Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Theory of ferromagnetic double perovskites[1] OINAM NGANBA MEETEI, ONUR ERTEN, ANAMITRA MUKHERJEE, MOHIT RANDERIA, NANDINI TRIVEDI, PATRICK WOODWARD, The Ohio State University — We derive and validate an effective classical spin model which describes the magnetic properties of double perovskites (DP) like Sr_2FeMoO_6, including the effects of disorder and carrier concentration. This model generalizes the Anderson-Hasegawa model for manganites to DP's. We validate our effective spin model by making detailed comparisons with the results obtained from a quantum Hamiltonian of itinerant electrons interacting with spins on the Fe-sites. We show that the conduction electron polarization at the chemical potential $P(T)$ tracks the temperature-dependence of the total magnetization $M(T)$. We point out the importance of Coulomb correlation U on Mo-sites and of direct Mo-Mo hopping t' on stabilizing the ferromagnetic phase as a function of electron doping (by La substitution of Sr). We show how the small parameters U and t' are crucial in understanding the experimental results for T_c as a function of carrier concentration. We predict how the ferromagnetic T_c can be raised substantially (up to 40%), without sacrificing the polarization P, by a combination of excess Fe and La-doping.

[1]Supported by the NSF-MRSEC grant DMR-0820414

Oinam Nganba Meetei
The Ohio State University

Date submitted: 19 Nov 2010 Electronic form version 1.4