

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Electron-doped $\text{Sr}_2\text{IrO}_{4-\delta}$ ($0 \leq \delta \leq 0.04$): Evolution of a disordered $J_{eff} = 1/2$ Mott insulator into an exotic metallic state¹ O.B. KORNETA, T.F. QI, S. CHIKARA, L.E. DE LONG, G. CAO, Department of Physics and Astronomy, University of Kentucky, S. PARKIN, Department of Chemistry, University of Kentucky, P. SCHLOTTMANN, Department of Physics, Florida State University — Stoichiometric Sr_2IrO_4 is a ferromagnetic $J_{eff} = 1/2$ Mott insulator driven by strong spin-orbit coupling. Introduction of very dilute oxygen vacancies into single-crystal $\text{Sr}_2\text{IrO}_{4-\delta}$ ($\delta < 0.04$) leads to significant changes in lattice parameters and drives a number of intriguing phenomena such as insulator-to-metal transition at $T_{MI} \approx 105K$, anomalous non-Ohmic behavior and an abrupt current-induced transition in the resistivity. Highly-anisotropic resistivity of the samples continues to decrease by several orders of magnitude below T_{MI} without saturation to a residual limit at the lowest temperature studied $T = 1.8K$. The low-temperature metallic state exhibits two distinct regimes (separated at $T \approx 52K$) of switching in the non-linear $I - V$ characteristics. The novel behavior illustrates an exotic ground state and constitutes a new paradigm for device structures.

¹This work was supported by NSF through grants DMR-0552267, DMR-0856234 (GC) and EPS-0814194 (GC, LED), and by DoE through grants DE-FG02-97ER45653 (LED) and DE-FG02-98ER45707 (PS).

O.B. Korneta
Department of Physics and Astronomy, University of Kentucky

Date submitted: 11 Nov 2010

Electronic form version 1.4