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Breakup of partially wetting nanoscale nematic liquid films[1] MICHAEL LAM, New Jersey Institute of Technology, LINDA CUMMINGS COLLABORATION, LOU KONDIC COLLABORATION, TE-SHENG LIN COLLABORATION[2] — The breakup of nematic liquid crystals (NLCs) films with thicknesses less than a micrometer is studied. Particular attention is paid to the interplay between the bulk elasticity and the anchoring (boundary) conditions at the substrate and free surface. Within the framework of the long wave approximation, a fourth order nonlinear partial differential equation (PDE) is derived for the free surface height. Numerical simulations of a perturbed flat film show that, depending on the initial average thickness of the film, satellite droplets form and persist on time scales much longer than dewetting. Formulating the model in terms of an effective disjoining pressure (elastic response and van der Waals interaction), simulations further suggest that satellite droplets form when the initial average film thickness corresponds to a positive effective disjoining pressure. Our results may shed light on the so-called "forbidden film thicknesses" seen in experiments.

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