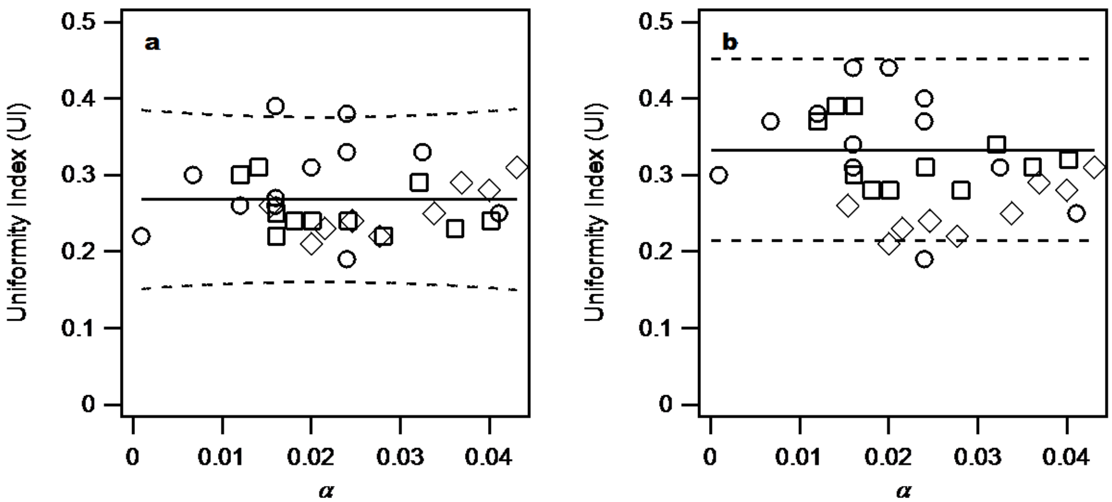


Supplementary Figure 1. Uniformity indices computed for Pickering emulsions prepared in this study. (a) Values computed using a popular definition (Supplementary References 1, 2, and 3):

$$UI = \frac{\sum_{j=0}^{+\infty} N_j d_j^3 \left| d_\mathrm{m} - d_j \right|}{d_\mathrm{m} \sum_{j=0}^{+\infty} N_j d_j^3} \qquad (1),$$

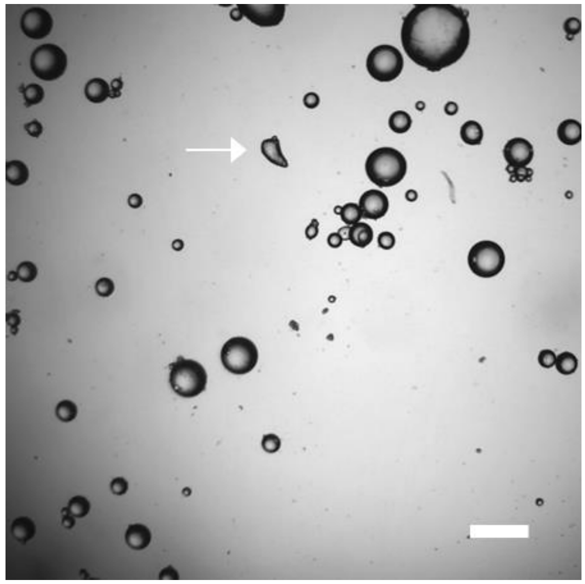
where N_j is the number of droplets having diameter d_j and d_m is the volume-weighted median. (b) Values computed using a less-popular formula:[20]

$$UI = \frac{\sum_{j=0}^{+\infty} N_j d_j^2 \left| \bar{d} - d_j \right|}{\bar{d} \sum_{j=0}^{+\infty} N_j d_j^2} \qquad (2),$$

where

$$\bar{d} = \frac{\sum_{j=0}^{+\infty} N_j d_j^3}{\sum_{j=0}^{+\infty} N_j d_j^2} \qquad (3).$$

Solid lines represent the means. Dashed lines bracket 95% confidence intervals. Both methods give similar *UI* values with an average of 0.27(±0.05) from Supplementary Equation 1 and an average of 0.33(±0.05) from Supplementary Equation 2. Symbols: squares, latex particle-stabilized water droplets in dodecane; diamonds, silica particle-stabilized 1,2-dichlorobenzene droplets in water; circles, carbon nanotube-stabilized water droplets in dodecane.



Supplementary Figure 2. Optical micrograph of diluted silica-stabilized 1,2-dichlorobenzene (DCB) droplets in water, showing a non-spherical droplet (marked by an arrow). DCB-to-water mass ratio: 0.02. Stabilizer-to-droplet mass ratio: 0.034. Scale bar: 200 μm.

