

Supplementary information for

Capillary imbibition of confined monodisperse emulsion in microfluidic channels

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List of experiments conducted in this study:

Tables S1 and S2 detail the experiments performed for confinement ratios of $d/H=1.2$ and $d/H=0.65$, respectively. The term "bulk volume fraction" describes the initial volume fraction of the stock emulsions prepared for the capillary experiments. The starting emulsion was prepared at a 50% volume fraction, which was then diluted to 40%, 30%, 20%, and 10% by adding 2 wt% SDS solutions. Despite the similar densities of the dispersed and continuous phases, creaming of the dispersed phase to the top of the stock solutions was observed. This issue was addressed by thorough mixing with a pipette before conducting the experiments. Nevertheless, the quality of mixing and sampling of the emulsion may contribute to the observed variability in area fractions across different experiments, even when the same nominal stock concentrations were used. The true area fraction of droplets within the channels was determined by counting the droplets and dividing by the total area of the observed window. For strongly confined droplets ($d/H=1.2$), any clear fluid region was excluded from the total area fraction of the observable window, if present in a snapshot. For $d/H=0.65$, the measurement of area fractions commenced once the dense region moved beyond the observable window.

confinement (d/H)	Recording location	Bulk volume fraction	Area fraction
1.2	Location 1	0.5	0.47
1.2	Location 1	0.4	0.38
1.2	Location 1	0.3	0.36
1.2	Location 1	0.2	0.29
1.2	Location 1	0.1	0.18
1.2	Location 2	0.5	0.5
1.2	Location 2	0.4	0.45
1.2	Location 2	0.3	0.35
1.2	Location 2	0.2	0.28
1.2	Location 2	0.1	0.18

Table S. 1 - Experiments conducted at $d/H = 1.2$

confinement (d/H)	Recording location	Bulk volume fraction	Area fraction
0.65	Location 1	0.5	0.78
0.65	Location 1	0.5	0.76
0.65	Location 1	0.4	0.7
0.65	Location 1	0.3	0.5
0.65	Location 1	0.3	0.5
0.65	Location 1	0.2	0.36
0.65	Location 1	0.2	0.31
0.65	Location 1	0.1	0.19
0.65	Location 1	0.1	0.18
0.65	Location 2	0.4	0.8
0.65	Location 2	0.3	0.63
0.65	Location 2	0.3	0.53
0.65	Location 2	0.2	0.5
0.65	Location 2	0.2	0.45
0.65	Location 2	0.1	0.23
0.65	Location 2	0.1	0.2

Table S. 2 - Experiments conducted at $d/H = 0.65$