Relaxation and Hyperthermia Investigation on Magnetic Nanoparticle suspensions

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— We have examined the Néel and Brownian relaxation mechanisms and hyperthermia characteristics of aqueous suspension of $\gamma$-Fe$_2$O$_3$ and Fe$_3$O$_4$:Co$_x$ ($0 \leq x \leq 0.15$) nanoparticles by ac and dc magnetization measurements and specific absorption ratio (SAR) values. The structural properties were investigated by X-ray diffraction (XRD) and Transmission Electron Microscopy (TEM). The ac susceptibility measurement showed dissipation peaks associated with Néel relaxation in $\gamma$-Fe$_2$O$_3$ and Fe$_3$O$_4$ samples but only the Fe$_3$O$_4$ sample showed a significant Brownian relaxation peak near the melting temperature of the carrier fluid. The specific absorption rate (SAR) value for the Fe$_3$O$_4$ sample is five times larger than that of the $\gamma$-Fe$_2$O$_3$ sample, which we attribute to reduced steric hindrance to rotation. Changes in the structural, magnetocrystalline, and SAR values on incorporating Co ions in Fe$_3$O$_4$ will be presented.