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Unusual interlayer magnetic coupling in quasi 2-D heavy-mass nearly ferromagnetic state of $(Sr_{1-x}Ca_x)_3Ru_2O_7$ D. FOBES, J. PENG, Z. QU, T. J. LIU, Z. Q. MAO, Department of Physics, Tulane University, New Orleans, LA 70118, A. ROTARU, L. SPINU, Department of Physics, University of New Orleans, New Orleans, LA 70148 — Perovskite ruthenates exhibit a wide range of complex magnetic ground states. In this talk we focus on an unusual heavy-mass, nearly ferromagnetic state with an extremely large Wilson ratio (Z. Qu *et al.*, Phys. Rev. B **78** R180407 (2008)). Despite considerable FM correlations, this state never develops long-range FM order, instead freezing into a cluster-spin-glass (CSG) state. We have further investigated this magnetic state through in-plane angular dependence of magnetoresistivity and magnetization on $(Sr_{0.62}Ca_{0.38})_3Ru_2O_7$. The in-plane magnetoresistivity $\rho_{ab}(\phi)$ at high magnetic fields reveals a change in anisotropy symmetry from 2-fold to 4-fold at the frozen temperature T_f of the CSG phase, whereas inter-planar magnetoresistivity $\rho_c(\phi)$ at high fields only exhibits 4-fold symmetry. For low magnetic fields, both ρ_{ab} and ρ_c only exhibit anisotropy below T_f, also with 4-fold symmetry. Angle-dependent magnetization data reveal that at high field the anisotropy exhibits 8-fold symmetry for $T > T_f$. However, for $T < T_f$, an additional asymmetric 2-fold anisotropy develops. These results may indicate non-traditional interlayer magnetic coupling, one possible scenario involving perpendicular spin stacking between alternate layers.

David Fobes
Department of Physics, Tulane University, New Orleans, LA 70118

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