Localized, field induced defect formation and manipulation in hybridized LCs

Samuel Schafforz, Atefeh Habibpourmoghadam[1], Chenjuan Zhang[1], Larissa Braun[2], and Alexander Lorenz[1,3*]

[1]*Department of Chemistry, Physical Chemistry, Paderborn University, Paderborn (DE)*
[2]*Institute for Condensed Matter Physics, TU Darmstadt, Darmstadt (DE)*
[3]*Institute of Chemistry, University of Kassel, Kassel (DE)*

Highly responsive LC test cells were assembled with photovoltaic substrates (iron doped lithium niobate windows). In these hybridized samples, the LC was driven by exposure with a tightly focused laser beam, which caused locally high photovoltaic surface fields (generated within the substrates). Field induced director orientation, defect creation, lensing, manipulation of the film edge, and interaction of defects were studied [1-3] in experiments and simulations. Samples were investigated with rotated crossed polarizers [1,3] in order to learn about defect strength and sign of the field induced topological charges. In a nematic LC, umbilic defects and interactions of point and line defects were seen. Defect-free director realignments with radial symmetry were found, if these samples were assembled with an indium tin oxide coated cover glass. In samples with chiral nematic (N*) LCs, rewritable patterns (Figure 1) were created. A uniformly standing helix texture was seen in the initial state. Exposure with a scanned laser beam locally resulted textural transitions (Frank-Pryce defects) and bistable responses: Such a hybridized N* LC can be used as rewritable canvas for index modulations and micron scale textural transitions – no dye doping is required + a diode laser beam has just the right intensity for writing and erasing patterns. Small, field generating iron doped lithium niobate particles, functionalized with surface grafted surfactants [4] are promising candidates to fabricate photo responsive LC dispersions.

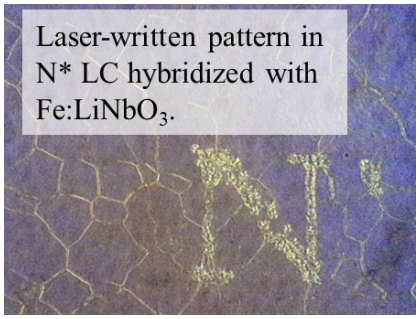

Figure 1: Pattern in a N LC sample (no doping, no dyes), written with a scanned laser beam.*

References

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**Corresponding author e-mail: alexander.lorenz@online.ms*