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Dynamic Hysteresis of $Fe_{10}Co_{90}$ Nanoparticle Compacts K.M. CHOWDARY, Dept. of Physics and Astronomy, Bucknell University, Lewisburg PA 17837, S.A. MAJETICH, Dept. of Physics, Carnegie Mellon University, Pittsburgh PA 15213 — The time-dependent magnetic response of composites made of consolidated $Fe_{10}Co_{90}$nanoparticles was measured and modeled. 200 nm particles with average grain size 20 nm synthesized by the polyol method were consolidated to 95% theoretical density by plasma pressure compaction. Power loss, complex permeability, and coercivity were extracted from dynamic minor hysteresis loops measured over a range of temperatures (77 K – 873 K) and frequencies (100 Hz – 100 kHz) for toroidal samples. When the data were scaled relative to the peak frequency of the imaginary permeability, universal behavior was observed, with two distinct components. This behavior is explained through simulations of the Néel-Brown thermal aftereffect in which a time-dependent energy barrier in an Arrhenius-Néel law gives a rate equation for magnetization reversal. Quantitative attempts to match model and experiment indicate a distribution of energy barriers along with coupled and uncoupled regions in the compacted sample. The uncoupled regions limit the useful frequency range of the sample.

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