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Droplet size distributions in liquidliquid semi-batch Taylor-Couette ow MICHAEL G. OLSEN, CHARLTON F. CAMPBELL, R. DENNIS VIGIL, Iowa State University — Droplet size distributions in a vertically oriented liquidliquid Taylor- Couette reactor operated in a semi-batch fashion with continuous feed of the dispersed phase and no feed or removal of the continuous liquid were measured using optical techniques. The effects of both the inner cylinder angular velocity and the dispersed phase inlet flow rate on droplet size distributions were considered. Both the mean droplet diameter and the droplet size distribution were found to depend upon the jet Reynolds number and were independent of cylinder rotation speed up to the largest azimuthal Reynolds number investigated (60 000). The droplet size distribution underwent a transition from a unimodal distribution at low cylinder rotation speeds to a bimodal distribution at intermediate speeds. At the largest rotation speeds considered, the bimodal distribution became right-skewed. These observations suggest that the mean droplet size and droplet size distribution are determined primarily by jet breakage dynamics at the tips of inlet nozzles. Furthermore, the mean droplet size data collected from two geometrically distinct reactors can be collapsed onto a universal curve by plotting the Weber number against the jet Reynolds number.

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