AT01

Ferromagnetic Phase in Bulk (Cd,Cr)Te Dilute Magnetic Semiconductor

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Ferromagnetic behaviors in dilute magnetic semiconductor at room temperature remain still elusive [1]. Ko and Blamire [2] reported that ferromagnetism with a Curie temperature ~ 395 K in Cr-doped CdTe dilute magnetic semiconductor could be explained by ferromagnetic interaction between Cr atoms dissolved in the CdTe matrix. Recently Stefaniuk et al. [3] analyzed ferromagnetic resonance in sintered Cd1-xCrxTe solid solution at room temperature through Kittle and Van Vleck theories. Room temperature ferromagnetic phase in bulk Cr-doped CdTe crystal are reported using X-ray diffraction, field emission transmission electron microscopy (FE-TEM), EDX and SQUID. Electron diffraction and lattice image in Fig. 1 showed that it completely correspond with single-phased zincblende structure. It displayed with no existence of second phase such as NiAs-CrTe, MnP-CrTe, Cr_2Te_3 and Cr_3Te_4 compounds. Magnetic measurements in a temperature range of 5 ~ 500 K under zero field cooling (ZFC) and field cooling (FC) showed temperature induced ferro-magnetic phase shift of ~20 K with a Curie temperature ~362 K. Ferro-magnetic phase (H_c ≈ 100 Oe) with ~0.025 μ_B per Cr-atom is unlikely to be associated with impurity phases, and is coupling between Cr atoms dissolved in the CdTe matrix. The deviation between ZFC and FC seem to be similar with spin glass-like V-doped ZnO film [4].

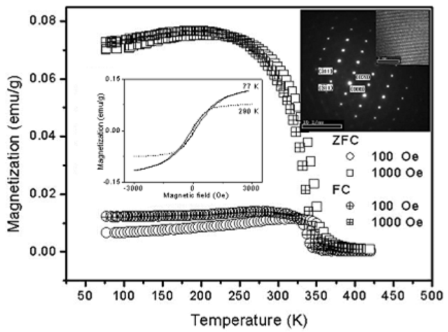

Fig. 1. TEM micrographs and temperature dependent magnetization curves.

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AT02

Magnetic and Structural Studies on Fe Doped ZnO thin Films Deposited by RF Magnetron Sputtering

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Abstract
A high quality Fe doped ZnO thin films were fabricated on a α-sapphire substrate by RF magnetron sputtering. We present the magnetic and structural properties of $Zn_{1-x}Fe_xO$ films with various thickness. The structures of $Zn_{1-x}Fe_xO$ thin films with the composition ratio of Fe were studied with FE-SEM, XRD, AFM and x-ray absorption fine structure measurements. The XRD measurements showed that $Zn_{1-x}Fe_xO$ films have a wurtzite structure like ZnO crystals. However, the (0002) diffraction peak moved from 2θ = 34.42° to 34.1° as x is increased. This implied that the lattice constant c was increased by about 0.047 Å due to Fe replacement on the Zn site in the $Zn_{1-x}Fe_xO$ films. The structural environments around Zn atoms in $Zn_{1-x}Fe_xO$ thin films were studied with XAFS. XPS measurements were employed to characterize the valence state of Fe ions. In the XPS measurements revealed the evidence for the coexistence of the Fe^{3+} and Fe^{2+} ions. And by the XPS data, we can rule out the existence of Fe metal clusters. In addition, we introduce Superconducting Quantum Interference Device measurement (SQUID) in order to determine the magnetic properties of $Zn_{1-x}Fe_xO$.

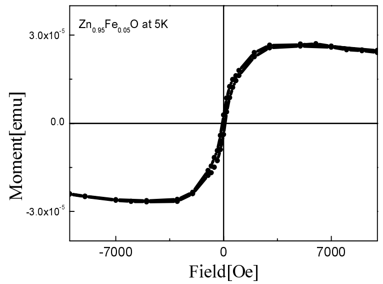

Fig. 1. M-H curve of $Zn_{0.95}Fe_{0.05}O$ films grown on a α-sapphire substrates measured at 5K.

Keywords : rf-magnetron sputtering, ZnO, XPS, XAFS, magnetic property.