Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Characterization of transition metal doped CVD-grown ZnO films and nanostructures[1] D. HILL, R.A. BARTYNSKI, L. WIELUNSKI, P. WU, Y. LU, V. POLTAVETS, M. GREENBLATT, Rutgers University, DOPED ZINC OXIDE TEAM — Diluted magnetic semiconductors (DMS) are intriguing materials that offer the possibility of studying magnetic phenomena in crystals with a simple band structure and excellent magneto-optical and transport properties. Theoretical and experimental studies indicate that ZnO is a promising DMS candidate for room temperature spintronics applications. We have characterized the chemical, compositional, and magnetic properties of TM-doped ZnO films grown by MOCVD and sputter deposition on a variety of substrates. Doping with Mn, and Fe by either diffusion, co-sputtering, or ion implantation has been investigated, and each doping method results in very different dopant depth profiles as revealed by Rutherford backscattering spectrometry. Soft x-ray absorption spectroscopy (SXAS) indicates that the TM dopant may be in either the 2+ or 3+ oxidation state and depends upon doping method and/or sample processing. Furthermore, the XAS results are consistent with the TM ions being substitutional for Zn. Squid magnetometry shows that some doping methods yield films exhibiting ferromagnetic behavior, with some Fe-doped films having the Curie temperatures above room temperature. Finally, we discuss the properties of MOCVD-grown ZnO nanotips that have been doped by TM ion implantation.

[1]Support from NSF grant # ECS-0224166 is gratefully acknowleged.

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Date submitted: 22 Mar 2013 Electronic form version 1.4