Abstract Submitted
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**Precipitation of coherent FeRh nanoparticles with highly suppressed magnetostructural transition temperatures in rapidly solidified $(FeRh)_5Cu_{95}$ alloys**[1] RADHIKA BARUA, Department of Chemical Engineering, Northeastern University, XIUJUAN JIANG, JEFF SHIELD, Department of Mechanical Engineering, University of Nebraska, DON HEIMAN, Department of Physics, Northeastern University, LAURA LEWIS, Department of Chemical Engineering, Northeastern University — Magnetostructural phase transitions have the capability of delivering large functional effects in response to small excursions in magnetic field, temperature and strain; this potential might be amplified in nanostructured systems by virtue of large surface:volume ratios. Nanoprecipitates (∼10nm) of FeRh, a well-known magnetostructural material, were studied with structural and magnetic probes in a rapidly solidified phase-separated system of $(FeRh)_5Cu_{95}$. Magnetization studies indicate a dramatic reduction in the magnetostructural phase transition temperature ($T_t$) of the nanoscaled FeRh phase relative to the bulk value ($\Delta T = T_{t,Bulk} - T_{t,Nano} = 220$ K). Transmission electron microscopy (TEM) and selected area electron diffraction (SAED) reveals a coherent orientational relationship between the FeRh ($a_{FeRh} = 3.09$ Å)and Cu ($a_{Cu} = 3.78$ Å) phases. At the matrix/precipitate interface a constrained misfit strain of $\epsilon = 0.18$ is observed. The reduction of the magnetostructural phase transition temperature and evolution of the magnetic properties with system annealing is analyzed in the context of the strain between the FeRh nanoparticles and the Cu matrix.

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