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Pillar-Assisted Epitaxial Assembly of Focal Conic Domain Arrays in Smectic-A Liquid Crystals DANIEL BELLER, APIRADEE HONGLAWAN, MARCELLO CAVALLARO, RANDALL KAMIEN, KATHLEEN STEBE, SHU YANG, University of Pennsylvania — We demonstrate a versatile approach to tailor the spacing and symmetry of periodic arrays of toric focal conic domains (TFCDs) over a large area via confinement of smectic-A liquid crystals (SmA LCs) in patterned substrates. Arrays of pillars with variable dimensions are employed to direct the assembly of TFCDs, determining both the domain positions and the size of the defects. Highly ordered square and hexagonal arrays of TFCDs result from topographical confinement of the LC in square and hexagonal arrays of pillars. Focal conic domains are shown to form only when the confined geometry provides sufficient area so that substrate-induced planar alignment of LC molecules is energetically favorable. Since the spacing and symmetry of the TFCD array can be readily pre-determined by the arrangement of the directing pillars, this pillar-assisted assembly technique serves as a model study for directed assembly of liquid crystals in three dimensions and offers improvements to the capability of LC-based templates for device fabrication and lithography.

Daniel Beller
University of Pennsylvania

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