The structural instabilities of ferronematic based on liquid crystal with low magnetic susceptibility anisotropy in high magnetic fields.

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9.7 cm

The ferronematics are suspensions of very low volume concentration of fine magnetic particles (d=10nm, approximately) in nematic liquid crystals. The structural instabilities in ferronematic based on liquid crystal ZLI 1695, which has very low anisotropy of magnetic susceptibility ($\chi_a = -3 \times 10^{-8}$), exposed to high magnetic field oriented parallel to the initial director (molecular alignment), were studied within the Burylov and Raikher's theory. The magnetic field with such orientation provokes (according to the negative value of the magnetic susceptibility anisotropy) the Fredericksz transition, known in liquid crystals. The critical magnetic fields B_{FN} corresponding to these transitions in ferronematics with different volume concentrations of magnetic particles were found by means of the capacity measurements. These values were then used for the estimation of the surface density of the anchoring energy W of liquid crystal molecules on the magnetic particle surface. It was found out the interval of the values of $W = 3 - 50 \times 10^{-7} N/m$. The calculated parameter of the theory $\omega = Wd/K \approx 10^{-3} \ll 1$ ($K = 2.15 \times 10^{-11} N$ is the corresponding elastic Frank constant) confirms the soft-anchoring of the liquid crystal molecules on magnetic particles surfaces in used ferronematic.

13.4 cm

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