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**Luminescence properties of Dy³⁺ or/and Sm³⁺ doped LiLa(WO₄)₂ phosphors
and energy transfer from Dy³⁺ to Sm³⁺**

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Abstract:

The Dy³⁺ or/and Sm³⁺ doped LiLa(WO₄)₂ phosphors are synthesized by a facile solid state reaction method. The phase and luminescence properties of the phosphors are investigated. The powder X-ray diffraction (XRD) results show that the phosphor has a tetragonal phase crystal structure. The quenching concentration of single doped Dy³⁺ and Sm³⁺ in the LiLa(WO₄)₂ are determined to be 6% and 3%, respectively. Under the excitation of 404 nm, warm white light is obtained in the co-doped phosphors. With the concentration of Sm³⁺ increasing, the correlated color temperature (CCT) gradually decreases from 3090 to 2453 K. Two kinds of energy transfer may exist at the same time. The overlap between the emission spectrum of Dy³⁺ and the excitation spectrum of Sm³⁺ reveals that the energy of Dy³⁺ can transfer to Sm³⁺ via radiation. Another way of energy transfer, that is non-radiative energy transfer, is attributed to the excited state of Dy³⁺ (⁴F_{9/2}) slightly higher than that of Sm³⁺ (⁴I_{19/2}). The calculation results show that non-radiative energy transfer process from Dy³⁺ to Sm³⁺ ions is predominated by quadrupole–quadrupole interaction.

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