Abstract Submitted
for the OSF12 Meeting of
The American Physical Society

Characterization and magnetic properties of pure and transition metal doped ZnO thin films EHAB ABDELHAMID, DEBABRATA MISHRA, WISSAM FAWAZ, BORIS NADGORNY, GAVIN LAWES, Wayne State University, LAWES TEAM, NADGORNY TEAM — Zinc oxide (ZnO), a hexagonal n-type semiconductor, has been widely studied because of the ease of changing its properties by doping with selected elements. Although pure ZnO is paramagnetic, many studies confirm that doped ZnO thin films show room temperature ferromagnetism. This allows the potential to control the electrical properties of the semiconductor using magnetic fields. In this study, pure and Ti, V, and Co doped ZnO thin films were prepared on silicon substrates by spin coating. X-ray diffraction and Raman spectroscopy both confirm the formation of a single phase ZnO wurtzite structure. Magnetic measurements on the samples show magnetization for the as-prepared samples. The magnetization increases dramatically on vacuum annealing, which can be attributed to the incorporation of oxygen vacancy defects. Moreover, doping with Ti increases the saturation magnetization around five times as compared to pure ZnO, while the magnetization in the Co doped samples increases by 12 times. Finally, fitting the magnetization curves shows that the approach to saturation follows a 1/H dependence, suggesting the governance of defects rather than magnetocrystalline anisotropy.

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Date submitted: 04 Sep 2012 Electronic form version 1.4