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Lattice-driven magnetoresistivity and metal-insulator transition in single-layered iridates[1] O.B. KORNETA, T.F. QI, L.E. DE LONG, G. CAO, Department of Physics and Astronomy and Center for Advanced Materials, University of Kentucky, M. GE, China High Magnetic Field Lab and University of Science and Technology of China, S. PARKIN, Department of Chemistry, University of Kentucky, P. SCHLOTTMANN, Department of Physics, Florida State University — Sr_2IrO_4 exhibits a novel insulating state driven by spin-orbit interactions. Here we report two novel phenomena, namely a large magnetoresistivity that is extremely sensitive to the orientation of magnetic field but exhibits no apparent correlation with the magnetization, and a robust metallic state that is induced by dilute electron (La^{3+}) or hole (K^+) doping on Sr^{2+} ions in Sr_2IrO_4. This study reveals that a strong spin-orbit interaction alters the balance between the competing energies so profoundly that (1) the spin degree of freedom alone is no longer a dominant force; (2) underlying transport properties delicately hinge on the Ir-O-Ir bond angle via a strong magnetoelastic coupling; and (3) a highly insulating state in Sr_2IrO_4 is proximate to a metallic state, and the transition is governed by lattice distortions that can be controlled via either magnetic field or chemical doping.

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