Peculiar Behaviour of Holographic Gratings in Light-Sensitive Liquid-Crystalline Elastomers

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Light-sensitive liquid crystalline elastomers (LS-LCEs) are optical holographic materials with many intriguing properties. Light-induced modifications of refractive index are several orders of magnitude larger than in conventional light-sensitive elastomers [1-4]. Holographic patterning process is very nonlinear, which allows an intricate control over the 3D spatial structuring. The associated effects are particularly interesting in the temperature region close to the nematic-paranematic phase transition, where phenomena, like recording of hidden holograms and hologram dark-enhancement effect can be observed [5].

LS-LCEs are also very efficient for recording of optical polarization gratings that are fabricated on the basis of the variation of polarization state of the optical field. In the vicinity of the Bragg angle such gratings exhibit an unusual splitting of the diffraction peak [6]. Very interesting behaviour appears also during mechanical stretching of the gratings, particularly along the direction of the soft elasticity, for which a synergetic correlation between the grating structure and the formation of reorientational domains can take place.

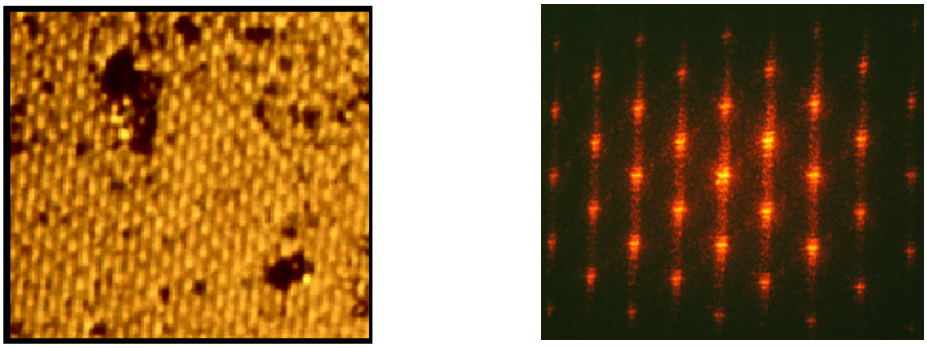

Figure 1: Optical polarization microscopy image (left) and far field optical diffraction pattern (right) of a 2D square lattice recorded in 10 μm thick LCE layer. The lattice distance is 13.5 μm.

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