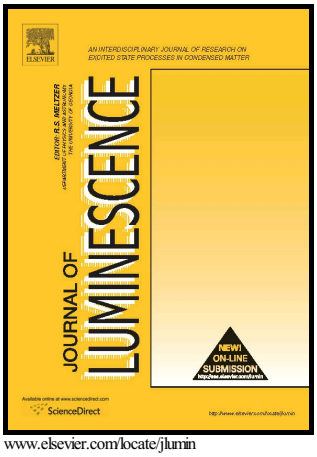

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Europium doping in monoclinic $KYb(WO_4)_2$ crystal

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Abstract

We report on a detailed spectroscopic study of Eu^{3+} ions in the monoclinic $KYb(WO_4)_2$ crystal. The polarized room and low-temperature absorption spectra are measured. The maximum σ_{abs} corresponding to the $^7F_1 \rightarrow {}^5D_1$ transition is 1.32×10^{-20} cm^2 at 534.2 nm with a bandwidth of 0.7 nm (for $E \parallel N_m$). The Stark sub-levels of the excited mulitplets are determined. A Judd-Ofelt analysis is applied to the Eu^{3+}:$KYb(WO_4)_2$ crystal to determine the probability of spontaneous transitions, radiative lifetimes and luminescence branching ratios. Within the strong configuration interaction (SCI) approximation, the intensity parameters are Ω_2 = 4.757, Ω_4 = 2.295, Ω_6 = 1.644 [10^{-20} cm^2] and Δ_f = 50160 cm^{-1}. The radiative lifetime of the $^5D_0$ state is 351 μs. The maximum stimulated-emission cross-section corresponding to the $^7F_1 \rightarrow {}^5D_1$ transition is 1.44×10^{-20} cm^2 at 703.2 nm (for $E \parallel N_m$). Under UV excitation, the Eu^{3+}: $KYb(WO_4)_2$ crystal provides intense red photoluminescence with CIE coordinates, x = 0.675, y = 0.325.

Keywords: double tungstates, europium, absorption, luminescence.