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Quantum criticality in the Itinerant Ferromagnets $Zr_{1-x}Nb_xZn_2$[1]
D. SOKOLOV, M.C. ARONSON, Department of Physics, The University of Michigan, Z. FISK, Department of Physics, University of California, Davis — We report the results of magnetization measurements performed on the family itinerant ferromagnets $Zr_{1-x}Nb_xZn_2$, ($0 \leq x \leq 0.14$). Nb doping reduces the moment M_0 and also the Curie temperature T_c, which simultaneously disappear at the critical Nb concentration x_c=0.084. We find that $T_c \propto (x\text{-}x_c)^{3/4}$, as predicted for a 3d ferromagnet, while $M_0 \propto T_c$ (x), as expected for a Stoner ferromagnet. For all Nb concentrations and for temperatures which approach 100 K, the extrapolated zero field susceptibility χ can be expressed with a modified Curie Weiss expression $\chi = C/(T^\gamma + \theta)$. θ is finite in the paramagnetic state ($x>x_C$), but vanishes as the system becomes critical at $x=x_C$, evidenced by the T=0 divergence of χ in this system. We find that γ is near one in paramagnetic regimes for $x<x_c$ ($T>T_c$), and for $x \gg x_c$. However, γ is substantially enhanced in the vicinity of the quantum critical point ($0.08<x<0.09$), indicating the breakdown of the conventional Stoner theory.

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