Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Filament thinning dynamics of Boger fluids in extensional flow under microfluidic environment TANOY KAHALI, SUMAN CHAKRABORTY, Department of Mechanical Engineering, Indian Institute of Technology Kharagpur, Kharagpur - 721302, India — Polymer addition to Newtonian-fluid drastically alters the neck thinning dynamics especially in reduced length scale system due to enhanced elasticity. This motivates to study the neck thinning of two-phase polymeric–Newtonian system in micro-scale. Previous studies are mostly focused on gravity assisted filament thinning in macro-scale. Here, we intend to study the effect of elasticity on filament thickness for a series of Boger fluids(dispersed phase)stretched in a medium of silicon oil under micro-environment.Qualitatively, we observed that the filament thinning rate is much slower compared to Newtonian fluid. At an earlier stage, both fluids undergo a shear thinning process where the filament thickness decays exponentially with time. In later stage, for Newtonian fluid a capillary driven regime dictates further thinning and rupture of the filament. In contrast, a second exponential thinning regime (causing the delay) is observed for polymer filaments along with capillary-driven thinning before pinch off. We envisage that this analysis may elucidate the role of different types of polymer addition and its concentration on the universal trend of filament thinning process in micro-scale.

Tanoy Kahali
Dept of Mechanical Engineering, Indian Institute of Technology Kharagpur

Date submitted: 01 Aug 2019 Electronic form version 1.4