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Distinguishing Magnetic Behavior on the Slater-Pauling Curve applied to nanoscale thin films. K.R. PODOLAK, M.G. BIRKE, Penn State Univ., N. JANKE-GILMAN, Latrobe Univ. (present affiliation), R.F. WILLIS, Penn State Univ. — The Slater-Pauling curve is a plot of the stoichiometric mean saturation magnetization per atom as a function of the electron filling of the d-bands in the transition metals and their alloys. When the elemental magnetic moments are aligned, the volcano-shape curve plots the variation of the mean magnetic moment. It has been predicted that a narrowing of the d-bands in nanostructured magnetic materials will influence both the magnitude of the magnetic moments as well as the overall magnetic alignment through increased spin-orbit coupling [1]. In this paper, we report dichroism in the core-level x-ray photoemission spectra of the elements which reveals and distinguishes the changing magnitudes of the magnetic moments and the changing alignment of these moments with changing composition. The 3p core-level spectral densities of multiplet spin-ordered states show a width W proportional to the local Zeeman splitting of levels, and a magnetic dichroism amplitude A sensitive to the non-local magnetic order (anisotropy). In nanoscale epitaxial layers, small deviations from the bulk Slater-Pauling curve are observed due to enhanced moments due to d-band narrowing [2]. It is predicted that a plot of the spectral parameters W, A will show a different dependence of temperature approaching Tc, the critical ordering temperature. [1] S. Handschuh & S. Blügel, Solid State Communications. 105, 633 (1998). [2] R.F. Willis & N. Janke-Gilman, Europhysics Letters. 69, 411 (2005).

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