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Determination of the magnetocrystalline anisotropy constant from the frequency dependence of the specific absorption rate in a frozen ferrofluid[1] NATHANIEL MOSHER, EMILY PERKINS-HARBIN, BRANDON AHO, Kettering University Department of Physics, LIHUA WANG, Kettering University Department of Chemistry and Biochemistry, RONALD KUMON, CORNELIU RABLAU, PREM VAISHNAVA, RONALD TACKETT, Kettering University Department of Physics, THERAPEUTIC BIOMATERIALS GROUP TEAM — Colloidal suspensions of superparamagnetic nanoparticles, known as ferrofluids, are promising candidates for the mediation of magnetic fluid hyperthermia (MFH). In such materials, the dissipation of heat occurs as a result of the relaxation of the particles in an applied ac magnetic field via the Brownian and Neel mechanisms. In order to isolate and study the role of the Neel mechanism in this process, the sample can be frozen, using liquid nitrogen, in order to suppress the Brownian relaxation. In this experiment, dextran-coated Fe_3O_4 nanoparticles synthesized via co-precipitation and characterized via transmission electron microscopy and dc magnetization are used as MFH mediators over the temperature range between -70 °C to -10 °C (Brownian-suppressed state). Heating the nanoparticles using ac magnetic field (amplitude ∼300 Oe), the frequency dependence of the specific absorption rate (SAR) is calculated between 150 kHz and 350 kHz and used to determine the magnetocrystalline anisotropy of the sample.

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