Anchoring breaking or surface order reconstruction in nematics?

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Nematics are easily distorted by weak electric fields, leading to electro-optical effects widely used in display technology. The anchoring breaking of nematics has been demonstrated as a first-order transition in the case of tilted anchoring or as a second-order transition in the case of planar anchoring (1-3). These phenomena allow to connect two nematic textures having distinct topologies, as in the well know case of the π-cell with weak surface anchoring. More recently, the electrically controlled biaxial order reconstruction in the nematic bulk was presented. This electro-optical effect is very fast, in the microseconds range, it is compatible with intrinsically bistable nematic devices and it implies the local exchange of two eigenvalues of the nematic order tensor through intermediate biaxial states. To check the biaxial order reconstruction due to elastic distortion squeezed down to the nanoscale, we can make thin planar cells with a thickness of few microns and with surface treatments to induce a planar splay deformation in a nematic with positive dielectric anisotropy (3-10).
In this work, we present experimental investigations about the biaxial order reconstruction close to a boundary surface, in the case of strong anchoring conditions, demonstrating that the anchoring breaking can be interpreted as a particular case of surface order reconstruction. The biaxial order reconstruction behaviour has been investigated by means of dynamical electro-optical observations for applied electric pulses in the range from 10 μsec to 10 msec.

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