

## Electrically induced transformations of the cholesteric structure with tangential-conical boundary conditions

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Cholesteric liquid crystals are of interest due to unique properties caused by the specific orientational ordering and the transformation features in external fields [1]. The cholesteric structures with tangential, homeotropic, homeoplanar boundary conditions and in the cells with surface topography have been well studied. New cholesteric structures with tangential-conical boundary conditions (uniform tangential boundary conditions at one substrate and conical anchoring at another one) have been described recently for the cells with the different ratio of the cholesteric layer thickness  $d$  to the helix pitch  $p$  [2].

The present work is devoted to the transformations of defects in the twisted cholesteric structure with the tangential-conical boundary conditions under the electric field [3]. The samples with the ratio  $d/p = 0.57$  have been investigated. It has been shown that the twisted structure with the defect loops having the under-twisted and over-twisted areas (Fig. 1) or the structure with the over-twisted and under-twisted defect lines are formed in the cholesteric layer. The perpendicularly applied electric field causes a decrease of the azimuthal director angle at the substrate with the conical surface anchoring. As a result, the defect loops shrink and disappear, and defect lines shorten or/and transformation into a defect of the third type. The director field near the defect lines has been investigated by the rotating analyzer method. It has been shown that the length ratio between the over-twisted and third-type defect lines can be controlled by the electric field.

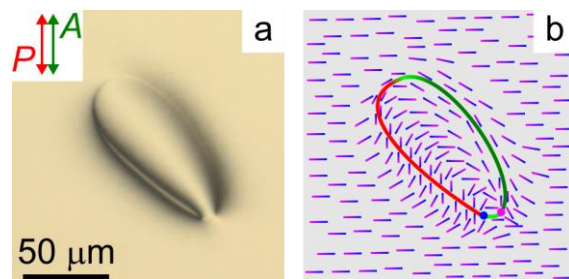


Figure 1 – POM photo of the defect loop (a) and the corresponding scheme of the director orientation at the substrate with conical anchoring (b). The red and dark green colored lines indicate the parts of the loop with under-twisted and over-twisted areas, respectively.

### References:

- [1] P. Oswald, & P. Pieranski, *Nematic and cholesteric liquid crystals: concepts and physical properties illustrated by experiments*, (Taylor & Francis, Boca Raton, 2005), pp. 618.
- [2] M.N. Krakhalev, et al., *Crystals*, **9**, 249 (2019).
- [3] M.N. Krakhalev, et al., *Scientific Reports*, **10**, 4907 (2020).

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