REFERENCES

Adamson, A.W. (1990) Physical Chemistry of Surfaces. 5th ed., New York: John Wiley & Sons.

Amirfazil, A., Keshavarz, A., Zhang, L., and Neumann, A.W. (2003) Determination of line tension for systems near wetting. Journal of Colloid and Interface Science, 265, 152-160.

Balasuwatthi, P., Dechabumphen, N., Saiwan, C., and Scamehorn, J.F. (2004) Contact angle of surfactant solutions on precipitated surfactant surfaces. II. Effect of surfactant structure, presence of a subsaturated surfactant, pH, and counterion/surfactant ratio. Journal of Surfactants and Detergents, 7, 31-40.

Basu, S., Nandakumar, K., and Masliyah, J.H. (1998) Effect of NaCl and MIBC/kerosene on bitumen displacement by water on glass surface Colloids and Surfaces A: Physicochemical and Engineering Aspects, 136, 71-80.

Dalal, E.N. (1987) Calculation of solid surface tensions. Langmuir, 3, 1009-1015.

Deshpande, S., Shiau, B.J., Wade, D. Sabatini, D.A., and Harwell, J.H. (1999) Surfactant selection for enhancing ex situ soil washing. Water Research, 33(2), 351-360.

Dionisio, M. and Sotomayor, J. (2000) A surface chemistry experiment using an inexpensive contact angle goniometer. Journal of Chemical Education, 77(1), 59-62.

Erbil, H.Y., McHale, G., Rowan, S.M., and Newton, M.I. (1999) Determination of the receding contact angle of sessile drops on polymer surfaces by evaporation. Langmuir, 15, 7378-7385.

Extrand, C.W. (2003) A thermodynamic model for wetting free energies from contact angle. Langmuir, 19, 646-649.

Fillipi, B.R., Brant, L.W., Scamehorn, J.F., and Christian, S.D. (1999) Use of micellar-enhanced ultrafiltration at low surfactant concentrations and with anionic-nonionic surfactant mixtures. Journal of Colloid and Interface Science, 213, 68-80.

Ghannam, M.T., (2002) Wetting behavior of aqueous solutions of polyacrylamide over polyethylene substrate. Journal of Chemical Engineering, 47, 274-277.

Hauthal, H.G., Jurges, P., Mohle, L., and Ohlerich, U. (1999) Synergism in the wetting properties of ternary surfactant mixtures. Journal of Surfactants and Detergents, 2(2), 175-180.

Hanna, H.S. and Somasundaran, P. (1979) Adsorption of sulfonates on reservoir rocks, Journal of Colloid Interface Science, 19, 221.

Janczuk, B., Wojcik, W., and Zdiziennicka, A. (1998) Wettability and surface freeenergy of glass in the presence of cetyltrimethylammoniumbromide. Materials Chemistry and Physics, 58, 166-171.

Kabza, K., Gestwicki, J.E., and McGrath, J.L. (2000) Contact angle goniometry as a tool for surface tension measurements of solids, using Zisman plot method. Journal of Chemical Education, 77(1), 63-65.

Kumar, N., Varanasi, K., Tilton, R.D., and Garoff, S. (2003) Surfactant self-assembly ahead of the contact line on a hydrophobic surface and its implications for wetting. Langmuir, 19, 5366-5373.

Kwok, D.Y., Gietzelt, T., Grundke, K., Jacobasch, H.J., and Neumann, A.W. (1997) Contact angle measurements and contact angle interpretation. 1. Contact angle measurements by axisymetric drop analysis and goniometer sessile drop technique. Langmuir, 13, 2880-2894.

Kwok, D.Y., Lam, C.N.C., Li, A., Leung, A., Wu, R., Mok, E., and Neumann, A.W. (1998) Measurement and interpreting contact angles: a complex issue. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 142, 219-235.

Lin, F.H.Y. and Li, D. (1995) The Effect of surface heterogeneity on the drop size dependence of contact angles. Chemical Engineering Science, 50(16), 2633-2639.

Luangpirom. N., Dechabumphen, N., Saiwan, C., and Scamehorn, J.F. (2001) Contact angle of surfactant solutions on precipitated surfactant surfaces. Journal of Surfactants and Detergents, 4(4), 367-373.

