Doping liquid crystals with nanoparticles in low volume concentrations has been found promising in modification of the properties of nematic liquid crystals. It has been shown previously [1] that doping with elongated magnetic particles shaped similarly to the molecules of the host liquid crystal is more effective and thus offers better perspectives for ferronematics in applications where a magnetic field is necessary to control the orientation of the liquid crystal.

With the aim to study the influence of the size of the particles on the magnetic response, two kinds of rod-like magnetic particles were prepared: larger rod-like particles with mean diameter of 18 nm and mean length of 400 nm, and smaller rod-like particles with mean diameter of 10 nm and mean length of 50 nm. The ferronematic samples with two different volume concentrations of nanoparticles, $10^{-4}$ and $10^{-3}$, were based on the nematic 4-(trans-4'-n-hexylcyclohexyl)-isothiocyanatobenzene (6CHBT). The structural transitions in the prepared samples were monitored by capacitance measurements in a capacitor made of ITO-coated glass electrodes.

In the presented work we demonstrate that both the threshold of the magnetic Freedericksz transition and the dielectric response to low magnetic fields (far below the Freedericksz transition) depend not only on the volume concentration of the magnetic particles, but also on their size. The critical magnetic field for the Freedericksz transition in 6CHBT doped with magnetic nanoparticles is lower than that for pure 6CHBT, and this reduction becomes larger if the concentration is increased (in case of the same nanoparticles), as well as if the size of the nanoparticles is larger (at the same concentration).

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References:

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