# Magnetic response of Fe and Ni nanoparticles embedded in artificial $SiO_2$ opals

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Applying the Stöber method, silica spheres were obtained and arranged in an fcc lattice. Metallic Fe and Ni were introduced in opal voids by means of the reduction of precursor salts with different reducing agents. Magnetization curves of the synthesized metallic nanoparticles and of the artificial opals with infiltrated nanoparticles were measured by using the vibrating sample magnetometry (VSM) technique with an applied magnetic field oriented along the [111] direction of the opal matrix. Nonlinear Landau-Lifshitz-Gilbert (LLG) equation was solved numerically, in order to reproduce the experimental results qualitatively. In solving LLG equation we have used Ewald summations to take into account the dipolar interaction between the spatially arranged magnetic nanoparticles. The theory reproduces the general features of the measured magnetization curves, in particular, there is a strong dependence of hysteresis loops on the magnetic nanoparticle filling fraction.

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