Co-doped ZnO nanostructures with magnetic properties by electrochemical route

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Abstract

We present the fabrication of highly oriented wurtzite ZnO nanorods by electrodeposition using Zn(NO$_3$)$_2$ as the electrolyte. The ZnO nanostructures were synthesized with different Co doping concentrations on high purity Cu foil and ITO coated glass substrates. We have studied in detail the effects of Co doping on the morphology, structure and magnetic properties of ZnO nanocoatings. The surface morphology and the presences of Co content in the coatings were reported using the field emission scanning electron microscopy (FESEM) and energy dispersive spectroscopy (EDS), respectively. The significant changes in morphologies of ZnO coatings can be effectively controlled by varying the concentrations of the dopant. The X-ray diffraction data demonstrate the incorporation of dopant in the wurtzite structure of ZnO. Moreover, the studies on the magnetic properties of Co doped ZnO samples were carried out using vibrating sample magnetometer (VSM) in order to determine the contributions of oxygen vacancy related defects. A clear ferromagnetic behavior is observed with a coercivity of 356 gauss for a concentration of 0.5 mM CoSO$_4$ doped ZnO on high purity copper foil.