Relaxation and Hyperthermia Investigation on Magnetic Nanoparticle suspensions

V. BUBULAC, Department of Physics and Astronomy, Wayne State University, Detroit, MI 48201, P.P. VAISHNAVA, Kettering University, Flint, MI 48504, R. TACKETT, C. SUDAKAR, R. NAIK, G. LAWES, Department of Physics and Astronomy, Wayne State University, Detroit, MI 48201

— 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.

Chandran Sudakar
Wayne State University, MI 48201

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