Abstract Submitted
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Rate-dependent hysteresis losses in ensembles of magnetic nanoparticle clusters[1] ONDREJ HOVORKA, RICHARD EVANS, The University of York, UK, GARY FRIEDMAN, Drexel University, Philadelphia, USA, ROY CHANTRELL, The University of York, UK, DREXEL UNIVERSITY COLLABORATION — Hysteresis is ubiquitous in magnetic nanoparticle systems and understanding how it emerges from complex interactions and for different time scales is a long-standing issue in magnetism research. Understanding the phenomenon is most important for engineering magnetic nanoparticle structures of well-controlled properties in magnetic recording, hysteresis loss optimization in hyperthermia cancer treatment in biomedicine, or biological and chemical sensing, to name a few examples. In this work we address one of the general questions related to the influence of thermal activation processes on hysteresis loss. Employing large-scale computational modeling based on the master-equation framework we investigate the influence of dipolar interactions on thermal hysteresis loops in ensembles of magnetic nanoparticle chains and clusters. We show that the directional dependence of dipolar interactions results in enhanced or reduced hysteresis loss, depending on the distribution of particles' anisotropy axes and particle chain orientations with respect to the external field. Additional hysteresis loss reduction occurs in case of particle clusters due to possibility of the frustration phenomenon not present for topologically simpler chains.

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