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Anisotropy of magnetoresistivity in trilayered ruthenate $Sr_4Ru_3O_{10}$: Evidence for orbital dependent metamagnetism D. FOBES, M. ZHOU, T.J. LIU, Z. QU, Tulane University, USA, H.Q. YUAN, M. SALAMON, University of Illinois, Urbana-Champaign, USA, Z.Q. MAO, Tulane University, USA — Trilayered ruthenate $Sr_4Ru_3O_{10}$ is ferromagnetic with $T_c \approx 100$K and moderate in-plane magnetic field ($B_c \approx 2$T) induces an itinerant metamagnetic transition [1,2]. Such metamagnetism within a FM ground state cannot be understood with a single band model of a field-tuned Stoner transition. We have measured azimuthal angular dependence of in-plane and out-of-plane magnetoresistivity ($\rho_{ab}(\phi$,B) and $\rho_c(\phi$,B)). We found that for B<B_c, at fixed field $\rho_{ab}(\phi)$ exhibits a two-fold anisotropy attributable to anisotropic behavior of an Ising ferromagnet, while $\rho_c(\phi)$ does not show such a behavior. For B>B_c, both $\rho_{ab}(\phi)$ and $\rho_c(\phi)$ exhibit a four-fold symmetry anisotropy, but the minimum value in $\rho_{ab}(\phi)$ and $\rho_c(\phi)$ occurs along different directions, i.e., [100] and [010] for ρ_{ab}, and [110] and [1$\bar{1}$0] for ρ_c. Such a difference in anisotropic behavior between $\rho_{ab}(\phi)$ and $\rho_c(\phi)$ provides strong support that metamagnetism in $Sr_4Ru_3O_{10}$ is orbital dependent, i.e., ferromagnetic and metamagnetic bands coexist.

[1] Cao et al., Phys. Rev. B 68, 174409 (2003)
[2] Mao et al., Phys. Rev. Lett. 96, 077205 (2006)

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