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Unconventional Spin-Fluctuation Mediated Superconductivity in $PuMGa_5$ (M=Co, Rh) JOHN SARRAO, Los Alamos National Lab, E.D. BAUER, N.J. CURRO, L.A. MORALES, J.D. THOMPSON, M.J. GRAF, A.V. BALATSKY, F. WASTIN, J. REBIZANT, P. BOULET, E. COLINEAU, J.C. GRIVEAU, G.H. LANDER — The discovery of superconductivity at T_c=18.5 K in $PuCoGa_5$ and at T_c = 9 K in $PuRhGa_5$ has generated renewed interest in Pu-based intermetallic compounds. The thermodynamic properties of $PuMGa_5$ (M=Co, Rh), such as the initial slope of the upper critical field and specific heat jump at T_c, are consistent with an electronic specific heat coefficient $\gamma \sim$ 50-100 mJ/mol-K^2 indicating moderately heavy fermion behavior in these materials. The normal and superconducting states of these two Pu-based superconductors are remarkably similar to those of the well-known heavy-fermion $CeMIn_5$ (M=Co, Rh, Ir) superconductors, in which superconductivity is mediated by antiferromagnetic spin fluctuations. We present electrical resistivity and nuclear spin lattice relaxation measurements on $PuMGa_5$ that indicates a single (spin-fluctuation) energy scale dominates the physical properties, suggesting that spin fluctuations control both the superconducting and normal states. We contrast these behaviors with those observed in isostructural $UMGa_5$ and $NpMGa_5$.

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