

Dilute magnetic semiconductor of ZnCoSe thin films: Structural, optical, and magnetic characteristics

A series of $\text{Zn}_{1-x}\text{Co}_x\text{Se}$ ($x = 0, 0.025, 0.050, 0.075, \text{ and } 0.100$) films using were evaporated (thickness of $1 \mu\text{m}$) using electron beam gun. The effect of Co doping on the structural, optical, and magnetic properties has been investigated. X-ray diffraction studies confirm formation of zinc blend structure for all $\text{Zn}_{1-x}\text{Co}_x\text{Se}$ films. The crystallite size increases and the lattice strain decreases with the increase in Co content. The elemental constituents were characterized by energy dispersive X-ray. Optical studies showed an increase in refractive index and a decrease in energy gap with the increase in the cobalt doping. The dispersion of the refractive index has been analyzed in terms of the Wemple-DiDomenico single oscillator model. The oscillator parameters including the single oscillator energy (E_o), the dispersion energy (E_d), and the static refractive index (n_o) were estimated. Magnetization measurements via vibrating sample magnetometer showed a hysteresis loop and confirmed room-temperature ferromagnetism in Co-doped ZnSe films.