Supporting Information

Formation and stability of nanoemulsions with mixed ionic-nonionic surfactants

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1. Droplet sizes in decane/DDAB-$C_{12}E_5$/water systems

To study the nanoemulsion formation in binary ionic-nonionic surfactant systems, the two-step dilution process was applied to systems comprising of decane/DDAB-$C_{12}E_5$/water with different DDAB molar ratios. Apparent nanoemulsion droplet sizes were determined by dynamic light scattering (DLS), shown in Figure S1.

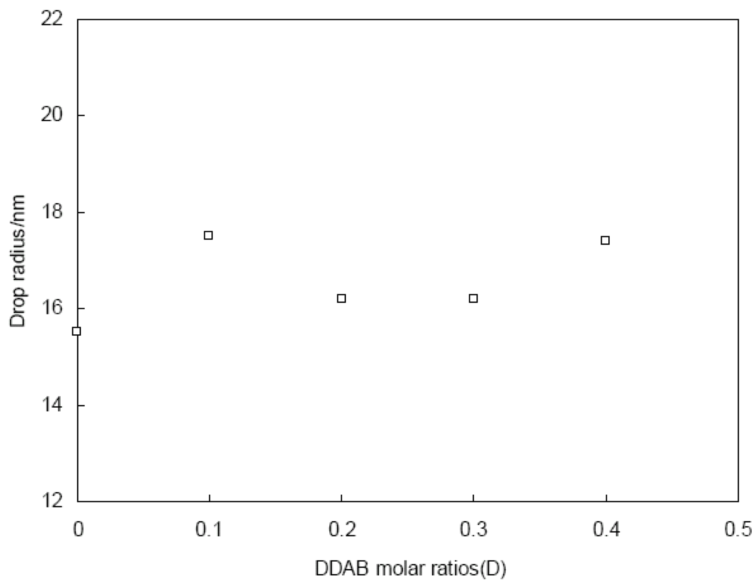

Fig. S1 Effect of DDAB molar ratio (*D*) on nanoemulsion droplet size at 25 °C by DLS.

2. SANS results

SANS data were fitted with a combination of a polydisperse core-shell model and a Hayter Penfold $S(Q)$; and associated parameters are shown in Table S1, S2 and S3. The linear relationship between the volume fraction ϕ and scale factors (SF) can be seen in Figure S2.

Table S1. The parameters obtained from analyses of SANS data with different DDAB molar ratios (D), as described in the text[a]

Parameters \ D	0	0.1	0.2	0.3	0.4
$SF/10^{-6}$	3.3	2.9	4.0	3.3	4.3
R_c^{av}/nm	9.2	8.1	8.5	8.8	8.4
σ/R_c	0.22	0.20	0.20	0.21	0.23
$R_{S(Q)}$	123	100	123	100	94
$\phi_{S(Q)}$	0.03	0.03	0.03	0.03	0.03
Z	2	27	32	50	35
$\kappa/10^{-3}$	0	2.9	3.6	8.0	6.0

[a] SF is the scale factor, R_c^{av} is the average drop radius, $R_{S(Q)}$ is an effective sphere radius, $\phi_{S(Q)}$ is apparent volume fraction for this S(Q), Z is an effective charge per droplet, and κ is an inverse Debye screening length. Uncertainties: R_c^{av} ±0.5 nm, scale factor ±0.5 x10^{-6}.

Table 2. The parameters obtained from analyses of SANS data at different volume fraction ϕ, as described in the text[a]

Parameters \ ϕ	0.12	0.06	0.03	0.015	0.006
$SF/10^{-6}$	9.8	5.6	3.3	1.6	0.6
R_c^{av}/nm	8.5	8.7	8.8	8.9	8.0
σ/R_c	0.18	0.20	0.21	0.20	0.18
$R_{S(Q)}$	113	109	100	100	98
$\phi_{S(Q)}$	0.129	0.060	0.030	0.014	0.006
Z	48	52	50	50	51
$\kappa/10^{-3}$	8.0	8.3	8.0	7.8	7.7

[a] *SF* is the scale factor, R_c^{av} is the average drop radius, $R_{S(Q)}$ is an effective sphere radius, $\phi_{S(Q)}$ is apparent volume fraction for this S(Q), *Z* is an effective charge per droplet, and κ is an inverse Debye screening length. Uncertainties: R_c^{av} ±0.5 nm, scale factor ±0.5 x10^{-6}.

Table 3. The parameters obtained from analyses of SANS data, as described in the text[a]

D	0			0.3		
Parameters	30 min	240 min	1 day	30 min	240 min	1 day
$SF/10^{-6}$	3.3	3.0	0.8	3.3	3.0	3.3
R_c^{av}/nm	9.2	8.8	9.1	8.8	8.8	8.7
σ/R_c	0.22	0.23	0.20	0.21	0.21	0.22
$R_{S(Q)}$	123	88	93	100	102	98
$\phi_{S(Q)}$	0.03	0.03	0.03	0.030	0.03	0.03
z	2	2	2	50	75	75
$\kappa/10^{-3}$	0	0	0	8.0	6.0	6.0

[a] *SF* is the scale factor, R_c^{av} is the average drop radius, $R_{S(Q)}$ is an effective sphere radius, $\phi_{S(Q)}$ is apparent volume fraction for this S(Q), *Z* is an effective charge per droplet, and κ is an inverse Debye screening length. Uncertainties: R_c^{av} ±0.5 nm, scale factor ±0.5 x10^{-6}.

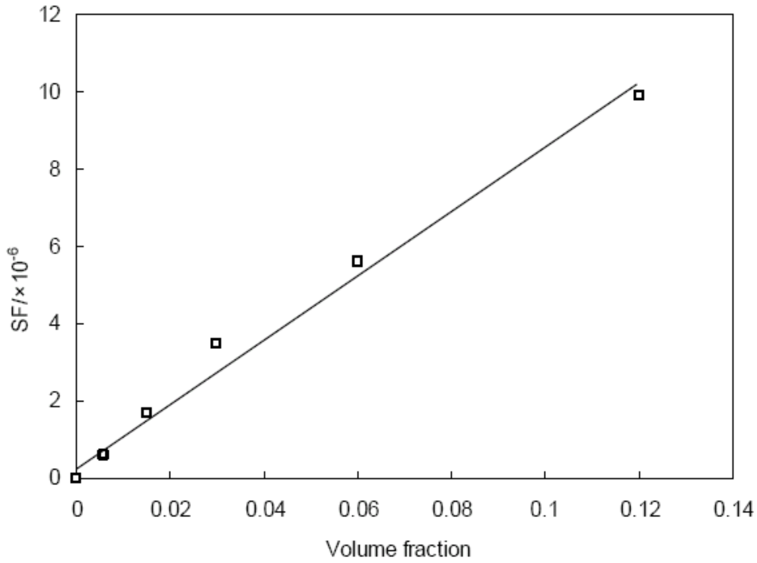

Fig. S2 Fitted SANS scale factors (*SF*) against nanoemulsion volume fraction ϕ with cationic systems at D=0.3.