



Master Thesis Defense

Growth and Characterization of Cr-Doped In_2O_3 Diluted Magnetic Semiconductors

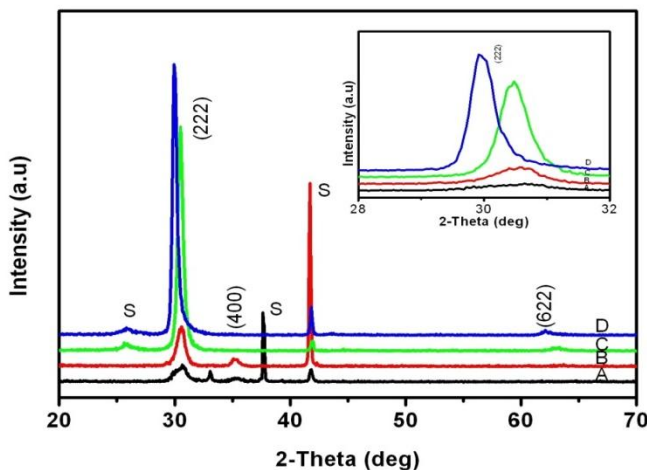
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4:00 to 5:00 pm, Thursday, April 23, 2009

Kemper Hall Room 100

We present a systematic experimental study of the structural and magnetotransport properties of chromium-doped indium oxide ($\text{In}_2\text{O}_3:\text{Cr}$) thin films using x-ray diffractometer, and by measuring the resistivity and Hall effect as a function of temperature in various magnetic fields. The $\text{In}_2\text{O}_3:\text{Cr}$ diluted magnetic semiconductor thin films were grown under different partial oxygen pressures (P_{O_2}) on sapphire substrates using pulsed laser deposition technique (PLD). Observed expansions in lattice parameter and crystal size in these films with increase in oxygen growth pressure are traceable to the reduction in oxygen vacancies. A redshift of the absorption edges of the samples with increase in oxygen growth pressure is attributed to the significant improvement in crystallinity. The exchange interaction between the electron spins in the conduction band and the spins of the Cr 3d electrons was evident in the anomalous Hall effect (AHE), which persisted up to 300 K. An analysis of the dc electrical transport in the films was carried out using hopping conduction and ionized impurity scattering models.



X-ray diffraction pattern for films grown at partial pressures of (A) 7.5×10^{-6} , (B) 7.5×10^{-5} , (C) 7.5×10^{-4} , and (D) 7.5×10^{-3} torr of oxygen.