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Dispersion of Suspensions in Unsteady Microchannel Flows MARTIN MAXEY, AMANDA HOWARD, LUKAS WINKLERPRINS, ANUBHUV TRIPATHI, Brown University, KYONGMIN YEO, IBM Watson Research Center — We explore the dispersion of non-Brownian ($Pe \gg 1$) suspensions in unsteady, low Reynolds number shear flows in a microchannel. Prior experimental work on oscillating Couette flows and Poiseuille flows has shown the importance of strain amplitude in determining the long term distribution of particles across the channel. We will present results from numerical simulations for the early development of these flows and the motion of finite length suspension plugs. The distortion of a plug by the shear flow results in inhomogeneous particle fluxes across the channel. This is largely reversible over the course of a full cycle, giving reversibility in the bulk. Self-diffusion gives irreversibility though at the microscale. As the strain amplitude increases or the initial volume fraction increases irreversibility in the bulk is seen. The dynamics behind these processes and the role of particle pressure will be noted, together with related experimental observations.

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