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Effect of disorder on itineracy and magnetism in ultra thin Fe and Fe/C_{60} films[1] PARTHA MITRA, ARTHUR HEBARD, Department of Physics, University of Florida, Gainesville, FL 32611 — We present *in situ* measurements of the temperature and field dependence of the longitudinal (R_{xx}) and transverse (R_{xy}) resistance of ultra thin (d $<$ 50 Å) Fe thin films and Fe/C_{60} thin-film composites. The study is motivated by the question as to what happens in a band ferromagnet when the ability of the itinerant electrons to transfer spin is compromised by disorder. We use the sheet resistance R_{xx} as a measure of disorder and correlate this quantity with the saturation field, the saturated moment and the carrier concentration as derived from normal and anomalous Hall effect (AHE) measurements. We find that in the weakly disordered regime ($R_{xx} \leq 5000 \quad \Omega$) where logarithmic temperature dependences dominate, there is a suppression of the saturated moment and the scaling relations $\partial R_{xx}/R_{xx} = \quad \partial R_{xy}^{AHE}/R_{xy}^{AHE} = -\partial\sigma_{xx}^{AHE}/\sigma_{xx}^{AHE}$ hold. When a monolayer of C_{60} is predeposited on the substrate, stable Fe/C_{60} films can be made. In the strongly disordered regime where the sheet resistance at low temperatures (∼5 K) is approaching 1 MΩ (a value well above the quantum limit), the saturated moment as determined by AHE measurements is still remarkably robust.

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