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Polarization-driven twisted states in ferroelectric nematic liquid crystals under confinement

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Ferroelectric nematic liquid crystals (FNLC) are 3D fluids with a giant spontaneous electric polarization (**P**) in the order of several microcoulombs per centimeter squared. In an unconstrained sample this high **P** has recently been shown to twist the nematic director field in order to reduce the electrostatic energy [1]. In this contribution, we now present studies of an FNLC, namely AUUQU-2-N, in a wedge cell with continuously increasing thickness and show that the polarization-driven twist modes depend on the local distance *d* between the lower and the upper plates of the wedge. For planar and parallel anchoring conditions of the nematic director we find a uniform, non-twisted director field at small *d* below 2 µm and domains with ±2π-twisted director fields above a certain critical thickness of about 4 µm (see Fig. 1). At intermediate *d*, we observe locally twisted director fields but with zero total twist between the lower and the upper surface. We coin these twisted director configurations with alternating twist sense "mesotwisted". In view of these polarization-driven twist instabilities in FNLCs, the uniform state at small *d* might be considered as a surface-stabilized ferroelectric nematic, an interesting analogy to surface stabilized ferroelectric chiral smectics [2].

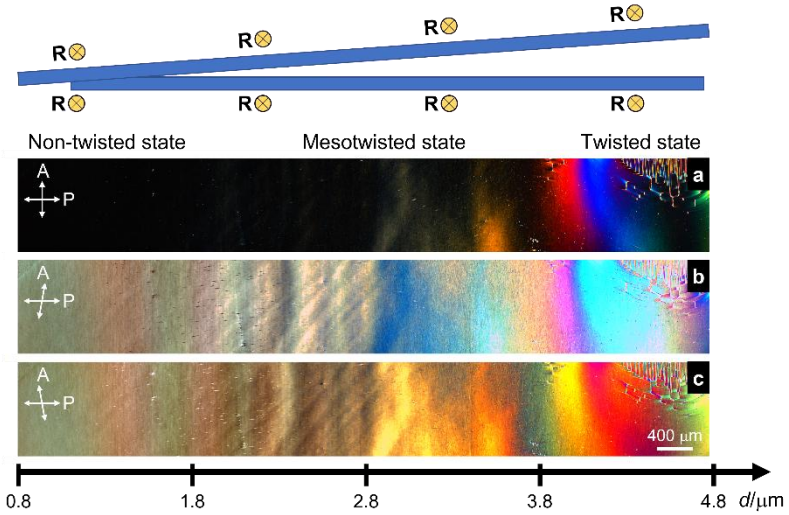

Figure 1. Panorama picture of a large part of the synpolar wedge cell filled with the N_F phase under crossed (a) and ±25° decrossed polarizers (b,c). (See explanation in text).

References

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