

# Properties of a possible nanoparticle-built magnetic material: A Monte Carlo study

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We investigate to what extent magnetic ensembles of nanoparticles might be used to produce magnetic materials with well prescribed magnetic properties. Within a Monte Carlo technique we simulate magnetic properties of a three-dimensional system of identical, spherical, single-domain, ferromagnetic nanoparticles with cubic magnetocrystalline anisotropy. Particles are embedded and immobilized in a nonmagnetic solid medium. Simulated are hystereses as well as results of zero field cooled (ZFC) and field cooled (FC) experiments. We compare results for two types of systems: a) with randomly oriented anisotropy axes of nanoparticles that occupy sites of the simple cubic lattice and b) with particles randomly distributed in space with exactly parallel all anisotropy axes. For both types of systems we investigate how the results depend on the particles' density in space. In our simulations we assume physical parameters as for nanoparticles made of fcc-Co.