MAR14-2013-020530

Abstract for an Invited Paper
for the MAR14 Meeting of
the American Physical Society

Electronic Phase Separation and Magnetic Phase Behavior in the Ru-doped Spin-Orbit Mott Insulator $Sr_3Ir_2O_7$

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Iridium-based 5d transition metal oxides host rather unusual electronic/magnetic ground states due to strong interplay between electronic correlation, lattice structure and spin-orbit interactions. Out of the many oxides containing iridium, the Ruddelsden-Popper (RP) series [$Sr_{n+1}Ir_nO_{3n+1}$] oxides are some of the most interesting systems to study both from the point of view of physics as well as from potential applications. $Sr_3Ir_2O_7$ (n=2) and Sr_2IrO_4 (n=1) are two representative candidates of this series. One way of experiencing the strength and relevance of electronic correlation in any condensed matter system is by doping charge carriers. The presence of electronic correlations in the host system determines the fate of the dopant and hence stabilizes a new electronic/magnetic ground state. I will discuss about importance of electronic correlations in one such doped system Sr_3 $(Ir_{1-x}Ru_x)_2O_7$ using combined neutron scattering, electric transport and magnetization techniques. Our findings demonstrate that correlation effects felt by carriers introduced within in a $5d$ Mott phase remain robust enough to drive electron localization, a key ingredient in emergent phenomena such as high temperature superconductivity and enhanced ferroic behavior.

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[2] Dhital, Chetan, et al. "Neutron scattering study of correlated phase behavior in Sr_2IrO_4." *Physical Review B* 87.14 (2013): 144405.
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