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Droplet breakup dynamics in a microfluidic T-junction GORDON CHRISTOPHER, NADIA NOHARUDDIN, SHELLEY ANNA, Department of Mechanical Engineering Carnegie Mellon University, MICRO COMPLEX FLUIDS LABORATORY TEAM — We present measurements of droplet breakup in shear-dominated flow in a microfluidic T-junction using high speed video imaging. In particular, we examine the transient drop shape as it breaks and relate this to critical behavior for drop breakup that has previously been reported in linear flows. We specifically focus on the capillary number, an important dimensionless variable in droplet breakup. In well-defined flows the capillary number is defined in terms of the characteristic shear rate and unperturbed drop size. In more complex geometries such as microfluidic devices it is more convenient to define capillary number through externally controlled parameters like flow rate and device geometry. We find that a 'local' capillary number based on shear rate calculated from the time-varying gap between the emerging droplet and the channel wall is a more appropriate way of characterizing the breakup dynamics. We study the droplet breakup dynamics for a range of viscosity ratios and volume fractions.

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