

Structural, optical and magnetic properties of Gd-doped ZnO thin films for spintronics applications

Different compositions of the bulk sample of $\text{Zn}_{1-x}\text{Gd}_x\text{O}$ ($x = 0, 0.02, 0.04, 0.06, 0.08$ and 0.1) are fabricated using co-precipitation technique. The current study investigates the structural, optical and magnetic properties of ZnO thin films doped by Gd. The desired films were deposited onto highly-clean glass substrates by electron beam technique. X-ray diffraction revealed the formation of hexagonal wurtzite single phase of ZnO and having intense (002) peak with a peak shift towards lower angle. The crystallite size of the films was found to be decreased with increasing Gd content. The effect of Gd dopant on the optical and magnetic properties of the prepared thin films was investigated. The optical energy gap decreases from 3.27 to 3.11 eV with increasing Gd content. In addition, ferromagnetism initially increases up to optimal Gd concentration at 0.06 after that the ferromagnetism decreases with increasing Gd concentration (at 0.08 and 0.1). The changes in the optical and magnetic properties of the prepared films were discussed based on the structural modification, which, further, enhances upon Gd-doping..