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Effect of magnetic dipolar interactions on temperature dependent magnetic hyperthermia in Fe_3O_4 ferrofluids MAHESHIKA PALIHAWADANA ARACHCHIGE, HUMESHKAR NEMALA, Wayne State University, Detroit, Michigan, USA, VAMAN NAIK, University of Michigan-Dearborn, Dearborn, Michigan, USA, RATNA NAIK, Wayne State University, Detroit, Michigan, USA — We have investigated temperature dependent magnetic hyperthermia in two ferrofluids of Fe_3O_4 nanoparticles prepared by co-precipitation (CP) and hydrothermal (HT) synthesis methods. Both the CP and HT prepared nanoparticles show similar physical particle size distribution (≈14 nm) and saturation magnetization (≈ 70 emu/g), but very different specific absorption rate (SAR) ≈110 W/g and ≈40 W/g at room temperature (measured with an ac magnetic field amplitude of 240 Oe and frequency 375 kHz). This observed reduction in SAR has been explained by taking into account the dipolar interactions and the distribution of magnetic core size of MNPs in ferrofluids. The HT ferrofluid shows a higher effective dipolar interaction and a wider distribution of magnetic core size of MNPs compared to that of CP ferrofluid. We have fitted the temperature dependent SAR data using linear response theory, incorporating an effective dipolar interaction, to determine the magnetic anisotropy constant of MNPs prepared by CP (22 +/- 2 kJ/m^3) and HT (26 +/- 2 kJ/m^3) synthesis methods. These values are in good agreement with the magnetic anisotropy constant determined using frequency and temperature dependent magnetic susceptibility data obtained on powder samples. The details of the study will be presented.

Maheshika Palihawadana Arachchige
Wayne State University, Detroit, Michigan, USA

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