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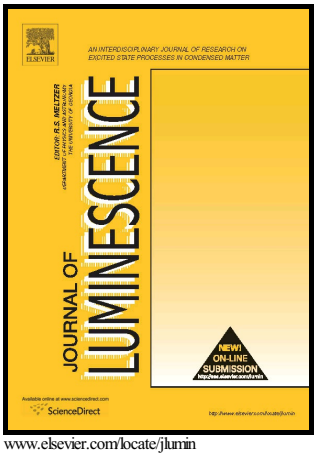

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Crystal Field Splitting of 5d States and Luminescence Mechanism in $SrAl_2O_4:Eu^{2+}$ Phosphor

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Abstract

A stoichiometric $SrAl_2O_4:Eu^{2+}$ nanosized powder was synthesized by combustion method using urea at 500°C and calcinated at 1000ºC. The measurements of the luminescent properties of $SrAl_2O_4:Eu^{2+}$ were carried out; additionally, theoretical study of the crystal field splitting of the Eu^{2+} 5*d* levels at two crystallographically different Sr positions in the $SrAl_2O_4$ lattice was performed. Two luminescence bands at 450 nm and near 520 nm were observed at lower temperatures. The luminescence mechanism and peculiar temperature dependence of bands intensities are discussed on the basis of the crystal field theory (within the exchange charge model) combined with the vibronic approach. The latter involves the electron vibrational interaction in two kinds of the Eu^{2+} centers as well as the interaction between these centers in the host lattice. A simplified single-mode model was adopted for each center and the section of the bi-dimensional adiabatic potential of the Eu^{2+} dimer along an effective