Luokkala, B.B., Garoff, S., Tilton, R.D., and Suter, R.M. (2001) Interfacial structure and rearrangement of nonionic surfactants near a moving contact line Langmuir, 17, 5917-5923.

Marmur, A. (1996) Equilibrium contact angles: Theory and measurement. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 116, 55-61.

McHale, G., Erbil, H.Y., Newton, M.I., and Natterer, S. (2001) Analysis of shape distortions in sessile drops. Langmuir,17, 6995-6998.

Modaressi, H. and Garnier, G. (2002) Mechanism of wetting and adsorption of water droplets on sized papers: Effects of chemical and physical heterogeneity Langmuir, 18, 642-649.

Nylund, J., Sundberg, K., Shen, Q., and Rosenholm, J.B. (1998) Determination of surface energy and wettability of wood resins. Colloids and Surfaces, 133, 261-268.

Qu, D., Suter, R., and Garoff, S. (2002) Surfactant self-assemblies controlling spontaneous dewetting. Langmuir, 18, 1649-1657.

Rodriguez, C.H., Chintanasathien, C., Scamehorn, J.F., Saiwan, C., and Chavadej, S. (1998) Precipitation in solutions containing mixtures of synthetic anionic surfactant and soap. I. Effect of Sodium octanoate on hardness tolerance of sodium dodecyl sulfate. Journal of Surfactants and Detergents, 1(3), 321-328.

Rosen, M.J. (1989) Surfactant and Interfacial Phenomena. 2nd ed., New York: John Wiley & Sons.

Sefiane, K., Tadrist, L., and Douglas, M. (2003) Experimental study of evaporating water-ethanol mixture sessile drop: Influence of concentration. International Journal of Heat and Mass Transfer, 46, 4527-4534.

Shafrin, G. and Zisman, W.A., (1967) Critical surface tension for spreading on a liquid substrate. Journal of Physical Chemistry, 71, 1309-1312.

Siboni, S., Volpe, C.D., Maniglio, D., and Brugnara, M. (2004) The solid surface free energy calculation II. The limits of the Zisman and of the 'equation of state' approaches. Journal of Colloid and Interface Science, 271, 454-472.

Sis, H. and Chander, S. (2003) Adsorption and contact angle of single and binary mixtures of surfactants on apatite. Minerals Engineering, 16, 839-848.

Starkweather, B.A., Zhang, X.S., and Counce, R.M. (2000) An experimental study of the change in the contact angle of an oil on solid surface. Industrial and Engineering Chemistry Research, 39, 362-366.

Woodward, J.T., Gwin, H., and Schwartz, D.K. (2000) Contact angle on surfaces with mesoscopic chemical heterogeneity. Langmuir, 16, 2957-2961.

Zdziennicka. A., Janczuk, B., and Wojcik, W. (2003) Wettability of polytetrafluoroethylene by aqueous solutions of two anionic surfactant mixtures. Journal of Colloid and Interface Science, 268, 200-207.

Zhou, Q., Wu, Y., and Rosen, M.J. (2003) Surfactant-surfactant molecular interaction in mixed monolayers at a high hydrophobic solid/aqueous solution interface and their relationship to enhanced spreading on the solid substrate. Langmuir, 19, 7955-7962.

APPENDICES

Appendix A Experimental data of contact angle study.

Table A1 Contact angle of saturated CaC_{12} solution containing subsaturated NaDS in the system with various concentrations of NaCl added

NaDS concentration (mM)	Contact Angle		
	0.00 M NaCl	0.01 M NaCl	0.03 M NaCl
0	89.9	83.7	81.4
0.5	85.2	74.1	72.4
1.0	77.7	71.5	63.5
1.5	70.8	65.5	59.7
2.0	65.9	57.7	53.6
2.5	59.4	53.9	45.5
3.0	54.4	50.5	41.2
3.5	53.0	43.9	40.7
4.0	51.2	41.3	40.9
4.5	49.3	39.9	40.9
5.0	47.5	40.0	41.0
5.5	46.5	40.0	41.5
6.0	44.0	39.9	41.4
6.5	43.5	40.4	42.1
7.0	43.0	41.0	41.9
7.5	43.0	41.3	42.4
8.0	43.1	41.9	42.3
8.5	43.0	42.5	42.6
9.0	43.3	42.7	42.3
9.5	43.9	42.9	42.4
10.0	43.8	43.0	42.3

