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Differential approach to Capillary Breakup Rheometry: role of filament asymmetry induced by sample volume and strain LOUISE MCCARROLL, WILLIAM SCHULTZ, MICHAEL SOLOMON, University of Michigan — We investigate the operating range of the 1-D, Newtonian, differential analysis for capillary breakup rheometry. Capillary breakup rheometry (CBR) derives specimen physical properties (e.g. viscosity) from measurements of the filament evolution after a sudden deformation. In our differential analysis, derivatives of the filament radius as a function of the axial coordinate and time are measured to determine the ratio of surface tension to viscosity. We evaluate the accuracy of the differential method by applying it to Newtonian fluids with a range of viscosities and for experiments with different sample volumes and strains. We investigate the impact of filament asymmetry on the performance of the differential method for the range of conditions studied and with a 1-D numerical model. This evaluation yields recommendations for using the differential CBR technique. We discuss the scope for extending the differential analysis to more complex cases, such as for insoluble surfactant at the fluid-air interface.

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