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Large-deformation dynamics of an elastic filament at a fluid interface SRINIVASA GOPALAKRISHNAN GANGA PRASATH, JOEL MARTHELOT, RAMA GOVINDARAJAN, TCIS, TIFR Hyderabad, NARAYANAN MENON, TCIS, TIFR Hyderabad and Dept. of Physics, UMass Amherst, TCIS, TIFR HYDERABAD AND DEPT. OF PHYSICS, UMASS AMHERST COLLABORATION — We study the dynamics of a thin elastic filament at the interface of two fluids and observe the time evolution in its shape when released from an initial configuration with a large curvature. The unfolding of the filament is driven by a competition between bending energy and viscous dissipation. We experimentally study the overdamped regime of this system by varying fluid viscosity (η), length (L), diameter (d) and elastic modulus (E) of the filament with similar initial conditions and observe the kinematics of the filament straightening. The time-dependence for this process can be collapsed by scaling time by $\eta L^4/Ed^3$. However, the characteristic time is a very small fraction of this time-scale. We perform numerical computations parallel to the experiments to get access to the dynamics of the filament to resolve this puzzle. An understanding of the time-dependence will enable the use of this technique to measure interfacial properties.

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