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Generating arrays of defect arcs, loops, stripes and Skyrmions in liquid crystals[1] SAJEDEH AFGHAH, YUBING GUO, MIAO JIANG, OLEG LAVRENTOVICH, QI-HUO WEI, JONATHAN SELINGER, ROBIN SELINGER, Kent State University — Using both simulation and experiment, we demonstrate that an ordered array of defect structures—e.g. disclination arcs and loops—can be created in a nematic liquid crystal cell by patterning the confining substrates with non-uniform surface anchoring. We study liquid crystal cells with a lattice of topological point +/- (1/2) or +/-1 defects in the anchoring pattern on one or both substrates. We find an ordered array of disclinations connecting pairs of point defects along one substrate or between substrates. Simulation studies are compared to experimental results. We also perform analytical calculations to model defect patterns in cholesteric liquid crystals confined in thin cells with uniform homeotropic anchoring. We examine formation of a lattice of Skyrmions or a lattice of stripes, optimize the structure and spacing of each pattern, and determine which structure minimizes the free energy for a given cell thickness. We find that, as the inverse pitch of the liquid crystal increases, the resulting defect structure goes from uniformly homeotropic to a Skyrmion lattice and then to a stripe lattice. Results are compared to recent experiments and simulations [Y. Guo, S. Afghah, J. Xiang, O.D. Lavrentovich, R.L.B. Selinger, and Q.H. Wei, Soft Matter 12 (29), 6312 (2016).]

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