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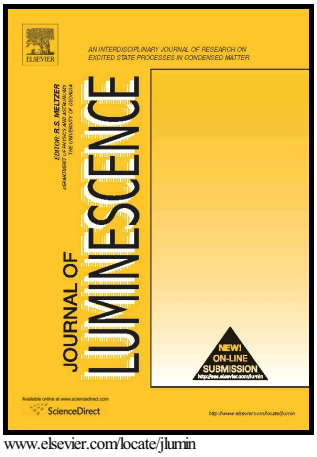

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Synthesis and photoluminescence properties of red-emitting $NaLaMgWO_6:Sm^{3+},Eu^{3+}$ phosphors for white LED applications

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Abstract: A series of red-emitting $NaLaMgWO_6:Sm^{3+},Eu^{3+}$ phosphors were successfully synthesized by the solid-state reaction method. The crystal structure, morphology and photoluminescence properties were investigated in detail. The $NaLaMgWO_6$ compound has monoclinic structure with the space group *C2/m*. Upon excitation of the near-ultraviolet light, the Sm^{3+} singly doped and Eu^{3+} singly doped phosphors exhibit red emission at 600 nm ($^4G_{5/2}\rightarrow{}^6H_{7/2}$ transition of Sm^{3+}) and 617 nm ($^5D_0\rightarrow{}^7F_2$ transition of Eu^{3+}), respectively, while the Sm^{3+}, Eu^{3+} co-doped phosphors show the characteristic transition of Eu^{3+} whether excited by 397 or 406 nm. This indicates the existence of the energy transfer from Sm^{3+} to Eu^{3+} ions. Furthermore, the mechanism of energy transfer and energy transfer efficiency were confirmed by the decay time of Sm^{3+} ion in $NaLaMgWO_6:Sm^{3+},Eu^{3+}$ phosphors. The mechanism of energy transfer between Sm^{3+} and Eu^{3+} is proved to be dipole-dipole interaction, and the energy transfer efficiency of $NaLa_{0.65}MgWO_6:0.05Sm^{3+},0.3Eu^{3+}$ phosphor is calculated to be 38.89%. The temperature dependent emission spectra demonstrate that the $NaLaMgWO_6:Sm^{3+},Eu^{3+}$ phosphor has a good thermal stability with an thermal activation energy ΔE of 0.241 eV. The CIE chromaticity coordinate is calculated to be (x = 0.661, y = 0.339).

Keywords: Red phosphors, Photoluminescence, Energy transfer, White LEDs

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