The theory of ferromagnetic double perovskites\textsuperscript{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\textsubscript{2}FeMoO\textsubscript{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.

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