Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Transport, Magnetic and Thermodynamic Properties of Doped and Undoped $Yb_{14}MnSb_{11}$ Crystals B.C. SALES, P. KHALIFAH, T. ENCK, E. NAGLER, D.G. MANDRUS, ORNL — Hall, Seebeck, magnetization and heat capacity data are reported for La doped ($Yb_{13.3}La_{0.7}MnSb_{11}$, T_c $\approx$39 K) and undoped crystals of the nearly half-metallic ferromagnet $Yb_{14}MnSb_{11}$ (T_c $\approx$ 53 K). Since only about 4 % of the atoms are magnetic (only the Mn atoms are magnetic), these materials represent ideal dilute magnetic semiconductors because there is no possibility of forming magnetic clusters. Hall and Seebeck data from the undoped crystals indicate a carrier concentration of about 1.9 x 10^{21} hole/cm^3 near room temperature increasing to about 2.5 x 10^{21} holes/cm^3 at 5 K. The carrier concentration in the doped crystals is typically 4 x 10^{20} holes/cm^3 consistent with the filling of holes in the Sb bands by the extra electron donated when La^{+3} replaces Yb^{+2}. The T_c decreases with fewer holes but the saturation moment increases from 4.2 to 4.5 μ_B per Mn. The characteristics of the anomalous Hall effect, and the unusual magnetism in these materials will be discussed. Oak Ridge National Laboratory is managed by UT-Battelle, LLC for the Department of Energy.

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Date submitted: 23 Nov 2004 Electronic form version 1.4