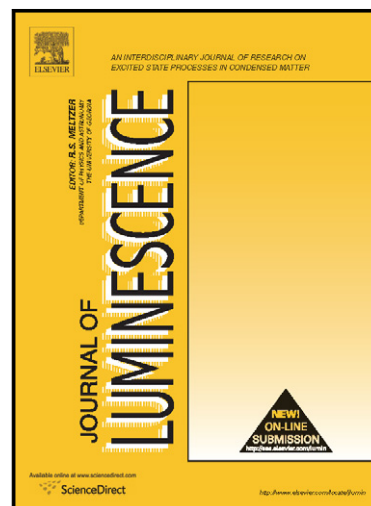


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Optical constants and near infrared emission of Er doped ZnO sol-gel thin films

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Abstract

Erbium (Er) doped zinc oxide (ZnO) sol-gel thin films were deposited on glass substrate using spin coating method. The effect of erbium concentration and annealing temperature on structural and optical properties were studied. The annealed film was analysed by X-ray diffraction (XRD), scanning electron microscope (SEM) with energy dispersive X-ray spectrum (EDX), micro Raman, photoluminescence (PL) and UV-Vis spectroscopy. All films showed a wurtzite structure of polycrystalline nature with an average crystal size of 27.44 nm at 500°C and 29.28 nm at 600°C. Raman spectra confirmed the absence of secondary phases in the Er doped ZnO films and the longitudinal optical phonon mode were upto the fifth order. Densely packed surface of the films were observed from SEM images. The presence and distribution of Zn, O and Er elements in the deposited films were confirmed by EDX analysis. The calculated value of exciton binding energy of ZnO film was 60 meV with a maximum value of 72 meV being observed for Er doped films. The near infra-red emission peak was observed at 1.63 eV through PL spectra studies. The average transmission was 80% with the calculated value of optical band gap being 3.26 - 3.32 eV. An increase in the refractive index value predicts the substitutional incorporation of Er ions in ZnO with the maximum optical conductivity being observed in the UV region.

Keywords: Erbium doped ZnO; sol-gel thin film; optical constant; near infra-red emission; optical conductivity.

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