

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

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## Abstract

A series of Zn<sub>1-x</sub>Co<sub>x</sub>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 Zn<sub>1-x</sub>Co<sub>x</sub>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 ( $E_0$ ), the dispersion energy ( $E_d$ ), and the static refractive index ( $n_0$ ) were estimated. Magnetization measurements via vibrating sample magnetometer showed a hysteresis loop and confirmed room-temperature ferromagnetism in Co-doped ZnSe films.

**KEYWORDS:** magnetization, optical constants, oscillator parameters, zinc blend structure, Zn<sub>1-x</sub>Co<sub>x</sub>Se thin films