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Ferromagnetic fluids (ferrofluids) are homogeneous colloidal dispersions of ferromagnetic nanoparticles dispersed in a liquid carrier. In ferrofluids large linear and circular optical anisotropy can be induced by applying relatively small external magnetic fields [1]. Because of that they are extensively studied for applications in optical technology as fast shutters, switches, tunable phase retarders, etc.

Dispersion of ferromagnetic nanoparticles into ferroelectric liquid crystals is of special interest due to the possible formation of multiferroic materials. Experiments that give information on the magnetic properties of nanoparticles are crucial since the latter determine the optical properties of ferrofluids. Here we present a combination of experimental measurements and theoretical modeling, which enables determination of the magnetic moment of a single nanoparticle, its plasma frequency and the effect of particle chain formation on optical properties.

Induced optical activity (Faraday effect) and induced birefringence (Cotton-Mouton effect) in a composite material made of cobalt nanoparticles embedded in a dielectric liquid host are studied [2,3]. Nanoparticles have a diameter of approximately 10 nm and are in a monodomain ferromagnetic state. The volume fraction of nanoparticles is of the order of 10^{-4} and lower.

[1]Y. Zhao, Y. Zhang, R. Lv, and Q. Wang, *J. Magn. Magn. Mater.* **323**, 2987 (2011).

[2]J. Szczytko, N. Vaupotič, K. Madrak, P. Sznajder, and E. Gorecka, *Phys. Rev. E* **87**, 033201 (2013).

[3]J. Szczytko, N. Vaupotič, M. A. Osipov, K. Madrak, P. Sznajder, and E. Gorecka, *Phys. Rev. E* **87**, 062322 (2013).

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