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Arrangement of high-viscosity droplets in diverging/converging microchannels[1] BIBIN M. JOSE, THOMAS CUBAUD, Stony Brook University — We experimentally examine the dynamics of highly viscous droplets in a two-dimensional pore model, i.e., a plane diverging/converging microfluidic chamber. Upstream from the chamber, regular trains of droplets are formed in the dripping and jetting regimes using a hydrodynamic focusing section into a square microchannel. This method permits the steady generation of elongated droplets (dripping) and small spherical droplets (jetting). We measure the velocity and trajectory of drops as they traverse the pore for various fluid viscosities and flow rates. In particular, the variation of the flow velocity in the diverging/converging channel produces a broad range of self-assembly phenomena. We focus on the formation crystal-like structures by hydrodynamic coupling by tracking individual droplets and measuring the droplet stream envelope in the chamber. The individual and collective droplet behaviors are analyzed based on the droplet concentration and injection flow rates required for initiating coalescence and building ordered or disordered droplet assemblies.

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