NaDS concentration (mM)	Contact Angle		
	0.00 M NaCl	0.01 M NaCl	0.03 M NaCl
11.0	44.2	43.3	42.5
12.0	43.9	43.2	42.8
13.0	44.6	43.9	43.0
14.0	45.0	44.1	43.2
15.0	44.9	43.8	42.7

Table A2 Contact angle of saturated CaC_{12} solution containing subsaturated NPE

NPE concentration (μM)	Contact Angle
0	89.2
10	86.4
20	84.1
30	78.9
40	70.9
50	69.4
60	68.8
70	66.3
80	62.1
90	62.3
100	63.1
110	62.0
120	63.6
130	63.4
140	64.4
150	63.3
160	64.2

NPE concentration (μM)	Contact Angle
170	62.8
180	64.0
190	63.3
200	63.2

Table A3 Contact angle of saturated CaC_{12} solution containing subsaturated NaC_8

NaC_8 concentration (mM)	Contact Angle
0	85.6
20	70.0
40	62.1
60	50.8
80	46.5
100	45.6
120	45.3
140	41.8
160	40.7
180	38.3
200	36.6
220	35.8
240	33.9
260	33.5
280	31.5
300	31.2
320	31.5
340	31.9
360	32.1

NaC_8 concentration (mM)	Contact Angle
380	32.2
400	31.1

Appendix B Experimental data of surface tension measurement.

Table B1 Surface tension of aqueous solution of NaDS

NaDS concentration (mM)	Surface Tension (mN/m)
0	72.34
0.5	68.73
1.0	66.34
1.5	63.47
2.0	60.57
2.5	57.30
3.0	55.41
3.5	52.17
4.0	50.29
4.5	48.87
5.0	46.83
5.5	45.11
6.0	43.73
6.5	41.55
7.0	40.67
7.5	39.62
8.0	38.47
8.5	38.23
9.0	38.64
9.5	38.21
10.0	38.16
11.0	38.47
12.0	38.22
13.0	38.27

NaDS concentration (mM)	Surface Tension (mN/m)
14.0	38.48
15.0	38.28

Table B2 Surface tension of saturated CaC_{12} solution containing subsaturated NaDS in the system with various NaCl added

NaDS concentration (mM)	Surface Tension (mN/m)		
	0.00 M NaCl	0.01 M NaCl	0.03 M NaCl
0	70.42	70.41	70.58
0.5	62.09	55.60	49.99
1.0	55.09	49.65	46.24
1.5	51.54	46.74	41.44
2.0	48.71	42.90	39.33
2.5	45.19	41.67	36.05
3.0	41.88	40.34	34.38
3.5	40.37	38.32	34.40
4.0	39.85	36.63	34.51
4.5	38.75	34.82	34.59
5.0	38.26	34.80	34.87
5.5	37.35	34.88	34.73
6.0	35.95	34.96	34.72
6.5	36.05	35.08	34.75
7.0	35.37	35.11	34.57
7.5	35.38	35.25	34.39
8.0	35.41	35.42	34.52
8.5	35.72	35.23	34.49
9.0	36.05	35.32	34.66

NaDS concentration (mM)	Surface Tension (mN/m)		
	0.00 M NaCl	0.01 M NaCl	0.03 M NaCl
9.5	36.62	35.35	34.50
10.0	37.28	35.33	34.26
11.0	37.53	35.53	34.78
12.0	37.10	35.53	34.70
13.0	37.22	35.56	34.34
14.0	37.19	35.93	34.14
15.0	37.49	35.68	34.35

Table B3 Surface tension of aqueous solution of NPE

NPE concentration (μM)	Surface Tension (mN/m)
0	72.51
10	63.77
20	59.37
30	49.49
40	42.73
50	39.56
60	38.34
70	35.03
80	33.46
90	32.54
100	32.80
110	32.74
120	32.47
130	32.25
140	32.24

