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Room Temperature Ferromagnetism in Transition Metal Doped CVD-Grown ZnO Films and Nanostructures[1] D.H. HILL, R. GATEAU, R.A. BARTYNSKI, P. WU, Y. LU, L. WIELUNSKI, V. POLTAVETS, M. GREENBLATT, Rutgers University, D.A. ARENA, NSLS, J. DVORAK, Montana State University, S. CALVIN, Sarah Lawrence College — We have characterized the chemical, compositional, and magnetic properties of Mn- and Fe-ion implanted epitaxial ZnO films and single crystal nanostructures grown by MOCVD as candidate room temperature diluted magnetic semiconductors. X-ray absorption spectroscopy (SXAS) shows that Mn-implanted films contain Mn^{2+} ions which convert to a mixture of Mn^{3+} and Mn^{4+} upon annealing. Fe-implanted films contain a mixture of Fe^{2+} and Fe^{3+} which converts to a higher concentration of Fe^{3+} upon annealing. XAS and preliminary analysis of EXAFS data indicate that the TM ions are substitutional for Zn. SQUID magnetometry shows that as-implanted films are ferromagnetic at 5K and the annealed films are ferromagnetic at room temperature. X-ray diffraction shows that the annealed films remain epitaxial with excellent long range order. Rutherford backscattering spectrometry indicates a substantial recovery of local order upon annealing as well. The properties of in-situ Fe-doped MOCVD-grown ZnO epitaxial films and nanostructures will also be discussed.

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