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Asymptotic model for three-dimensional coating flow of nematic liquid crystal on an inclined substrate[1] MICHAEL LAM, New Jersey Institute of Technology, LIN TE-SHENG, National Chiao Tung University, LINDA CUMMINGS, LOU KONDIC, New Jersey Institute of Technology — We consider a coating flow of nematic liquid crystal (NLC) film on an inclined substrate. Exploiting the large aspect ratio in the geometry of interest, an asymptotic approach is utilized to derive a fourth order nonlinear partial differential equation governing the evolution of the free surface. Previous results have shown that there exist two-dimensional traveling wave solutions that translate down the substrate. In contrast to the analogous Newtonian flow, such solutions may be unstable to streamwise perturbations. Extending well-known results for Newtonian flow, we analyze the stability of the front with respect to transverse perturbations. Particular attention is paid to the interplay between the bulk elasticity and the anchoring conditions at the substrate and free surface. Using full numerical simulations, we validate the linear stability theory and present examples of downslope flow of NLC in the presence of both transverse and streamwise instabilities.

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