Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Electrically tunable transport in antiferromagnetic Sr $_3Ir_2O_7$[1]

HEIDI SEINIGE, CHENG WANG, The University of Texas at Austin, GANG CAO, University of Kentucky, JIANSHI-S. ZHOU, JOHN B. GOODENOUGH, MAXIM TSOI, The University of Texas at Austin — Recently we demonstrated experimentally the existence of interconnections between magnetic state and transport currents in antiferromagnetic (AFM) Mott insulator Sr_2IrO_4. We found a very large anisotropic magnetoresistance [1] and demonstrated a reversible resistive switching driven by high-density currents/high electric fields [2]. These results support the feasibility of AFM spintronics, where antiferromagnets are used in place of ferromagnets, however a low Néel temperature of this material (240 K) questions any practical applications. Here we present a comparative electrical transport study of its sister compound Sr_2IrO_4 which has a higher transition temperature (285 K). Similar to the case of Sr_2IrO_4, we find a continuous reduction in the resistivity of $Sr_3Ir_2O_7$ as a function of increasing electrical bias and abrupt reversible changes above a threshold bias current. We explain these results by a reduction of activation energy associated with a field-driven lattice distortion. [1] C. Wang et al., Phys. Rev. X 4, 041034 (2014); [2] C. Wang et al, PRB 92, 115136 (2015).

[1]This work was supported in part by C-SPIN, one of six centers of STARnet, a Semiconductor Research Corporation program, sponsored by MARCO and DARPA, and by NSF grants DMR-1207577, DMR-1265162, and DMR-1122603.

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Date submitted: 24 Nov 2015 Electronic form version 1.4