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Nucleation type instabilities in partially wetting nanoscale nematic liquid films MICHAEL LAM, LINDA CUMMINGS, LOU KONDIC, New Jersey Institute of Technology — Nucleation type instabilities are studied in nematic liquid crystal (NLC) films with thicknesses less than a micrometer. Within the framework of the long wave approximation, a 4th order nonlinear partial differential equation is proposed for the free surface height. Unlike simple fluids, NLC molecules have a dipole moment which induces an elastic response due to deformation in the bulk of the fluid. The model includes the balance between the bulk elasticity energy and the anchoring (boundary) energy at the substrate and free surface, and van der Waals' intermolecular forces, by means of a structural disjoining pressure. In this presentation, we focus on two-dimensional flow and present simulation results for a flat film with a localized perturbation. We are interested in the morphology of the dewetted film as a function of the initial film thickness. We will show that there exists a range of film thicknesses within the linearly unstable flat film regime where stability analysis does not explain the morphology of the dewetted film. Marginal stability criterion (MSC) is used to derive an analytical expression for the velocity at which a perturbation propagates into the unstable flat film. Finally, we discuss the degree to which MSC can be used to explain the observed morphology.

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