Structures, topological defects and optical patterns of cholesteric droplets with homeotropic anchoring

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Chiral liquid crystals (CLC) confined in a cavity can form various structures depending on the ratio of the cavity size to the intrinsic helix pitch, the boundary conditions (preferred orientation of the director on the interface and surface anchoring strength), and other factors. In the case of homeotropic anchoring, the tendency of the director near interface to remain perpendicular to the surface contradicts with the need to form a helical structure, which leads to a rich variety of possible configurations [1,2]. In the present work, the orientational structures, topological defects and optical patterns of CLC droplets with the homeotropic boundary conditions have been studied. An untwisting influence of interface on the chiral structure was revealed. The N number of director π-turns along the droplet diameter d depends on its size as $N = 2p_0/d - b/d$, where b is the parameter affected by the intrinsic helix pitch p_0 of CLC [3]. Analysis of the droplets optical textures observed in a polarizing microscope was carried out for the various ratios of the droplet size and helix pitch p_0. It was shown that the twisted defect loop with N number of turns is formed near interface [4]. The existence of the defect has been verified by the structural and optical calculations (Fig. 1).

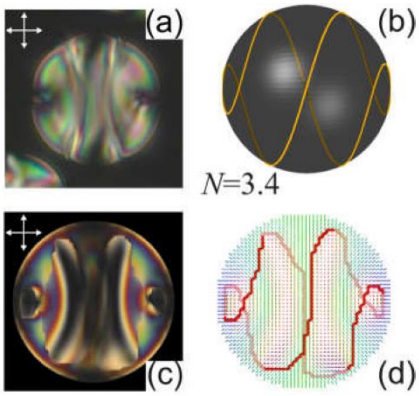

Figure 1. POM image of CLC droplet in XPOL, N=3.4 (a), its scheme (b), the calculated droplet structure (d), and its simulated optical pattern (c).

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