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HeleShaw model for studying particle interactions in a confined Couette flow[1] SAGNIK SINGHA, Texas Tech University, ABHILASH REDDY MALIPEDDI, George Washington University, MAURICIO ZURITA-GOTOR, Universidad Loyola Andalucia, KAUSIK SARKAR, George Washington University, JERZY BLAWZDZIEWICZ, Texas Tech University — In a highly confined drop monolayer subjected to shear flow, deformable particles spontaneously rearrange to form highly ordered linear structures along the flow direction. This self-ordering phenomenon can be attributed to a combination of the HeleShaw quadrupolar interactions (responsible for drop alignment into chains) and the swapping-trajectory repulsion (responsible for maintaining uniform separation between drops within a chain) [Soft Matter 15, 4873 (2019)]. The damped swapping-trajectory repulsion is generated when flow scattered by a given particle is reflected from the wall towards a neighboring particle. This reflected flow drives the second particle into a streamline that pushes it away from the first particle. For deformable particles, the swapping trajectory repulsion is finite-range, due to deformation-induced particle migration towards the center of a channel. I will demonstrate quantitative modeling of the 3D swapping-trajectory motion and discuss its effect on the microstructure of a drop monolayer.

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