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Magnetic Properties of Nanostructured Mn_xTaS_2 PAUL SHAND, ZACH GRIFFITH, STROH LESLIE, TIM KIDD, LAURA STRAUSS, University of Northern Iowa — We have fabricated tapelike nanostructures of Mn_xTaS_2 that consist of bundles of TaS_2 nanotubes intercalated with Mn. The magnetic properties of samples with Mn concentrations of 15% and 23% (nominal 25%) were investigated. The $Mn_{0.23}TaS_2$ sample exhibited ferromagnetic characteristics with a Curie temperature near 90 K, which is close to that of bulk $Mn_{0.25}TaS_2$ crystals; however, the behavior of the linear and nonlinear ac susceptibility in the vicinity of the transition indicates departures from standard 3D ferromagnetic behavior. The $Mn_{0.15}TaS_2$ sample exhibits a spin-glass-like transition near 8 K, with a frequency-dependent ac susceptibility near the transition and hysteretic and aging effects below the transition. The imaginary part of the ac susceptibility becomes non-zero at temperatures significantly higher than the transition temperature, which is unusual for spin glasses. Overall, our measurements indicate strong similarities between our nanostructured samples and their bulk crystalline counterparts but some intriguing differences as well. It is not yet clear whether these differences can be attributed to the quasi-one-dimensional nature of the nanostructured Mn_xTaS_2 samples.

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