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Crossover and coexistence of superconductivity and antiferromagnetism in the filled-skutterudite system $\text{Pr}_{1-x}\text{Eu}_x\text{Pt}_4\text{Ge}_{12}$. I. JEON, A. J. BREINDEL, B. LUONG, M. B. MAPLE, Univ. of California - San Diego, P.-C. HO, California State Univ. Fresno, R. B. ADHIKARI, C. C. ALMASAN, Kent State Univ. — We studied the superconducting and normal-state properties of the unconventional superconductor $\text{PrPt}_4\text{Ge}_{12}$, in which Eu has been substituted for Pr. Polycrystalline samples of $\text{Pr}_{1-x}\text{Eu}_x\text{Pt}_4\text{Ge}_{12}$ were investigated via x-ray diffraction, electrical resistivity, magnetic susceptibility, and specific heat measurements. Upon Eu substitution, we observed a crossover from superconducting to antiferromagnetically ordered states with a region where superconductivity and antiferromagnetism coexist. In the superconducting region, the specific heat data exhibit a change of temperature dependence, suggesting an alteration from a nodal to nodeless superconducting energy gap or suppression of multiband superconductivity. This change is relatively slower than previous reports for different substituent ions, suggesting that paramagnetic impurities have a weaker pair breaking effect on unconventional superconductivity in $\text{PrPt}_4\text{Ge}_{12}$. In the normal state, we observed an evolution from Fermi-liquid to non-Fermi-liquid behavior, accompanying the coexistence of superconductivity and antiferromagnetism, suggesting the electronic band structure is closely related to the complex physical phenomena in this system. This work was supported by the Grant No. DOE-DE-FG02-04-ER46105, and NSF-DMR-1206553 and 1506677. The work at KSU was supported by the Grant No. NSF-DMR-1505826.

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