Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Effect of the size distributions of magnetic nanoparticles on metastability using phonon-assisted transition rates YOH YAMAMOTO, KYUNGWHA PARK, Virginia Tech — Experiments show that magnetic nanoparticles have distributions of sizes and shapes, and that the distributions greatly influence static and dynamic properties of the nanoparticles. Therefore, it is critical to understand their properties as a function of the distributions. Previously, we studied an effect of particle size distributions on metastability in magnetization relaxation, using spin $S = 1$ Blume-Capel model with Glauber transition rates. The size distributions were simulated using distributions of magnetic anisotropy parameter D with spins fixed. We found that the lifetime of the metastable state is governed by the smallest particle in a given system. In this talk, we present the effect of size distributions on metastability in magnetization relaxation with phonon-assisted transition rates. These transition rates differ from Glauber dynamics and are derived from weak spin-phonon coupling. In the phonon-assisted transition rates, spin-flips occur via emission or absorption of phonons, and so transitions are forbidden between degenerate states. We investigate magnetization relaxation with distributions of D using kinetic Monte Carlo simulations, when the distributions include values with which such forbidden transitions are expected.

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Date submitted: 10 Nov 2011 Electronic form version 1.4