

Luminescence properties of 30SrO-30MgO-40P2O5 DOPED WITH Dy2O3

Abstract :

This paper reports on the luminescence properties of Dy³⁺ (1.0 mol%) doped 30SrO-30MgO-40P2O5, which had been prepared by solid state reaction. The crystalline phases were identified using X-ray diffraction (XRD) and their luminescence properties were studied using excitation and emission spectra obtained from photoluminescence spectroscopy. The results of XRD patterns indicate that the prepared sample contains Mg₂P₄O₁₂ and SrMg P₂O₇ crystalline phase. The excitation spectrum of 30SrO-30MgO-40P2O5: Dy³⁺ consists of many dominant broad bands centered at ~280, 310 and 400-600 nm. The broad band excitation spectrum is associated with defects and vacancies of host material through two different crystalline phases present in host material. The other feature of sharp peaks is very similar and belongs to Dy³⁺ ions. The observed f-f transitions in the range of 417-475 nm correspond to the transitions from 6H_{15/2} to 4K_{17/2} + 4M_{19/2}, 2_{1/2} + 4I_{13/2} + 4F_{7/2}, 4G_{11/2}, 4I_{15/2} and 4F_{9/2}, in the range of 392 nm to 6P_{3/2} + 6P_{5/2}, and in the range of 312-370 nm to 4K_{15/2}, 6P_{7/2} + 4M_{15/2} and 4I_{11/2} respectively. The sharp emission peaks like at 482, 465, and 455 nm could be assigned to the transition of 4F_{9/2} → 6H_{15/2}, 4I_{15/2} → 6H_{15/2} and 4G_{11/2} → 6H_{15/2} of Dy³⁺, respectively. Dy³⁺ has emissions due to the atomic energy levels of itself and emissions due to the acceptor levels of defect sites formed by Dy³⁺. In addition, the SrO-MgO-P2O5 is found a new self-active luminescent material.