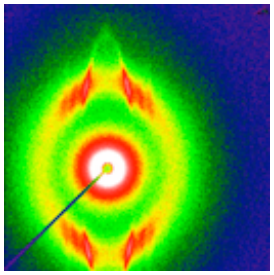

Contribution ID : **28** Type : **not specified**

Contr. Talk 3 - Flow-assisted droplet assembly in a 3D microfluidic channel

Monday, 10 December 2018 16:40 (20)

Self-assembly of soft matter, such as droplets or colloids, has become a promising scheme to engineer novel materials, model living matter, and explore non-equilibrium statistical mechanics. In this talk, we present detailed numerical simulations of few non-Brownian droplets in various flow conditions, specifically, focusing on their self-assembly within a short distance in a three-dimensional (3D) microfluidic channel, cf. [Shen et al., Adv. Sci., 2016, 3(6):1600012]. Contrary to quasi two-dimensional (q2D) systems, where dipolar interaction is the key mechanism for droplet rearrangement, droplets in 3D confinement produce much less disturbance to the underlying flow, thus experiencing weaker dipolar interactions. Using confined simple shear and Poiseuille flows as reference flows, we show that the droplet dynamics is mostly affected by the shear-induced cross-stream migration, which favors chain structures if the droplets are under an attractive depletion force. For more compact clusters, such as three droplets in a triangular shape, our results suggest that a non-uniform cross-sectional inflow profile is further required. Overall, the accelerated self-assembly of a small-size droplet cluster results from the combined effects of strong depletion forces, shear alignments, and fine-tuned inflow conditions. The deterministic nature of the flow-assisted self-assembly implies large throughputs, though calibration of all effects is likely difficult at the same time.

Presenter(s) : GE, Zhouyang

Session Classification : Later afternoon session - Colloids