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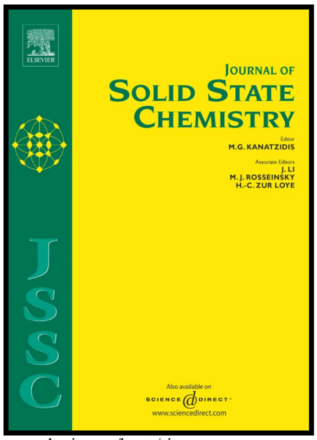

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Synthesis, crystal structure and Photoluminescence of Eu^{3+} or Tb^{3+} doped solid solutions $(Y_{1-x}RE_x)_4S_3(Si_2O_7)$

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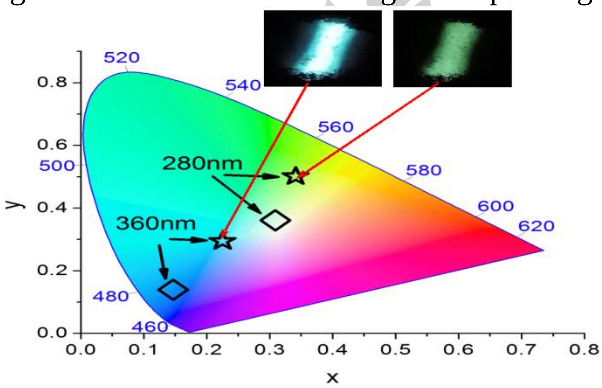
Abstract.

$Y_4S_3(Si_2O_7)$ and its solid solutions $(Y_{1-x}RE_x)_4S_3Si_2O_7$ (RE=Eu x=0.010-0.085, RE=Tb x=0.010-0.500) were quantitatively prepared by reaction of starting compounds in molten CsCl. Single crystal X-Ray analysis revealed the difference in preference Eu^{3+} occupancy for two independent RE-sites coming from volume difference of these sites. This effect is negligible for the Tb-containing solid solution due to smaller difference in radii Tb^{3+} and Y^{3+} ions. Tb^{3+}-containing samples are luminescent with typical emission of Tb^{3+}, while Eu^{3+}-containing samples are not luminescent. The 1%Tb^{3+}-containing sample emits in blue or in green color depending on the excitation wavelength. Measured melting points are 1545±15°C for all investigated samples $(Y_{1-x}RE_x)_4S_3Si_2O_7$.

Graphical abstract

Due to two kinds of luminescence: matrix and Tb^{3+}-ions, the sample $Y_4S_3(Si_2O_7)$:1%Tb^{3+} changes color of FL from blue to green depending on the excitation wave.



Keywords: rare earth elements, silicate, chalcogenide, crystal structure, luminescence.

Introduction