Electronic Supplementary Material (ESI) for Soft Matter.
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Supplementary Information

Achieve foaming control smartly: Pre-solubilized flavor oil serve as in-situ homogeneous defoamer

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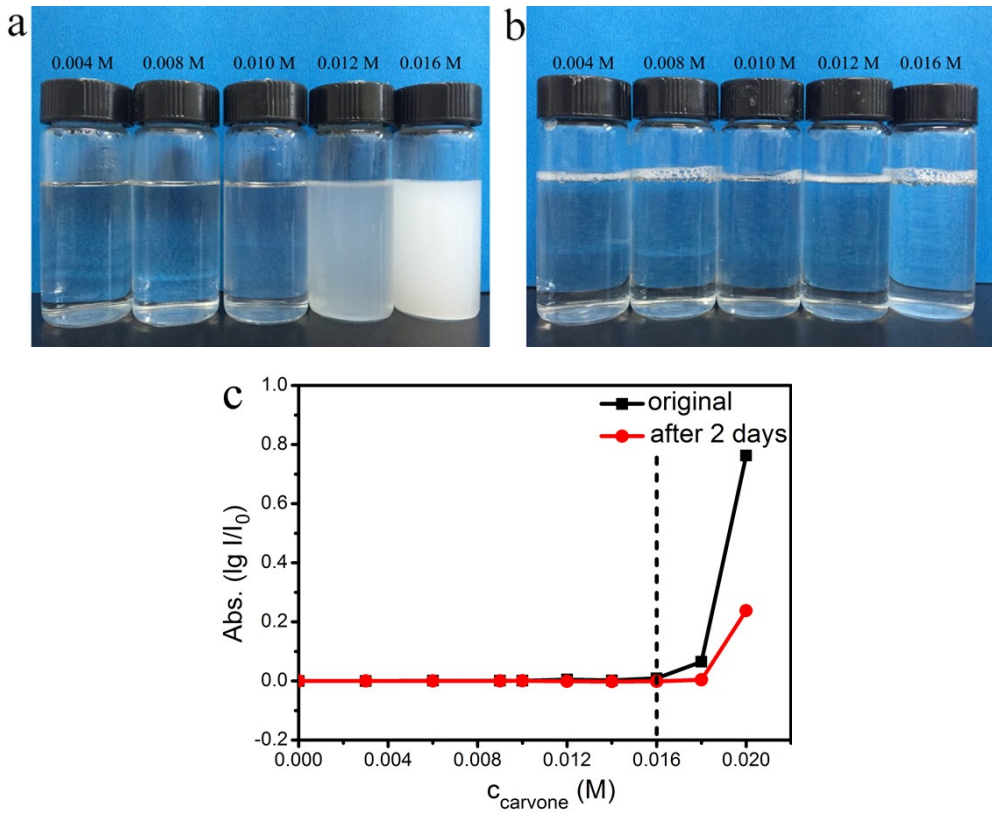

Fig S1. (a, b) The schematic of the solubilization capacity of carvone in pure water (a) and 0.01 M SDS solution (b). The label refers to the carvone concentration. (c) Variation of the absorbance of light as a function of the carvone concentration in 0.01 M SDS solution (dashed line refers to the solubility limit concentration of carvone).

SDS micellar solution could provide hydrophobic region for oil molecules to solubilize. The maximal solubility concentration of carvone in 0.01 M SDS was 0.016

M indicated by UV spectrophotometry measurment (Figure S1), while that in water is 0.008 M.

