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Dynamics of Topological Defects around Drops and Bubbles Rising in a Nematic Liquid Crystal SIDDHARTH KHULLAR, CHUNFENG ZHOU, JAMES J. FENG, University of British Columbia — We report numerical simulations and experimental observations of topological defects around drops and bubbles that rise through a vertically-aligned nematic liquid crystal. The moving interface is computed in a diffuse-interface framework, and the anisotropic rheology of the liquid crystal is represented by the Leslie-Ericksen theory, regularized to permit topological defects. Results reveal interesting coupling between the flow field and the orientational field surrounding the drop, especially the defect configuration. The flow generally sweeps the point and ring defects downstream, and may transform a ring defect into a point defect. The stability of these defects and their transformation are depicted in a phase diagram in terms of the Ericksen number and the ratio between surface anchoring and bulk elastic energies. The numerical predictions are confirmed by experimental observations with the help of polarizing microscopy. In particular, we provide direct evidence for downstream convection of the Saturn ring defect and its tranformation to a hyperbolic point defect.

Chunfeng Zhou
University of British Columbia

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