

# FREEDERICKSZ TRANSITION IN 6CB-BASED FERRONEMATIC LIQUID CRYSTALS WITH SPINDLE-LIKE MAGNETIC PARTICLES

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Liquid crystals represent a class of soft condensed matter combining fluidity with anisotropic properties of crystalline order. Nowadays, they are best known for their successful application in flat panel displays [1], but they also exhibit many unique and attractive properties that offer great potential for fundamental science and innovative applications [2]. One of the key phenomena in nematic liquid crystals is the Frederiks transition, i.e., a threshold reorientation of the director induced by an external electric or magnetic field, which forms the basis of many electro- and magneto-optical applications.

Of particular interest are ferronematic liquid crystals, where a nematic host is doped with magnetic nanoparticles. In this work, we investigate a composite ferronematic system based on the nematic liquid crystal 4-*n*-hexyl-4'-cyanobiphenyl (6CB), which is used as the host matrix and doped with spindle-like hematite magnetic particles. Previous experimental studies [3] have demonstrated that the magnetic moments of these elongated spindle particles are oriented perpendicular to their main axes, which represents a fundamental difference from conventional ferronematic systems. It was shown that increasing the particle length and volume concentration leads to a pronounced decrease of the critical magnetic field of the Frederiks transition.

In the present work, we build on these results and report new measurements of the Frederiks transition in a ferronematic system with a fixed spindle particle length. A systematic investigation of the influence of external electric and magnetic field orientations is performed, including both longitudinal (parallel to the director) and transverse (perpendicular to the director) geometries. The effects of electric and magnetic bias fields, as well as their combined action, are analyzed.

## References:

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[3] N. Tomašovičová and S. Burylov *ets.*, *Journal of Molecular Liquids* 267 (2018) 390-397.

*The financial support of SK-TW-RD-24-007 and VEGA 2/0109/26 is acknowledged.*