PHASE TRANSITIONS IN FERROCHOLESTERICS

A. N. Zakhlevnykh and V. S. Shavkunov
Perm State University, Perm 614990, Russia

9.7 cm

Ferrocholesterics (FC) are dilute suspensions of needle-like ferromagnetic grains on the base of cholesteric liquid crystal (CLC). We study the orientational and magnetic properties of a FC, placed between two parallel planes with soft homeotropic anchoring on it. The magnetic field is directed to the normal of the layer and we assume that CLC-matrix has positive diamagnetic anisotropy. It was shown that two kinds of structures can exist in the layer depending on material parameters of FC, the magnetic field strength and the layer thickness. The first kind is uniform homeotropic ordering of ferronematic (FN) type, where the director and the magnetic moments of the particles are oriented perpendicular to the layer, and the sample magnetization is maximum. Another one is FC ordering with the helical axis directed along the normal of the layer. The appearance of the FC phase is accompanied by forming of the conical helical structure, the decreasing of the sample magnetization, and the concentration of ferroparticles increases in those parts of the sample where the energy of the particles has a minimum, so the ferroparticles are accumulated nearby the layer boundaries. We study the phase transition between the homeotropic FN phase and FC phase. This transition can be either first or second order depending on the material parameters, the thickness of the layer and magnetic field strength. It is shown that decreasing of the anchoring energy causes the decreasing of the threshold value of the layer thickness, above which the FN - FC phase transition takes place, and causes an increase of the magnetic field strength critical value, in the case of the transition induced by magnetic field at constant thickness.

13.4 cm

Subject category :

5. Phase Transitions and Critical Phenomena

Presentation mode :
poster

Corresponding author :
A. N. Zakhlevnykh

Address for correspondence :
Theoretical Physics Department
Bukireva St. 15
Perm State University
Perm 614990
Russia

Email address :
anz@psu.ru