Plasma assisted micro poling of glassy surfaces: a new tool to achieve liquid crystal multi-domain alignments

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Abstract

We propose an innovative approach to program the alignment of liquid crystal (LC) assemblies allowing for the formation of multi-domain alignments whose orientation axis and sizes are controlled at the micrometer scale by an electrically patterned glass surface. The glass surface preparation is based on a thermo-electrical imprinting process to induce localized space charge implantations in the glass matrix just below its anode surface. To demonstrate this new approach, a commercial soda-lime glass slide has been polarized using as anode a simple micrometric nickel grid. Characterizing the polarized glass surface by second harmonic generation polarized microscopy; we show an accurate control of both location and spatial components of frozen static fields embedded in the glass as a function of the electrode patterns. The polarized glassy surface is then used in the conception of a LC cell in which homeotropic or planar alignments can be controlled following the electrical pattern induced on the glass surface. This study also points out the importance of plasma discharges spatially controlled along the electrode pattern during the process in order to promote the inplane electrical polarization effects, which are essential for the programming of the in-plane LC alignment on the polarized glass surface. Reference : https://doi.org/10.1364/OME.459498

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