ABSTRACT

The thesis presents optical and magnetic properties of K, (Cu, K) and (Fe, K) doped ZnO thin films and ZnO/KI composite. In the present study, K doped, (Cu, K) and (Fe, K) codoped ZnO thin films were prepared by chemical bath deposition technique and their optical and magnetic properties were studied to determine the effect of doping. In K doped ZnO thin films, the optical band gap values change with the crystallite sizes. The optical constants such as refractive index, extinction coefficient, real and imaginary parts of dielectric constant as a function of wavelength were determined. The thin films were found to have low refraction index and good quality. The PL spectra show a UV emission and two weak blue emissions (deep level emissions) for all the films. In the case of (Cu, K) doped and (Fe, K) doped ZnO thin films, K was kept at a concentration of 1% and Cu and Fe concentrations were varied at 1, 2, 3 and 4%. These thin films were found to exhibit semiconducting and magnetic properties giving rise to the behaviour of diluted magnetic semiconductors (DMS). The transmittance shows a significant variation when Cu and Fe are incorporated at different doping levels along with K and the band gap changes for higher doping concentration. The room temperature magnetic hysteresis reveals the typical ferromagnetic behavior for K doped, (K, Cu) and (K, Fe) doped ZnO thin films. The magnetic properties have been explained on the basis of the photoluminescence spectrum. The origin of ferromagnetism is due to the p-d hybridization which has the influence on the band gap also.

Novel ZnO/KI composite were synthesized by solid state reaction method at room temperature. The band gap values of ZnO/KI composites are found to decrease with increase in the KI concentrations. The transmittance spectrum reveals that the transmittance is not affected in the visible region due to the addition of KI to ZnO. Interference fringes appear for 20% and 40% exhibiting a good dispersion at these compositions. The photoluminescence spectrum shows a very strong UV emission and two very weak deep level emissions. HALL Effect measurements of the composite reveal the p-type nature for 30% and 40% of KI.