NPE concentration (μM)	Surface Tension (mN/m)
150	32.22
160	32.15
170	32.15
180	32.25
190	32.11
200	32.15

Table B4 Surface tension of saturated CaC_{12} solution containing subsaturated NPE

NPE concentration (μM)	Surface Tension (mN/m)
0	71.26
10	54.06
20	44.87
30	41.91
40	37.46
50	36.50
60	34.57
70	32.99
80	32.54
90	32.39
100	32.09
110	32.10
120	32.09
130	32.06
140	32.07
150	32.01
160	32.11

NPE concentration (μM)	Surface Tension (mN/m)
170	32.09
180	32.16
190	32.08
200	32.11

Table B5 Surface tension of aqueous solution of NaC_8

NaC_8 concentration (mM)	Surface Tension (mN/m)
0	72.38
20	66.21
40	58.30
60	51.96
80	48.04
100	44.18
120	41.23
140	36.87
160	36.15
180	33.85
200	31.92
220	30.17
240	28.98
260	27.20
280	26.69
300	26.19
320	26.22
340	26.66
360	26.84

NaC_8 concentration (mM)	Surface Tension (mN/m)
380	27.86
400	28.27

Table B6 Surface tension of saturated CaC_{12} solution containing subsaturated NaC_8

NaC_8 concentration (mM)	Surface Tension (mN/m)
0	70.80
20	60.93
40	53.95
60	49.01
80	46.34
100	41.73
120	39.10
140	36.83
160	34.45
180	32.59
200	31.07
220	29.73
240	28.06
260	27.37
280	26.12
300	25.62
320	26.08
340	26.55
360	26.74
380	27.60
400	28.77

Appendix C Experimental data of adsorption study.

Table C1 Adsorption of NaDS on CaC_{12} in the system without NaCl added

Initial NaDS concentration (mM)	Equilibrium NaDS concentration (mM)	NaDS Adsorbed (μmole/g)
1.0	0.85	5.81
1.5	1.29	8.40
2.0	1.62	15.20
2.5	2.03	18.64
3.0	2.41	23.49
3.5	2.68	32.77
4.0	3.04	38.56
4.5	3.45	42.00
5.0	3.88	44.80
5.5	4.17	53.20
6.0	4.46	61.60
6.5	4.87	65.20
7.0	5.14	74.57
7.5	5.61	75.67
8.0	6.04	78.55
8.5	6.43	82.80
9.0	6.90	84.00
9.5	7.20	91.92
10.0	7.81	87.60
11.0	8.70	92.00
12.0	9.65	94.00
13.0	10.54	98.40
14.0	11.48	100.80

Initial NaDS concentration (mM)	Equilibrium NaDS concentration (mM)	NaDS Adsorbed (μmole/g)
15.0	12.39	104.40

Table C2 Adsorption of NaDS on CaC_{12} in the system with 0.01 NaCl added

Initial NaDS concentration (mM)	Equilibrium NaDS concentration (mM)	NaDS Adsorbed (μmole/g)
1.0	0.64	14.4
1.5	1.11	15.6
2.0	1.63	14.8
2.5	1.97	21.2
3.0	2.36	25.6
3.5	2.61	35.6
4.0	2.73	50.8
4.5	3.07	57.2
5.0	3.44	62.4
5.5	3.90	64.0
6.0	4.16	73.6
6.5	4.58	76.8
7.0	5.08	76.8
7.5	5.49	80.4
8.0	5.94	82.4
8.5	6.36	85.6
9.0	6.78	88.8
9.5	7.23	90.8
10.0	7.70	92.0
11.0	8.47	101.2

Initial NaDS concentration (mM)	Equilibrium NaDS concentration (mM)	NaDS Adsorbed (μmole/g)
12.0	9.48	100.8
13.0	10.18	112.8
14.0	11.16	113.6
15.0	12.09	116.4

