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Time-varying droplet configuration determines break-up probability of drops within a concentrated emulsion JIAN WEI KHOR, MINKYU KIM, Department of Mechanical Engineering, Stanford University, SIMON SCHUTZ, TOBIAS SCHNEIDER, Emergent Complexity in Physical Systems Laboratory ECPS, Ecole Polytechnique Federale de Lausanne EPFL, Switzerland, SINDY TANG, Department of Mechanical Engineering, Stanford University — In this study, we investigate the origin of the probability of break-up of drops within a concentrated emulsion flowing as a 2D monolayer through a tapered microchannel into a constriction. Although the concentrated emulsion is complex involving many-body interactions, all break-up events occur between two drops pinching each other as they enter the constriction under the conditions tested. Whether break-up occurs or not depends strongly on the relative position between the two drops at the entrance of the constriction. There exists a critical offset between the initial positions of the two drops below which break-up always occurs, and another critical offset above which no break-up occurs. In between these two critical offsets, there is a narrow bistable region where both break-up and non-break-up events are observed. For a flowing concentrated emulsion, the relative position between two droplets entering the constriction varies stochastically. The frequency of occurrence of drop pairs having specific offsets, together with the critical offset values for break-up, determines the break-up probability in the flowing emulsion.

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