Synthesis and luminescence studies of Dy^{3+} doped $Li_3Sc(BO_3)_2$ polycrystalline powder for warm white light

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Abstract

$Li_3Sc(BO_3)_2$, an orthoborate polycrystalline compound, was synthesised using the solid-state synthesis method as a pure and Dy_2O_3-doped material. Dy^{3+} ions were used in various concentrations (from 1 to 6 mol. %). The experimental powder X-ray diffraction data and calculated Rietveld refined data are found to be in good agreement, verifying the effectiveness of the synthesis procedure. The luminescence studies were performed under the excitations of X-ray, proton beam, and UV light. The success of radioluminescence studies verifies the prospects of the Dy^{3+}-doped compound for its application as a radiation scintillator in imaging. The experimental study of cross-relaxation processes confirms the lack of potential evidence of the quenching of the emission peak at 765 nm through the absorption via $^6H_{15/2} \rightarrow {}^6F_{3/2}$ electronic transition cross-relaxation channel−1. The CIE 1931 colour coordinates and correlated colour temperatures were determined for all doped samples under X-ray, proton beam, and photoluminescence excitations. The obtained combined emission colour appeared in the warm white region, unlike many other Dy^{3+}-doped phosphors that suffer suppression of luminescence through the cross-relaxation process.

The full text can be found at the following link:

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