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Probing magnetic properties of ferrofluids using temperature dependent magnetic hyperthermia studies HUMESHKAR NEMALA, JAGDISH THAKUR, Department of Physics and Astronomy, Wayne State University, Detroit, MI, VAMAN NAIK, Department of Natural Sciences, University of Michigan-Dearborn, Dearborn, MI, RATNA NAIK, Department of Physics and Astronomy, Wayne State University, Detroit, MI — Tuning the properties of magnetic nanoparticles is essential for biomedical and technological applications. An important phenomenon displayed by these nanoparticles is the generation of heat in the presence of an external oscillating magnetic field and is known as magnetic hyperthermia (MHT). The heat dissipation by the magnetic nanoparticles occurs via Neel relaxation (the flip of the internal magnetic moment of the nanoparticles) and Brownian relaxation (the physical rotation of the nanoparticles in the suspended media). Dextran coated iron oxide (Fe_3O_4) nanoparticles were synthesized using the co-precipitation method and characterized using XRD, TEM and DC magnetometry measurements. Roughly spherical in shape the particles have an average size of 13nm and a saturation magnetization of 65 emu/g. The MHT properties of these nanoparticles suspended in a weakly basic solution (ferrofluid) have been investigated as a function of the frequency and amplitude of magnetic field by incorporating a complete thermodynamical analysis of the experimental set-up. The heat generation is quantified using the specific power loss (SPL) and compared with the predictions of linear response theory. This analysis sheds light on important physical and magnetic properties of the nanoparticles.

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