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Stabilizing Monodomain in Blue Phase Liquid Crystal by Chemically Patterned Surfaces. XIAO LI, JOSE A. MARTINEZ-GONZALEZ, MONIROSADAT SADATI, YE ZHOU, JUAN J. DE PABLO, PAUL F. NEALEY, University of Chicago — Topological defects in blue-phases liquid crystals (LCs) can be self-assembled into three-dimensional cubic crystalline structures, representing unique ordered states of matter among the other LCs. Stabilization of blue phases by trapping nanoparticles or polymerization right on the disclination lines and new mesogens synthesis are now serving as the major strategies for developing fast response optoelectronics. Polycrystalline, platelet and multi-domain topological defects of blue-phase LCs are difficult to overcame with current methods. We developed a chemically patterned surface that allows blue-phase LCs to be directed self-assembled upon the alternative planar/homeotropic (P/H) stripe pattern surface and into the uniform monodomain structure. The resulting blue-phases are single crystal, are oriented and guided with the underlying substrate and can be created over arbitrarily large areas. The single crystal blue-phase domain is determined by the period and the ration of P/H of the lithographically defined surface pattern rather than by the inherent limitations of the blue-phase material. Our results illustrate how directed self-assembly strategies by 2D chemically patterned surface allow for 3D disclination lines organization in existing manufacturing.

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