Magnetization processes of fractal-like core-shell nanoparticles

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The paper refers to micromagnetic simulations of magnetization processes of fractal-like core-shell nanoparticles. The objects were generated by the 3D diffusion limited aggregation (DLA) algorithm that allows obtaining fractals with two kinds of magnetic phases – magnetically soft core and magnetically hard shell. Also, the opposite situation have been taken in to consideration. The simulations were carried out using the cluster Monte Carlo algorithm designed for spin continuous and multiphase magnetic systems [1,2]. The presented researches include different degree of branches development, different strength of the exchange coupling between the phases as well as different soft phase content. As it was shown, the influence of microstructure on the coercivity mechanism is a complex phenomenon. In the presented work the variability spectra of the used parameters (e.g. the spin value, the exchange integral parameter, the anisotropy constants and the phase compositions) allowed determining the so-called optimization curves regarding the maximum values of coercive filed as well as $|BH|_{max}$ parameter. The carried out analysis is widely discussed in a context of enhancement of hard magnetic properties for the particles with magnetically soft or hard core.

References:

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