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Inertial Droplet Mixing in a Confined Microchannel Gas Flow
BRIAN CARROLL, BRIAN ROBINSON, CARLOS HIDROVO, The University of Texas at Austin — Efficient mixing at the microscale remains a formidable engineering challenge. Recent advancement and proliferation of Lab on a Chip and Micro Total Analysis Systems has demanded accelerated development and demonstration of novel micromixers as successful mixing is critical to device performance. In here we present a new droplet-based mixing technique currently being developed which aims to improve micromixing rates by increasing droplets Reynolds numbers in a microchannel prior to collision interaction. High speed gaseous flows are used to detach and transport discrete droplets to a collision zone where droplet interaction and subsequent mixing is achieved under highly inertial conditions. The design utilizes variants of the standard T-junction arrangement for both the detachment and collision process. Two fluorescing droplets with different fluorophore concentrations are brought into contact in a collision zone and allowed to interact. Mixing rates are quantified using an optical based measurement technique that examines temporal changes in droplet intensity as mixing progresses.

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