Abstract Submitted
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Critical Behavior Near the Ferromagnetic Transition in Nanostructured Gadolinium[1] PAUL SHAND, JUSTIN BOHNET, University of Northern Iowa, JARED GOERTZEN, JEFFREY SHIELD, GEOFFREY SHELBURNE, DAVID SCHMITTER, DIANDRA LESLIE-PELECKY, University of Nebraska-Lincoln — ac susceptibility and dc magnetization have been measured near the ferromagnetic transition in melt-spun nanostructured Gd. Effective critical exponents and the critical temperature were extracted using modified Arrott plots. The values obtained were $\beta_{eff} = 0.415 \pm 0.005$, $\gamma_{eff} = 1.36 \pm 0.04$, $\delta_{eff} = 4.24 \pm 0.02$, and $T_C = 290.0 \pm 0.1$ K. These exponent values satisfy the scaling relation $\beta\delta = (\beta+\gamma)$. The experimental exponent values are also close to those for a short-range 3D Heisenberg ferromagnet; however, there is a systematic shift toward mean-field values. Such a shift has been previously seen in amorphous ferromagnets and is likely due to the presence of longer-ranged interactions, especially in Gd-based alloys. The critical exponents for nanostructured Gd are closer to the short-range 3D Heisenberg exponents than are those for amorphous $Gd_{67}Co_{33}$ and $Gd_{80}Au_{20}$. This suggests that the dominant Gd-Gd interactions are shorter-ranged in nanostructured Gd than in the amorphous alloys.

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