

High pressure and time-resolved luminescence spectra of $\text{Ca}_3\text{Y}_2(\text{SiO}_4)_3$ doped with Eu^{2+} and Eu^{3+} .

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Streszczenie

Tricalcium diyttrium trisilicon oxide, $\text{Ca}_3\text{Y}_2(\text{SiO}_4)_3$ doped with Eu^{2+} and Eu^{3+} belongs to a very limited number of hosts able to accommodate both Eu^{3+} and Eu^{2+} ions, which might make it useful for white light emitting diodes (WLEDs) based on UV chip technology. In this contribution we present a detailed study of photoluminescence kinetics and high pressure spectroscopy of Eu^{3+} and Eu^{2+} doped $\text{Ca}_3\text{Y}_2(\text{SiO}_4)_3$. At ambient pressure and room temperature, under excitation with near-UV radiation, a broad emission band from 400 to 550 nm due to the $4f^65d^1 \rightarrow 4f^7(^8S_{7/2})$ transition in Eu^{2+} was observed, as well as several emission peaks in the region between 550 and 710 nm, ascribed to the $^5D_0 \rightarrow ^7F_J$ ($J = 0-4$) transitions in Eu^{3+} . The bluish green luminescence related to Eu^{2+} in the $\text{Ca}_3\text{Y}_2(\text{SiO}_4)_3$ exhibits a small red pressure-induced shift reaching $-5.2 \text{ cm}^{-1}/\text{kbar}$. The red shifts of the luminescence lines related to Eu^{3+} ion emission vary from 0.15 to $-0.54 \text{ cm}^{-1}/\text{kbar}$. Time-resolved photoluminescence was measured at different temperatures and pressures. Luminescence decay traces were studied for the bluish green emission band of Eu^{2+} and for the red emission peak due to the $^5D_0 \rightarrow ^7F_2$ transition of Eu^{3+} . Decay times slightly decreased with increasing pressure.

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