Supplementary Table 1. Results of Least-Square Regressions to Equation 2

Stabilizer	Parameter	Value
Latex Particle	k_1	1.77(±0.03) (R^2 = 0.99)
	k_2	2.43(±0.10) (R^2 = 0.97)
	k_3	3.13(±0.17) (R^2 = 0.97)
Silica Particle	k_1	1.78(±0.06) (R^2 = 0.96)
	k_2	2.78(±0.08) (R^2 = 0.96)
	k_3	3.48(±0.17) (R^2 = 0.91)
Carbon Nanotube	k_1	1.62(±0.06) (R^2 = 0.96)
	k_2	2.50(±0.10) (R^2 = 0.96)
	k_3	3.43(±0.10) (R^2 = 0.99)

Supplementary Table 2. Results of Least-Square Regressions to Equation 1

Stabilizer	Parameter*	Value
Latex Particle	$6\rho_{LP}(1-\eta)\tau_0$	0.056(±0.002) µm (R^2 = 0.91)
	$6\rho_{LP}(1-\eta)\tau_1$	0.096(±0.005) µm (R^2 = 0.89)
	$6\rho_{LP}(1-\eta)\tau_2$	0.138(±0.008) µm (R^2 = 0.85)
	$6\rho_{LP}(1-\eta)\tau_3$	0.166(±0.015) µm (R^2 = 0.83)
Silica Particle	$6\rho_{SP}(1-\eta)\tau_0$	4.91(±0.22) µm (R^2 = 0.78)
	$6\rho_{SP}(1-\eta)\tau_1$	8.74(±0.53) µm (R^2 = 0.67)
	$6\rho_{SP}(1-\eta)\tau_2$	13.6(±0.65) µm (R^2 = 0.81)
	$6\rho_{SP}(1-\eta)\tau_3$	16.6(±0.69) µm (R^2 = 0.86)
Carbon Nanotube	$6\rho_{CNT}(1-\eta)\tau_0$	0.97(±0.06) µm (R^2 = 0.76)
	$6\rho_{CNT}(1-\eta)\tau_1$	1.58(±0.12) µm (R^2 = 0.72)
	$6\rho_{CNT}(1-\eta)\tau_2$	2.56(±0.15) µm (R^2 = 0.71)
	$6\rho_{CNT}(1-\eta)\tau_3$	3.14(±0.05) µm (R^2 = 0.99)

*Values of specific gravity are ρ_{CNT} = 2.9(±1.5), ρ_{LP} = 1.05, and ρ_{SP} = 1.5(±0.2).

Supplementary Note 1: Evolution of Droplet Size Distribution through Coalescence

We start with the probability density function of normally distributed d_0:

$$f\left(d_0\right)=\frac{1}{\sigma_0\sqrt{2\pi}}\exp\left[-\frac{\left(d_0-\mu_0\right)^2}{2\sigma_0^2}\right] \qquad (4),$$

where μ_0 is mean and σ_0 is standard deviation. Through the change of variables, we obtain:

$$f\left(d_0^3\right)=\frac{f\left(d_0\right)}{3d_0^2}=\frac{1}{3d_0^2\sigma_0\sqrt{2\pi}}\exp\left[-\frac{\left(d_0-\mu_0\right)^2}{2\sigma_0^2}\right] \qquad (5).$$

Through the conservation of volume (Equation 6 in the main text), we relate d_0 to d_n by

$$f\left(d_n^3\right)=f\left(\sum_{j=1}^{T_n}d_{0,j}^3\right) \qquad (6),$$

where j = 1,...T_n is the index of the droplets. Assuming the selection of T_n droplets is independent, we can derive $f\left(d_n^3\right)$ via a series of change-of-variables operations:

$$f\left(d_n^3\right)=\int\int\cdots\int\left(\prod_{j=1}^{T_n}f\left(d_{0,j}^3\right)\right)d\left(d_{0,1}^3\right)d\left(d_{0,1}^3+d_{0,2}^3\right)\cdots d(d_{0,1}^3+d_{0,2}^3+\cdots+d_{0,T_n-1}^3) \quad (7),$$

which is the T_n-fold convolution power of the probability density function of $d_{0,j}^3$. Finally, the distribution of d_n is obtained by applying the change-of-variables technique again:

$$f\left(d_n\right)=3d_n^2 f\left(d_n^3\right) \qquad (8).$$

Neither Supplementary Equation 7 nor 8 has a closed-form expression.

Supplementary References

1. Wiley RM. Limited coalescence of oil droplets in coarse oil-in-water emulsions. *J Colloid Sci* **9**, 427-437 (1954).

2. Arditty S, Whitby CP, Binks BP, Schmitt V, Leal-Calderon F. Some general features of limited coalescence in solid-stabilized emulsions. *Eur Phys J E* **11**, 273-281 (2003).

3. Binks BP, Whitby CP. Silica particle-stabilized emulsions of silicone oil and water: Aspects of emulsification. *Langmuir* **20**, 1130-1137 (2004).