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Observing polymersome dynamics in controlled microscale flows
SUBHALAKSHMI KUMAR, ANISH SHENOY, CHARLES SCHROEDER, University of Illinois, Urbana Champaign — Achieving an understanding of single particle rheology for large yet deformable particles with controlled membrane viscoelasticity is major challenge in soft materials. In this work, we directly visualize the dynamics of single polymersomes ($\sim$ 10 μm in size) in an extensional flow using optical microscopy. We generate polymer vesicular structures composed of polybutadiene-block-polyethylene oxide (PB-b-PEO) copolymers. Single polymersomes are confined near the stagnation point of a planar extensional flow using an automated microfluidic trap, thereby enabling the direct observation of polymersome dynamics under fluid flows with controlled strains and strain rates. In a series of experiments, we investigate the effect of varying elasticity in vesicular membranes on polymersome deformation, along with the impact of decreasing membrane fluidity upon increasing diblock copolymer molecular weight. Overall, we believe that this approach will enable precise characterization of the role of membrane properties on single particle rheology for deformable polymersomes.

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