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Magnetic Phase Transitions in Nanostructured Mn-intercalated TaS_2[1] PAUL SHAND, CORBYN MELLINGER, COREY COOLING, KAYLA BOYLE, TIM KIDD, LAURA STRAUSS, University of Northern Iowa — Samples of nanostructured Mn-intercalated TaS_2 with different concentrations of Mn have been fabricated. Previous work on nanostructured Mn_xTaS_2 has shown that ferromagnetism competes with a cluster-glass phase as the atomic fraction x of Mn increases. There is a tricritical point near $x = 0.23$ as indicated by critical exponent values significantly greater than those associated with the three-dimensional Ising or Heisenberg models. To further understand the phase diagram, we have studied nanostructured Mn_xTaS_2 with $x = 0.235$. dc magnetization and ac susceptibility measurements indicate that there are two transitions as the temperature is varied. Arrott-Noakes and Kouvel-Fisher analyses indicate a ferromagnetic transition at $T_C = 74$ K, with critical exponent values $\beta = 0.86$ and $\gamma = 1.22$. The anomalous β value associated with the ferromagnetic transition was also seen in the sample that exhibited tricritical-like behavior. There is a sharp increase in the susceptibility as the temperature is lowered, with a peak occurring near 40 K. An excellent Vogel-Fulcher fit to the dynamic susceptibility data confirms a cluster glass transition. Our current results are consistent with a steep boundary between the ferromagnetic and cluster-glass phases.

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