{P}_{1/0} \rightarrow ^1\text{S}_0$) of Sb^{3+} occupying different crystal sites in $\text{Sr}_{10}[(\text{PO}_4)_{5.5}(\text{BO}_4)_{0.5}](\text{BO}_2)$. The emission spectrum of $\text{Sr}_{10}[(\text{PO}_4)_{5.5}(\text{BO}_4)_{0.5}](\text{BO}_2): \text{Eu}^{3+}$ consisted of a series of lines attributed to the $^5\text{D}_0 \rightarrow ^7\text{F}_j$ ($J = 1, 2, 3, 4$) transitions of Eu^{3+} . Moreover, an unusual blue emission band was observed, which was discussed in detail and proved to be related to the vacancy of Sr^{2+} through the charge compensation mechanism. In addition, red and warm white emissions could be obtained from Pr^{3+} and Dy^{3+} single doped $\text{Sr}_{10}[(\text{PO}_4)_{5.5}(\text{BO}_4)_{0.5}](\text{BO}_2)$ and their luminescence properties were discussed, respectively.

Keywords: A. optical materials; D. optical properties; D. luminescence

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1. Introduction

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