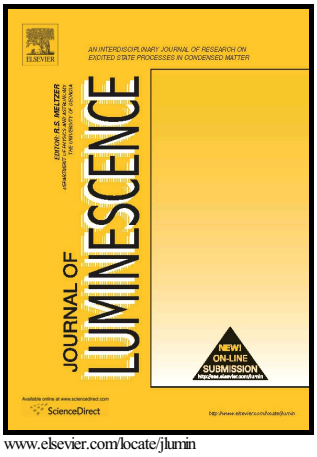

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PII: S0022-2313(17)31801-X
DOI: https://doi.org/10.1016/j.jlumin.2018.06.057
Reference: LUMIN15719

To appear in: *Journal of Luminescence*

Received date: 25 October 2017
Revised date: 14 May 2018
Accepted date: 18 June 2018

Cite this article as: Sumedha Tamboli, R.M. Kadam, B. Rajeswari, Birendra Singh and S.J. Dhoble, Correlated PL, TL and EPR study in γ-rays and C^{6+} ion beam irradiated $CaMg_2(SO_4)_3:Dy^{3+}$ triple sulphate phosphor, *Journal of Luminescence,* https://doi.org/10.1016/j.jlumin.2018.06.057

Correlated PL, TL and EPR study in γ-rays and C^{6+} ion beam irradiated $CaMg_2(SO_4)_3:Dy^{3+}$ triple sulphate phosphor

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Abstract

$CaMg_2(SO_4)_3$ host and $CaMg_2(SO_4)_3:Dy^{3+}$ phosphor (where Dy^{3+} = 0.05, 0.1,0.2, 0.5 and 1 mol%) were synthesized via solid state synthesis method at 700 °C. Phase formation of the compound was confirmed by obtaining its X-ray diffraction (XRD) pattern and the surface morphology was analysed with the scanning electron microscopy (SEM) technique. Photoluminescence (PL) excitation and emission spectra of $CaMg_2(SO_4)_3:Dy^{3+}$ phosphor shows characteristic emission and excitation peaks of Dy^{3+} ions, which confirms the doping of Dy^{3+} ions in the host. Material was irradiated with γ-rays and C^{6+} ion beam. Thermoluminescence (TL) glow curve of irradiated material was recorded at the heating rate of 5 °Cs^{-1}. A single TL peak is obtained after γ-rays irradiation for $CaMg_2(SO_4)_3$ host at 158 °C and two TL peaks were seen for $CaMg_2(SO_4)_3:Dy^{3+}$ at 129 °C and 355 °C. With increase in Dy^{3+} concentration, TL intensity is increased but the nature of TL glow curve remained same. Material was quenched from 400 °C and its TL was recorded by irradiating it with γ-rays and C^{6+} ion beam (75 MeV). TL intensity of quenched $CaMg_2(SO_4)_3:Dy^{3+}$ compound enhanced significantly as compared to annealed $CaMg_2(SO_4)_3:Dy^{3+}$ compound. Electron paramagnetic resonance (EPR) study was carried out on irradiated (γ-ray and C^{6+} beam) $CaMg_2(SO_4)_3:Dy^{3+}$ compound to analyse radicles formed in the irradiation process and possible mechanism of TL. Correlated study of TL, PL and EPR is done.