Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Different modes of self-assembly for same-stream and cross-stream microparticles in inertial microflows SOROUSH KAHKESHANI, Graduate student at UCLA, DINO DI CARLO, Associate professor of Bioengineering at UCLA — Understanding parameters affecting dynamic self-assembly of particles in microchannels can enable control of particle density for applications such as flow cytometry and tissue printing. Inertial lift forces and repulsive viscous interactions have been shown to have important effects on inter particle spacing and dynamic particle pairwise interactions. Based on the aspect ratio of the channel, particles inertially focus to two or four positions in finite Reynolds number flows. In this work, we show that in channels with aspect ratio of two or greater, where we have predominantly two focused streams of particles, there is a favored same-stream spacing as well as favored cross-stream spacing between particles. We studied how channel geometry, particle size, concentration of particles, orientation of the neighboring particles, and Reynolds number can affect both cross-stream and same-stream spacing. In addition, based on our simulations, for the first time we showed that particle size and position of the particle in the channel significantly affect the shape of reversing streamlines behind and in front of the particles, however Reynolds number does not have a controlling effect on shape of these reversing streamlines. These results show unique features of particle interactions.

Soroush Kahkeshani
Graduate student at UCLA

Date submitted: 01 Aug 2014 Electronic form version 1.4