2D Crystal of Topological Defects in Nematic Liquid Crystal

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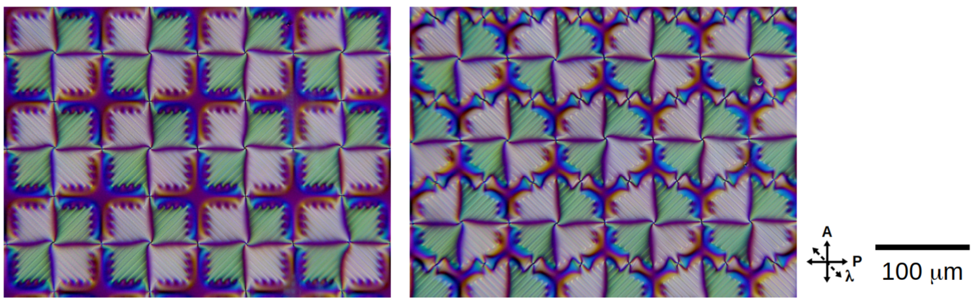
Topological defect arises when the symmetry of order in material is broken. The symmetry breaking can be induced by phase transitions or by application of confinements. The types of defects, such as point, line, or walls, depend on dimension of the order and topology of the confinement. Though topological defects appear because the present order is corrupted, they can mediate the birth of a new order. They trap particle[1, 2] and molecules[3], and they organize themselves into two-dimensional (2D) array[1] or three-dimensional (3D) crystals[2]. In a natural, large, stable defect array, the type, shape, number, and arrangement of the defects follow specific laws. The topological charge in the defect array must conserve, so the structure of the array is invariant under deformation and self-retained. The strain between the defects must have static balance, so the crystal of defects can be stable. To look for stable defect arrays and to figure the conservation laws out, radial, circular, and hyperbolic point defects are arranged in square and hexagonal arrays[4]. The shape and position of the point defects are precisely controlled by the patterned pixel electrodes[5,6]. Analysis on the director field reveals that the total surface topological charge in a homeotropic defect crystal is 0, independent of the lattice structure, invariant throughout radial to circular defect shapes.



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