Sidewall Control of Multistable Azimuthal Nematic Liquid Crystal Alignment

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Bistable alignment of a nematic liquid crystal has previously been achieved using a structured surface morphology on one of more of the substrates that confines the nematic layer [1-6]. If the bounding substrates are flat we have shown that a number of distinct stable azimuthal (in-plane) alignment configurations can be created in a planar nematic layer that is laterally confined in a square shaped well [7-9].

In the current work bistable and multistable nematic liquid crystal alignment configurations have been created in channels of planar nematic liquid crystal that are laterally bounded by one or more in-plane sawtooth grating structures. This in-plane geometry allows the 2-dimensional director configurations to be simply interpreted from their optical textures and provides an excellent model system for studying the stabilising influence of nematic defects. The optical textures of the observed states are in excellent agreement with the predictions of nematic Q-tensor theory.

Preliminary results will be presented from time resolved studies of the switching between optical textures using two types of liquid crystal: (i) standard liquid crystal materials where coupling to the flexoelectric polarisation plays an important role, and (ii) dual frequency liquid crystals in which the sign of the dielectric anisotropy depends on the frequency of an applied a.c. voltage.

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