Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Selective Viscous Withdrawal: Entrainment of Micro-jets and Micro-drops ZEHAO PAN, JANINE NUNES, NIKI ABBASI, HOWARD STONE, Princeton University, STONE GROUP TEAM — The study of microscale drop or jet generation has catalyzed the invention of numerous biomedical and industrial technologies. Existing shear-based technologies require active control of both the continuous and the dispersed phases, therefore limiting their capacity for large scale parallelization. A selective viscous withdrawal system is comprised of a nozzle immersed in one fluid near a fluid-fluid interface, where the application of a withdrawal flow can cause the entrainment of the second fluid into the nozzle forming jets or droplets. Since no active or independent flow rate control of the two fluids is needed, this system promises greater capacity for scale up of droplet or jet production. Here, we experimentally study the formation of jets and droplets in a selective viscous withdrawal system, and perform a scaling analysis of the jet and drop sizes with respect to key operation parameters including the flow rate, nozzle-interface distance, nozzle diameter, viscosity, and interfacial tension. Our work lays the groundwork for further application-driven explorations.

Zehao Pan
Princeton University

Date submitted: 28 Jul 2019 Electronic form version 1.4