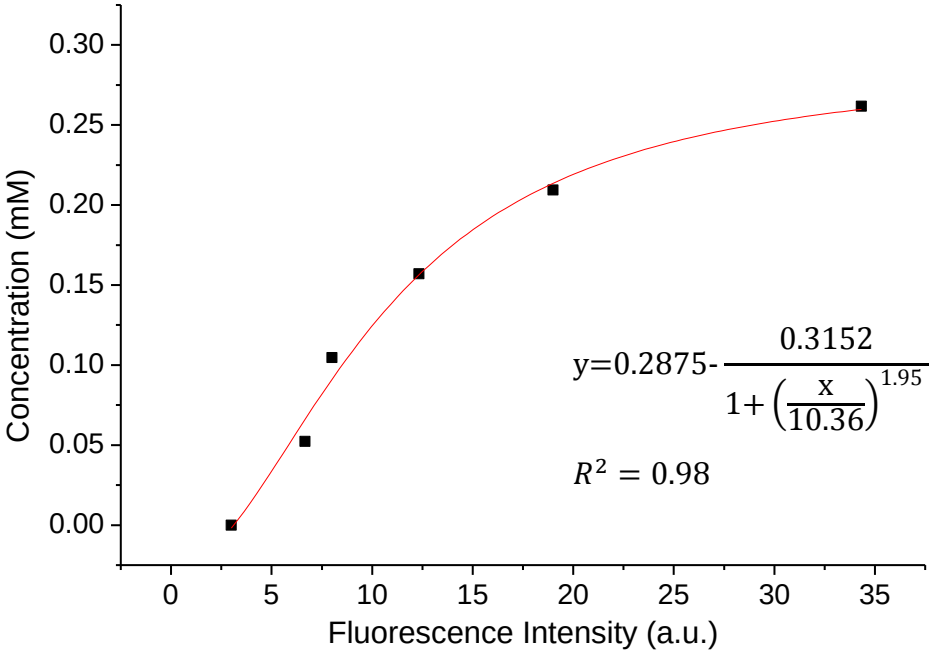
Supplementary Figure 1

The calibration curve of fluorescence intensity and its corresponding Nile red concentration was shown in Supplementary Figure 2. The fluorescence intensity was measured when the microchannel was filled with only disperse phase. The initial (I_0) and final (I_f) fluorescence intensities inside a droplet and the corresponding Nile red concentrations (C_0 and C_f, respctively) are listed in Supplementary Table 1.



Supplementary Figure 1. The calibration curve of fluorescence intensity and Nile red concentration in the disperse phase. The data points are fitted with the logistic model.

Supplementary Table 1. The initial and final fluorescence intensities and Nile red concentrations in droplets.

L_D* (μm)	I_o (a.u.)	I_f (a.u.)	C_0 (mM)	C_f (mM)
282	22.95	2.20	0.242	0.038
200	23.10	2.00	0.243	0.034
191	25.35	1.02	0.249	0.015
164	22.83	0.24	0.242	0.002
152	24.42	0.44	0.246	0.005

* L_D: the droplet size (The 282-μm droplet was semi-spherical and droplet length was used as its size.)

Supplementary Figure 2

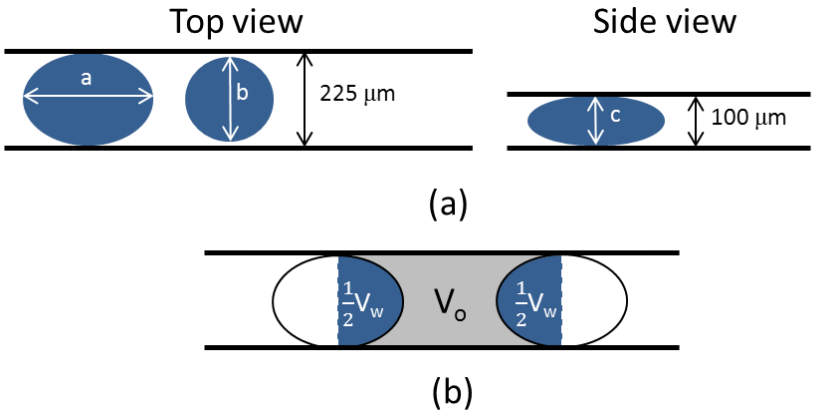
Droplet was considered as ellipsoids and their surface area (SA) and volume (V) were estimated by the following equation:

$$SA \approx 4\pi \left(\frac{a^p b^p + a^p c^p + b^p c^p}{3}\right)^{1/p} \quad \text{and p=1.6075}$$

$$V \approx \frac{4}{3}\pi abc$$

The parameters a, b, and c are shown in Supplementary Figure 2a. The surface area to volume ratio is calculated by dividing SA with V. Supplementary Table 2 shows the measured parameters for droplets with different sizes.

The ratio between the volumes of a droplet (V_w) and its surrounding continuous (V_o) phase is estimated by the area fraction between the two phases (Supplementary Figure 2b). The area fraction is measured using ImageJ.



Supplementary Figure 2. (a) The top view and side view of droplets (blue) in the channel. The channel width and depth are also addressed in the top view and side view, respectively. (b) The area fraction between continuous phase (V_o, gray) and a droplet (V_w, blue).

Supplementary Table 2. The measured dimensions of droplets, calculated surface area to volume ratio, and V_o/V_w.

F_c^* (ml/hr)	**Droplet size (µm)**	**a**	**b**	**c**	**SAV**	**V_o/V_w**
0.2	282	225	282	100	192	1.38
0.3	200	200	200	100	207	1.83
0.4	191	191	191	100	211	3.43
0.5	164	164	164	100	226	4.22
0.6	152	152	152	100	235	4.88

*F_c: flow rate of continuous phase