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Control of Lateral Inertial Migration Rate of Particles in Microchannels ARMIN KARIMI, University of California, Los Angeles, RISHAV ROY[1], Indian Institute of Technology (IIT), Kharagpur , SAM BRAY, DINO DI CARLO, University of California, Los Angeles — The net inertial lift force acting on particles results in lateral inertial migration across streams. The migration direction and magnitude is strongly dependent on channel geometry, size of the particle, Reynolds number and location of the particle within the channel cross-section. In many chemical and biological applications in which precise temporal control and solution exchange around particles is required, the initial variation in distribution of focusing positions of particles within the channel cross-section becomes a determining factor. This variation is shown to be a limiting factor in achieving precise control over the migration time in previous studies. In order to improve uniformity of the average migration rate, a microfluidic device is designed to aid particles in achieving a single stable equilibrium position by inducing a net helical flow. Using this inertial focusing platform, a comprehensive numerical and experimental study is performed to characterize the range of lateral migration rates for rigid spherical particles as a function of particle size, initial particle position, flow rates of each stream and Reynolds number for a given channel geometry. The tool developed in this study can be used to achieve precise migration characteristics for the microparticles crossing fluid streams in microchannels over millisecond time scales.

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