Evolution of periodic cholesteric structure with planar-conical boundary conditions in electric field

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Cholesteric liquid crystals (CLCs) have a helicoid structure with a period *p*. CLCs are attracted attention due to their ability to form the various patterns in electric field. The cholesteric pattern depends mainly on the anchoring conditions at the interface. Nowadays, CLC structures with homeotropic, planar or hybrid homeo-planar boundary conditions have been studied in detail [1, 2]. Recently, new cholesteric structures with planar-conical boundary conditions have been investigated for different values of the ratio of the layer thickness *d* to the helix pitch *p* [3].

In this paper we have considered an evolution of the periodic cholesteric structure within the cell with planar-conical boundary conditions in electric field [4]. The samples with the ratio d/p = 0.60 have been studied. The periodic structure is a set of over-twisted and under-twisted defect lines (Fig. 1a) which disappear entirely under 2.5 V voltage and more. After switching off field, the origin periodic structure is restored. However, an electric field applied during the relaxation process affects essentially the forming cholesteric pattern. Figure 1a shows the sample area during a field-free relaxation when the defect lines grow similarly to their initial arrangement. If, during relaxation, the CLC cell is exposed to an electric field that is less than the value required to destroy the periodic structure, the cholesteric pattern changes significantly (Fig. 1b). Namely, the forming new defect lines are oriented at an angle to the initial ones. It should be noted this angle depends on the value of applied voltage.

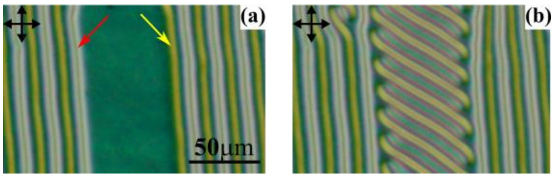

Figure 1 – Cholesteric patterns during a relaxation process at $U = 0$ V (a) and $U = 1.0$ V (b). Red and yellow arrows indicate the over- and under-twisted defect lines, respectively.

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References:

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