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Optical response and luminescence characteristics of Sm^{3+} and Tb^{3+}/Sm^{3+} co-doped potassium-fluoro-phosphate glasses for reddish-orange lighting applications

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Highlights

- Sm^{3+} and Tb^{3+}/Sm^{3+} doped potassium-fluoro-phosphate glasses were prepared.
- Spectroscopic properties have been determined using Judd-Ofelt theory.
- By co-doping with Tb^{3+}, energy transfer from Tb^{3+} to Sm^{3+} takes place.
- Intense reddish-orange emission was obtained due to $^4G_{5/2} \rightarrow {}^6H_{7/2}$ located at 600 nm.

Abstract

Potassium-fluoro-phosphate (KFP) glasses singly doped with different concentrations of samarium (0.1, 0.3, 0.5, 1.0, 1.5 and 2.0 mol%) and co-doped with Tb^{3+}(0.1, 0.5, 1.0 mol%) were prepared, and their luminescence properties were investigated. Optical transition properties of Sm^{3+} ions were evaluated by using Judd–Ofelt theory. Various emission properties were studied from luminescence spectra. Reddish-orange emission of Sm^{3+} exhibits mainly by $^4G_{5/2}$ level to $^6H_{7/2}$ located at 600 nm. Concentration quenching and energy transfer were observed from fluorescence spectra and decay curves respectively. The non-exponential decay profiles were analyzed Inokuti-Hirayama model (I-H). From this model, various energy transfer kinetic parameters were also calculated and analyzed. By co-doping with Tb^{3+}, energy transfer from

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