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Probing orbital-dependent magnetism in layered perovskite ruthenates through angle-dependent magnetoresistivity D. FOBES, T.J. LIU, Z. QU, Tulane University, H.Q. YUAN, M. SALAMON, University of Illinois, Urbana-Champaign, M. ZHOU, J. HOOPER, Z.Q. MAO, Tulane University — The orbital degree of freedom plays a very important role in layered perovskite ruthenates, leading to unusual magnetic states. The triple layered $Sr_4Ru_3O_{10}$ contains a ferromagnetic ground state, and undergoes a metamagnetic transition under moderate in-plane magnetic fields [1]. By analyzing the anisotropy in angle-dependent directional magnetoresistance measurements we can extract orbital information of magnetism. In $Sr_4Ru_3O_{10}$ we have found that below the metamagnetic transition the $4d_{xy}$ orbitals are already polarized whereas the $4d_{xz,yz}$ orbitals are not; ρ_{ab}(H) exhibits 2-fold anisotropic symmetry indicating ferromagnetism and ρ_c(H) exhibits anisotropy consistent with Fermi surface warping. Above the transition field, under polar rotation we observe a first order phase transition in ρ_c(H) for angles close to the *ab*-plane clearly indicating a polarization of the $4d_{xz,yz}$ orbitals. Additionally, we have performed similar studies on $Sr_3Ru_2O_7$, and have observed preliminary evidence of orbital-dependent magnetic correlations. This work is supported by the NSF under grant DMR-0645305, the DOE under DE-FG02-07ER46358.
[1] Cao *et al.*, Phys. Rev. B **68**, 174409 (2003)

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