

Electronic supplementary information

**Exploring the surface properties of mixed surfactants coated
aqueous aerosols**

Junyao Li, Siyang Li, Shumin Cheng, Narcisse T. Tsona and Lin Du*

Environment Research Institute, Shandong University, Binhai Road 72, Qingdao,
266237, China

*Corresponding author: Environment Research Institute, Shandong University, Binhai
Road 72, Qingdao, 266237, China

Email: lindu@sdu.edu.cn; Tel: +86-532-58631980

Table S1 Lift-off area (A_{lift}) of the surface pressure, collapse pressure (π_{collapse}) and the corresponding areas (A_{collapse}) for π -A isotherm of SA/chol and OA/chol systems at the air-sea water surface.

system	Fatty acids mixing ratio	A_{lift}	π_{collapse}	A_{collapse}
SA/chol	1:0	32	43	19
	9:1	35	39	20
	7:3	36	41	24
	1:1	41	41	32
	3:7	47	28	37
	0:1	52	32	45
OA/chol	1:0	58	35	24
	9:1	57	29	23
	7:3	54	35	30
	1:1	47	37	29
	3:7	50	39	32
	0:1	52	32	45

Table S2 Mean molecular area ($\text{\AA}^2/\text{molecule}$) of the mixed monolayer with different SA mole fractions at selected surface pressure (mN/m).

Pressure X_{SA}	5	10	15	20	25
0	48.89	48.08	47.45	46.76	46.21
0.3	42.47	41.20	40.13	38.97	37.45
0.5	37.93	37.01	36.28	35.47	34.94
0.7	31.63	30.19	28.96	27.67	26.79
0.9	29.05	26.35	24.33	22.92	22.15
1	27.10	25.32	23.71	22.28	21.54

Table S3 Mean molecular area ($\text{\AA}^2/\text{molecule}$) of the mixed monolayer with different OA mole fractions at selected surface pressure (mN/m).

Pressure X_{OA}	5	10	15	20	25
0	48.98	48.03	47.46	46.81	46.22
0.3	43.39	41.79	40.48	38.96	37.65
0.5	39.90	37.65	36.06	34.77	33.22
0.7	43.53	40.04	37.79	35.97	34.16
0.9	43.90	37.80	33.08	30.25	27.56
1	46.08	39.65	35.63	32.43	29.81

Table S4 Excess molecular area (ΔA_{exc} , in units of $\text{\AA}^2/\text{molecule}$) of the mixed monolayer with different SA mole fractions at selected surface pressure (mN/m).

X_{SA} \ Pressure	5	10	15	20	25
0	0	0	0	0	0
0.3	0.25	-0.04	-0.21	-0.50	-1.33
0.5	-0.23	0.19	0.59	0.88	1.07
0.7	-2.12	-2.03	-2.03	-1.99	-2.12
0.9	-0.36	-1.37	-1.77	-1.84	-1.87
1	0	0	0	0	0

Table S5 Excess molecular area (ΔA_{exc} , in units of $\text{\AA}^2/\text{molecule}$) of the mixed monolayer with different OA mole fractions at selected surface pressure (mN/m).

X_{SA} \ Pressure	5	10	15	20	25
0	0	0	0	0	0
0.3	-4.55	-3.89	-3.56	-3.52	-3.66
0.5	-7.52	-6.16	-5.43	-4.80	-4.71
0.7	-3.39	-2.24	-1.48	-0.87	-0.44
0.9	-0.75	-1.15	-1.62	-1.55	-1.64
1	0	0	0	0	0

Table S6 Excess Gibb free energies (ΔG_{exc} , in units of J/mol) of the mixed monolayer with different SA mole fractions at selected surface pressure (mN/m).

X_{SA} \ Pressure	5	10	15	20	25
0	0	0	0	0	0
0.3	0.12	0.40	-0.11	-1.73	-5.94
0.5	-1.70	-1.12	1.67	5.84	11.09
0.7	-10.97	-21.30	-31.15	-40.33	-50.95
0.9	-0.56	-5.16	-13.15	-22.38	-31.82
1	0	0	0	0	0

Table S7 Excess Gibb free energies (ΔG_{exc} , in units of J/mol) of the mixed monolayer with different OA mole fractions at selected surface pressure (mN/m).

X_{SA} \ Pressure	5	10	15	20	25
0	0	0	0	0	0
0.3	-26.25	-47.68	-65.99	-82.98	-101.02
0.5	-43.42	-76.98	-106.48	-130.80	-155.98
0.7	-20.57	-34.58	-43.87	-49.65	-52.58
0.9	-3.13	-7.74	-14.46	-22.62	-30.17
1	0	0	0	0	0

Table S8 Assignments of main vibration bands (cm^{-1}) for SA (or OA) mixed monolayers at the air-sea water surface.

system	fatty acids							
	mole fraction	$\nu(\text{C}=\text{C})$	$\nu_{\text{a}}(\text{CH}_2)$	$\nu_{\text{s}}(\text{CH}_2)$	$\nu(\text{C}=\text{O})$	$\nu_{\text{a}}(\text{COO})$	$\nu_{\text{s}}(\text{COO})$	$\delta(\text{CH}_2)$
SA/chol	1	-	2916	2850	1701	1562,1519	1392	1467
	0.9	-	2919	2850	1701	1562,1519	1392	1467
	0.8	-	2919	2850	1701	1562,1519	1392	1467
	0.7	-	2919	2850	1701	1562,1519	1392	1467
OA/chol	1	3004	2923	2855	1701	1562,1519	1391	1468
	0.9	3000	2923	2850	1697	1565,1519	1395	1468
	0.8	3016	2923	2858	1704	1554,1512	1400	1468
	0.7	3005	2923	2855	1709	1565,1516	1400	1468

Table S9 Ratios of peak intensity of CH_2 antisymmetric stretching bands to the symmetric stretching bands ($I_{\text{as}}/I_{\text{s}}$) for SA (or OA) mixed monolayers at the air-sea water surface.

X_{A}^{a} \ system	1	0.9	0.8	0.7
SA/chol	1.18	1.19	1.25	1.24
OA/chol	1.23	1.36	1.65	1.88

^a X_{A} denotes the mole fraction of fatty acids in the mixtures.