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Simulating the capillary breakup of a liquid torus HADI MEHRABIAN, JAMES J. FENG[1], Department of Chemical and Biological Engineering, University of British Columbia — Capillary instability of a Newtonian liquid torus suspended in a bath of Newtonian liquid is computed using Cahn-Hilliard diffuse interface method. The main difference between the torus and a straight thread is the presence of curvature and flow filed caused by the shrinkage of the torus. We show that the capillary wave initially grows linearly as on a straight thread. The azimuthal curvature decreases the growth rate while the flow field enhances the growth rate of the capillary waves. The initially dominant mode does not necessarily persist into nonlinear growth and eventual breakup. Breakup depends on the competition of two timescales: torus retraction and neck pinchoff. We demonstrate that it is determined by the initial amplitude, the aspect ratio and the viscosity ratio of the torus viscosity ratio. The numerical results are in agreement with experimental results.

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