S2. Solubility location

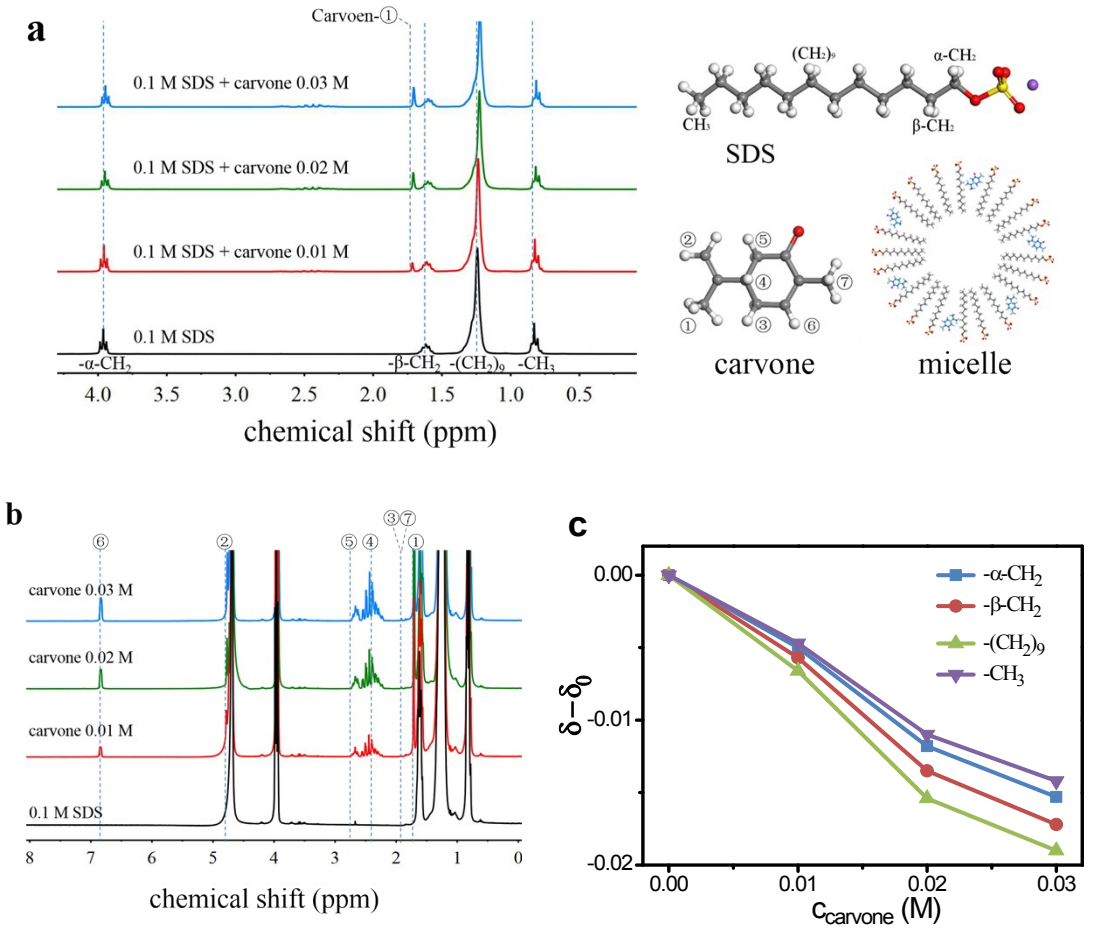

Fig S2. (a) ^{1}HNMR spectra of the SDS microemulsion systems with different concentrations of carvone. (b) Enlargement of Figure S2a to show the chemical shifts of carvone. (c) Variation of the change in chemical shifts of the different protons as a function of the concentration of carvone, c_{SDS} = 0.1 M. (δ_0 refers to the chemical shifts in pure SDS solution without carvone.)

The solubilization position of oil in the swollen micelles could be characterized by ^{1}HNMR spectra[1]. As shown in Figure S2, protons of SDS showed upfield shifts after carvone was added into the solution, which should be attributed to the aromatic ring effect[2] of carvone. The protons in four different positions in SDS molecule showed different variations in chemical shift while the chemical shifts of -$(CH_2)_9$ and β-CH_2 changed the most, which indicated that the solubilized carvone molecules

arrayed among the SDS molecular tails close to the hydrophilic headgroups of SDS as shown in Figure S2a.

