Pressure-Dependent Magnetization Studies of Two Rare Earth-Based Intermetallic Systems

R.P. GUERTIN, Tufts Univ., E.S. CHOI, Florida State Univ., B. ANDRAKA, C.R. ROTUNDU, Univ. of Florida, W. MCCAL-LUM, Y. JANSSEN, Iowa State Univ. — Pressure dependent magnetization studies have been performed on two rare earth-based ternary intermetallic systems, R$_2$CoIn$_8$, where R=Gd, Dy and Pr, and Pr$_6$Ni$_2$Si$_3$, the n=2 member of the Pr$_{(n+1)(n+2)}$Ni$_n(n+1)+2$Si$_n(n+1)$ family. The pressure dependence of the magnetization was measured for $2 < T < 300$ K, $0 < H < 9$ T and hydrostatic pressures $0 \leq P \leq 8$ kbar using a vibrating sample magnetometer. For the R$_2$CoIn$_8$ system, R=Dy and Gd order antiferromagnetically at $T_N = 17.0$ and 34.5 K, respectively and $dT_N/dP = +0.1$ K/kbar for R=Dy and $+0.4$ K/kbar for R=Gd. Pr$_2$CoIn$_8$ is a van Vleck paramagnet, indicating a crystalline electric field (CEF) singlet ground state. For Pr$_6$Ni$_2$Si$_3$, the Curie temperature ($T_C = 35.0$ K) and the saturation magnetization (1.35 $\mu_B$/Pr) decrease non-linearly with increasing pressure, consistent with a pressure-induced increase in the CEF splitting. The Pr$^{3+}$ ground state is presumably a singlet, as the local Pr symmetry is very low. Preliminary high field VSM data suggest that a CEF level crossing occurs at 10.5 T where magnetization increases sharply to above 3.0 $\mu_B$/Pr.

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