

Abstract Submitted
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Magnetic relaxation in dipolar magnetic nanoparticle clusters¹

ONDREJ HOVORKA, JOE BARKER, ROY CHANTRELL, The University of York, York, UK, GARY FRIEDMAN, Drexel University, Philadelphia, USA, YORK-DREXEL COLLABORATION — Understanding the role of dipolar interactions on thermal relaxation in magnetic nanoparticle (MNP) systems is of fundamental importance in magnetic recording, for optimizing the hysteresis heating contribution in the hyperthermia cancer treatment in biomedicine, or for biological and chemical sensing, for example. In this talk, we discuss our related efforts to quantify the influence of dipolar interactions on thermal relaxation in small clusters of MNPs. Setting up the master equation and solving the associated eigenvalue problem, we identify the observable relaxation time scale spectra for various types of MNP clusters, and demonstrate qualitatively different spectral characteristics depending on the point group of symmetries of the particle arrangement within the cluster – being solely a dipolar interaction effect. Our findings provide insight into open questions related to magnetic relaxation in bulk MNP systems, and may prove to be also of practical relevance, e.g., for improving robustness of methodologies in biological and chemical sensing.

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