Nanocomposites and nanomaterials

Reconfigurable patterns of smectic A liquid crystal defects

I. Gryn[1,2], E. Lacaze[2,3] and B. Zappone[1,4]

[1] *Physics Department, University of Calabria, 33/B, Rende(CS) 87036, Italy. E-mail: iryna.gryn@fis.unical.it*

[2] *Institute of Nano-Science of Paris, Pierre and Marie Curie University, 75005 Paris, France*

[3] *CNRS, UMR7588*

[4] *Consiglio Nazionale delle Ricerche, CNR-IPCF, Cosenza, Italy*

Micropatterns of highly oriented defect domains created by self-assembly in smectic-A liquid crystal open films [1,2] are being actively explored for various applications including the guided assembly of dispersed colloids and nanoparticles [3, 4]. In this work, we show that similar patterns can be created in a more controlled fashion also in closed cells where the liquid crystal is confined between interfaces imposing conflicting homeotropic and planar unidirectional anchoring.

By varying the film thickness and applying electric field, the pattern morphology (symmetry and periodicity) can be controlled. In the absence of a field, 1D arrays of straight linear domains (LD) are formed for thicknesses smaller than 1.3 μm, whereas a close packed 2D lattice of focal conic domains (FCD) is observed for thicknesses larger than 2.2 μm. The FCD lattice can be converted into a 1D array by applying an electric field. The 1D array period depends on the field strength. Interestingly, the patterns persist after switching the field off most likely due topological barriers required for reconfiguring a network of interacting defects.

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