Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Superconductivity in $PrRu_4As_{12}$ single crystals W. M. YUHASZ, P. -C. HO , T. A. SAYLES, T. YANAGISAWA, N. A. FREDERICK, M. B. MAPLE, University of California San Diego — Single crystals of the filled skutterudite compound $PrRu_4As_{12}$ were characterized by magnetization, specific heat, and electrical resistivity measurements. These measurements reveal the occurrence of superconductivity below $\sim$ 2.4 K. The magnetic susceptibility exhibits behavior consistent with a Pr^{3+} ninefold degenerate $J = 4$ Hund's rule ground state multiplet split in a tetrahedral crystalline electric field with either a nonmagnetic singlet or doublet ground state. Fits to the specific heat data indicate an electronic contribution to the specific heat γ of $\sim$ 70 mJ/mol K^2 and a Debye temperature Θ_D of $\sim$ 344 K. The value of $\Delta C/\gamma T_c \approx 1.53$ for $PrRu_4As_{12}$ is close to the weak-coupling BCS value of 1.43. Electrical resistivity measurements in field were used to determine H_{c2} as a function of temperature from which the zero temperature value of the orbital critical field ${}^*H_{c2}(0)$ was calculated and used to estimate the coherence length ξ_0 of $PrRu_4As_{12}$. In contrast to $PrRu_4As_{12}$, the compound $PrOs_4As_{12}$ displays two phase transitions at 2.2 K and 2.3 K in zero field, one of which is antiferromagnetic and the nature of the other is yet to be determined. $PrOs_4As_{12}$ also displays heavy fermion behavior with an enhanced electronic specific heat coefficient γ on the order of 200 mJ/mol K^2 and a Θ_D of only 260 K. This research was supported by the U.S. DOE (No. DE-FG02-04ER46105) and NSF (No. DMR 0335173).

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Date submitted: 05 Jan 2006 Electronic form version 1.4