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Coercivity, Anisotropy, and Relaxation in Nanocrystalline $\mathbf{Gd_{1-x}Fe_x}$ Alloys with x ≤ 0.3[1] P.M. SHAND, A.L. MEYER, M.W. STREICHER, U. Northern Iowa, V.J. LITWINOWICZ, J.E. SHIELD, U. Nebraska, D.L. LESLIE-PELECKY, U. Texas at Dallas — We have performed extensive dc and ac magnetization measurements on nanocrystalline $Gd_{1-x}Fe_x$(x ≤ 0.3) alloys at temperatures below the ferromagnetic Curie temperature. The coercivity for all x values generally increases with decreasing temperature. The temperature variation is similar to that of unalloyed Gd; however, the size of the coercivity at a given temperature varies with x in a non-monotonic fashion. The anisotropy as a function of temperature was extracted by applying the random anisotropy model to magnetization vs. field data. The variation of the anisotropy with temperature was very similar to the behavior of the coercivity, indicating that anisotropy is the dominant mechanism that drives the coercivity. The imaginary part of the ac susceptibility exhibited a peak at low temperatures. The temperature T_p at which the peak occurred shifts with frequency in a manner analogous to a cluster glass. For a given frequency, T_p increases with x. These phenomena can be explained in terms of the microscopic structure of the $Gd_{1-x}Fe_x$ alloys, which consists of nanoscale grains of Gd surrounded by disordered grain-boundary regions where the Fe atoms preferentially locate.

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