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Effect of the size distributions of magnetic nanoparticles on metastability across dynamic phase boundary YOH YAMAMOTO, KYUNG-WHA PARK, Virginia Tech — Recent experiments showed 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 functions of the distributions. Previously, we studied an effect of particle size distributions on metastability in magnetization relaxation, using a spin $S = 1$ Blume-Capel model, in the single-droplet regime where a critical droplet comprises a single flipped spin. The particle 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 or the particle with the smallest value of D in a given system. In this work, we present the effect of size distributions on metastability in the region where the values of D are distributed across the phase boundary between different critical droplets for constant D. Interesting phenomena may occur in this region because particles with low values of D expect different critical droplets from particles with high values of D in a given distribution of D. We examine magnetization relaxation in this region using kinetic Monte Carlo simulations for the spin $S = 1$ Blume-Capel model.

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