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# Photoluminescence, Thermoluminescence glow curve and emission characteristics of $Y_2O_3:Er^{3+}$ nanophosphor

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**Abstract**

Nanocrystalline $Er^{3+}$ doped $Y_2O_3$crystals were prepared by a sol gel technique. X-ray diffraction (XRD) patterns showed the cubic structure of $Y_2O_3$ and the crystallite size was found to be ~25 nm. Optical absorption showed absorption peaks at 454, 495 and 521 nm. These peaks are attributed to the $^4F_{3/2}$+$^4F_{5/2}$, $^4F_{7/2}$ and $^2H_{11/2}$+$^4S_{3/2}$ transitions of $Er^{3+}$. Under excitation at 378 nm, the appearance of strong green (520-565 nm) down conversion emission assigned to the ($^2H_{11/2,}$ $^4S_{3/2}$)→$^4I_{15/2}$ transition and the feeble red (650-665 nm) emission is assigned to the $^4F_{9/2}$→$^4I_{15/2}$ transition. The color chromaticity coordinates showed emission in the green region. The strong green emission of $Y_2O_3:Er^{3+}$ nanophosphor may be useful for applications in solid compact laser devices. Thermoluminescence (TL) studies of γ-irradiated $Y_2O_3:Er^{3+}$showed a prominent TL glow peak maximum at 383 K along with a less intense shoulder peak at ~425 K and a weak glow at 598 K. TL emission peaks with maxima at 545, 490, 588 and 622 nm for the doped sample were observed at a temperature of 383 K and these emissions were due to defect related to the host material. TL kinetic parameters were calculated by a glow curve deconvolution (GCD) method and the obtained results are discussed in detail for their possible usage in high dose dosimetry.