

Visualization of $\text{Eu}^{2+}/\text{Eu}^{3+}$ coactivated BaAl_2O_4 phosphor using X-ray nanoprobe beamline at TPS 23A

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Abstract

Rare-earth ions play the most important roles as activators in phosphor materials. The valence states of the rare-earth ions significantly affect the emission properties of the phosphors. The emissions of Eu^{2+} and Eu^{3+} ions in the same host lattice are tunable and may produce different chromaticity coordinates in white light. X-ray excited optical luminescence (XEOL) spectrum enable to clarify the transition mechanism of rare-earth elements. In the present study, we explored X-ray fluorescence (XRF) mapping to visualize the valence states of rare-earth ions using X-ray nanoprobe techniques. The results demonstrate that the main contribution to the luminescence intensity of $\text{BaAl}_2\text{O}_4:\text{Eu}^{2+}$ comes from the Eu^{2+} activator and the concentration of Eu^{2+} or Eu^{3+} ions have a negligible impact on the emission intensity.

Keywords - Rare-earth ions, phosphor materials, X-ray nanoprobe, X-ray excited optical luminescence, X-ray fluorescence