Chains of nanoparticles with cubic magnetic anisotropy: a Monte Carlo simulation

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We use Monte Carlo techniques to simulate magnetic properties of chains of identical, spherical, single-domain, ferromagnetic nanoparticles with cubic magnetocrystalline anisotropy. Hysteresis curves as well as zero field cooled (ZFC) and field cooled (FC) experiments are simulated for chains of different lengths, i.e. differing in both: the number of particles and interparticle distances. Strongly anisotropic dipole-dipole interparticle interactions lead to significant differences in system's response to the external magnetic fields oriented parallel and perpendicular to the chain, and further, to the occurrence of wasp-waisted hysteresis loops. To get the idea about the quantitative scale of the discussed phenomena we assume values of magnetocrystalline anisotropy consatants as known for fcc-Co.

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