## Selective Fusion of Anchored Droplets via Changes in Surfactant Concentration

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## **Supplemental Information**

**Figure S1.** Chip design used in experiments. The chip contains two flow focusers to make droplets. The wide part of the channel contains an anchor array shown in dark grey with wells that are 15  $\mu$ m deeper than the rest of the channel. For experiments, using only one type of aqueous droplets, Oil 3 inlet is used to flow in oil without surfactant.



**Figure S2.** Average droplet fusion delay time after the introduction of external oil without surfactant into the array portion. Data points are the average fusion time for an array containing 36 droplet pairs of identical content with the array geometry shown in Figure 3b. Data points are the average of two replicates of the experiment (with the exception of flow rates of 2.5 and 25  $\mu$ L/min where data from one replicate is shown).

## **Movie Captions:**

**Movie S1.** Anchored droplet array containing pairs of identical aqueous droplets. At t=0, oil without surfactant is flowed left to right at a rate of 15  $\mu$ L/min to trigger droplet coalescence.

**Movie S2.** Anchored droplet array containing pairs of identical aqueous droplets. Oil with surfactant enters in the upper portion of the channel while oil without surfactant enters at the bottom portion. Flow of oil is from left to right. At t = 0, the flow rate of oil without surfactant is increased with a concurrent decrease of oil with surfactant over the period of 180 seconds. The scale of flow rates on the right is scaled to indicate the approximate boundary of the laminar flow of the two oil flows at different times. Total flow oil flow in the channel was constant at 20  $\mu$ L/min.

**Movie S3.** Sequential droplet fusion of pairs of droplets containing 0.27 M FeCl<sub>3</sub> or 0.8 M KSCN by progressive increase in the flow of oil without surfactant in the channel while decreasing flow of oil with surfactant. Fusion of droplets initiates the reaction to form the colored product,  $FeSCN^{+2}$ .

**Movie S4.** Fusion of large droplet containing 0.27 M FeCl<sub>3</sub> with three small droplets containing 0.8M KSCN by the introduction of external oil without surfactant.

**Movie S5.** Fusion of droplets containing live *dictyostelium discoideum* cells (top drop in image) and trypan blue (bottom drop in image) by flowing oil without surfactant outside droplet. No visible staining of the cells is observed after fusion with the trypan blue droplet. The extension of cellular pseudopods is observed before and after droplet fusion.