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String defects in smectic-C monolayers and hybrid nematic films[1]
FANGFU YE, ZHAO LU[2], LENA LOPATINA, JONATHAN SELINGER, Liquid Crystal Institute, Kent State Univ, ALEX TRAVESSET, Dept of Physics and Astronomy, Iowa State Univ — Defects are important in determining the structure and statistical mechanics of liquid crystals. In this project, we study the structure of topological defects in smectic-C monolayers and hybrid nematic films. When subjected to boundary conditions requiring a total topological charge of +1, the classical xy model in a flat disk geometry has a ground state of a single vortex of charge +1. By comparison, perfect nematics with directors in the same 2D geometry have two +1/2 vortices repelling each other. We show that slightly tilting directors out of the plane to form a smectic-C monolayer yields two +1/2 vortices bound together by a domain wall, which we call a string defect. We also develop a model easily testable in experiments, in which a thick nematic film is constrained in a cell with weak homeotropic anchoring on one surface and strong planar anchoring on the other surface. For this model, we derive the phase diagram and investigate how the length of string defects changes with the thickness of the cell. We further present numerical simulations of the nematic director in the hybrid film.

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