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Anisotropy and shape of hysteresis loop of frozen suspensions of iron oxide nanoparticles in water ZOE BOEKELHEIDE, Lafayette College, CORDULA GRUETTNER, micromod partikeltechnologie GmbH, CINDI DENNIS, National Institute of Standards and Technology — Colloidal suspensions of nanoparticles in liquids have many uses in biomedical applications. We studied approximately 50 nm diameter iron oxide particles dispersed in H_2O for magnetic nanoparticle hyperthermia cancer treatment. Interactions between nanoparticles have been indicated for increasing the heat output under application of an alternating magnetic field, as in hyperthermia.[1] Interactions vary dynamically with an applied field as the nanoparticles reorient and rearrange within the liquid. Therefore, we studied the samples below the liquid freezing point in a range of magnetic field strengths to literally freeze in the effects of interactions. We found that the shape of the magnetic hysteresis loop is squarer (higher anisotropy) when the sample was cooled in a high field, and less square (lower anisotropy) when the sample was cooled in a low or zero field. The cause is most likely the formation of long chains of nanoparticles up to 500 μm, which we observe optically. This increase in anisotropy may indicate improved heating ability for these nanoparticles under an alternating magnetic field.
[1] C. L. Dennis et al, Nanotechnology 20, 395103 (2009)

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