Equilibrium and dynamic properties of textured membranes

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ABSTRACT

The topological defects in textured membranes favors the development of curvature to geometrically screen out the intrinsic stress field generated by the perturbations to the ordered state. Here we study the dynamics of defect annihilation in flexible crystalline and liquid-crystalline membranes suffering a symmetry breaking phase transition. The phase transition process is described through a Brazovskii-Helfrich-Canham Hamiltonian.

In crystalline membranes we observed that the unbinding of dislocations and Carraro-Nelson "antiferromagnetic" interactions between disclinations slow down the dynamics below the Lifshitz-Safran regime. On the other hand, in liquid-crystalline membranes we observed that topological defects can induce shape instabilities with different symmetries. In the high and low bending rigidity limits we found flat and buckled configurations resembling the equilibrium states found in hexatic membranes. At intermediate values of the bending rigidity the membrane wrinkles in configurations with similar features that elastic media under large external loads.