

Luminescence Thermometry Based on Structural Phase Transition of LaGaO₃:Eu³⁺

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Luminescence thermometry has drawn significant research interest recently, due to its remote and electrically passive readout capability and high reliability. The various strategies have been studied to improve the thermometric performance of luminescence thermometer. Among these, the thermally induced phase transition-based luminescence thermometry has received remarkable recognition due to its outstanding thermometric performance. In this work, luminescence thermometry based on structural phase transition of Eu³⁺ doped LaGaO₃ has been investigated. The spectroscopic properties of LaGaO₃: x% Eu³⁺ (x= 0.1, 0.25, 0.5, 1, 2) were determined as function of temperature and significant changes were observed around phase transition temperature. The thermally induced changes in emission spectra due to phase transition enabled the development of ratiometric luminescence thermometer. The maximum value of $S_R = 6\% \text{ K}^{-1}$ was achieved at 480 K for LaGaO₃:0.1%Eu³⁺. Moreover, it was shown that increasing Eu³⁺ concentrations result in a shift of the phase transition temperature, facilitating tunable thermometric behavior. These findings indicate that LaGaO₃ is a highly suitable host matrix for luminescence thermometers exploiting structural phase transitions in the temperature range above 400 K.

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