S3. Dynamic foam stability

Dynamic foam stability[3, 4] was measured by a Brookfield RS CC plus rheometer with a paddle rotor (10 r/s) as the overall foam viscosity decreased due to foam drainage and collapse process. Foaming process was started by blowing nitrogen (0.1 L/min), and stopped once the rotator was drowned by the foam column. The decrease slope and the end point of the decay curve correspondingly referred to the decay speed and the disappearance of foam volume. Foam generated by 0.01 M SDS solution maintained a high overall apparent viscosity under disturbance and lasted for over 400 min while the foam life time decreased significantly as carvone concentration increased. In conclusion, carvone showed strong defoaming property.

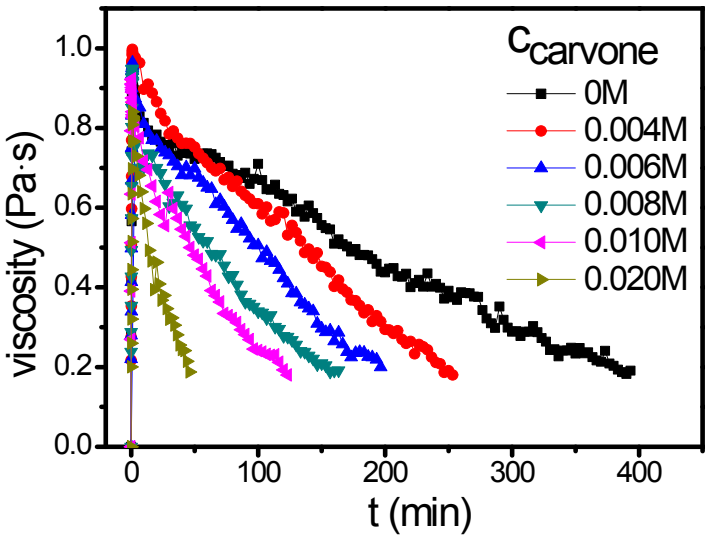

Fig S3. Dynamic foam stability with varying carvone concentration.

S4. Molecular simulation results of the adsorption layer of pure SDS

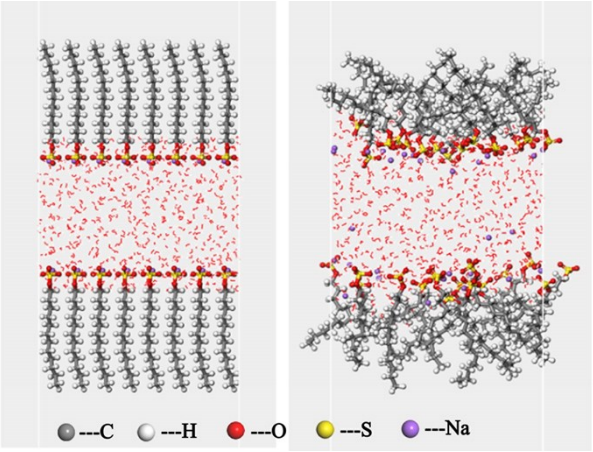

Fig S4. Illustrative diagrams of the initial model (left) and that after equilibrium (right) in molecular dynamics simulation of the interfacial layer of foam film composed of SDS molecules.

S5. Schematic diagram of DLS measurement

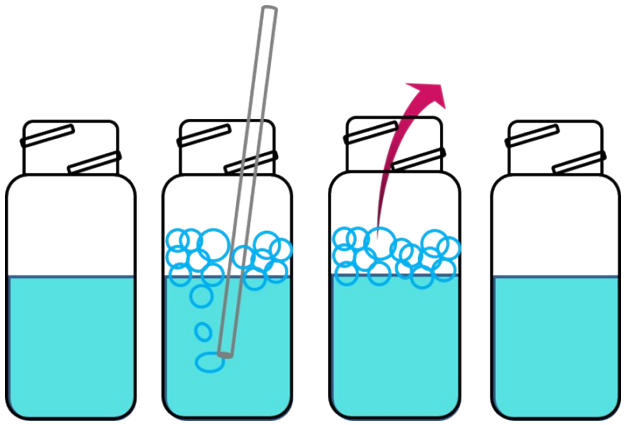

Fig S5. Schematic diagram of the handling process in DLS measurement.

References

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