Table C3 Adsorption of NaDS on CaC_{12} in the system with 0.03 NaCl added

Initial NaDS concentration (mM)	Equilibrium NaDS concentration (mM)	NaDS Adsorbed (μmole/g)
1.0	0.59	16.31
1.5	0.70	32.15
2.0	1.09	36.53
2.5	1.30	47.95
3.0	1.69	52.34
3.5	2.01	59.68
4.0	2.38	64.98
4.5	2.93	62.80
5.0	3.23	70.98
5.5	3.71	71.71
6.0	4.21	71.45
6.5	4.58	76.73
7.0	5.01	79.65
7.5	5.46	81.62
8.0	5.90	83.90
8.5	6.35	86.16
9.0	6.76	89.57

Initial NaDS concentration (mM)	Equilibrium NaDS oncentration (mM)	NaDS Adsorbed (μmole/g)
9.5	7.31	87.57
10.0	7.75	89.92
11.0	8.43	102.80
12.0	9.30	108.09
13.0	10.29	108.53
14.0	11.17	113.03
15.0	11.81	127.40

Table C4 Adsorption of NPE on CaC_{12} surface

Initial NPE concentration (μM)	Equilibrium NPE concentration (μM)	NPE Adsorbed (μmole/g)
20	16.43	0.14
30	21.66	0.33
40	28.23	0.47
50	36.02	0.56
60	38.76	0.85
70	43.47	1.06
80	45.56	1.38
90	55.33	1.39
100	60.91	1.56
110	69.51	1.62
120	71.31	1.95
130	74.57	2.22
140	79.69	2.41
150	83.93	2.64

Initial NPE concentration (μM)	Equilibrium NPE concentration (μM)	NPE Adsorbed (μmole/g)
160	92.71	2.69
170	105.62	2.58
180	117.88	2.48
190	125.03	2.60
200	134.28	2.63

Appendix D Correlation of measured contact angle and liquid/vapor interfacial tension to Young's equation.

Table D1 The contact angle as a function of reciprocal of liquid/vapor interfacial tension of mixed surfactant solution between saturated CaC_{12} and subsaturated NaDS in the system without NaCl added

NaDS concentration (mM)	cos θ	$1/\gamma_{LV}$
0	0.0034	0.0142
0.5	0.0853	0.0161
1.0	0.2146	0.0182
1.5	0.3295	0.0194
2.0	0.4097	0.0205
2.5	0.5095	0.0221
3.0	0.5832	0.0239
3.5	0.6029	0.0248
4.0	0.6270	0.0251
4.5	0.6524	0.0258
5.0	0.6765	0.0261
5.5	0.6893	0.0268
6.0	0.7196	0.0278
6.5	0.7256	0.0277
7.0	0.7322	0.0283
7.5	0.7316	0.0283
8.0	0.7310	0.0282
8.5	0.7316	0.0280
9.0	0.7280	0.0277
9.5	0.7214	0.0273
10.0	0.7226	0.0268
11.0	0.7178	0.0266

NaDS concentration (mM)	cos θ	$1/\gamma_{LV}$
12.0	0.7214	0.0270
13.0	0.7129	0.0269
14.0	0.7080	0.0269
15.0	0.7092	0.0267

Table D2 The contact angle as a function of reciprocal of liquid/vapor interfacial tension of mixed surfactant solution between saturated CaC_{12} and subsaturated NaDS in the system with 0.01 M NaCl added

NaDS concentration (mM)	cos θ	$1/\gamma_{LV}$
0	0.1113	0.0142
0.5	0.2746	0.0180
1.0	0.3187	0.0201
1.5	0.4152	0.0214
2.0	0.5355	0.0233
2.5	0.5903	0.0240
3.0	0.6371	0.0248
3.5	0.7214	0.0261
4.0	0.7515	0.0273
4.5	0.7674	0.0287
5.0	0.7668	0.0287
5.5	0.7668	0.0287
6.0	0.7680	0.0286
6.5	0.7618	0.0285
7.0	0.7549	0.0285
7.5	0.7515	0.284
8.0	0.7515	0.0282

NaDS concentration (mM)	cos θ	$1/\gamma_{LV}$
8.5	0.7381	0.0284
9.0	0.7358	0.0283
9.5	0.7334	0.0283
10.0	0.7322	0.0283
11.0	0.7286	0.0281
12.0	0.7298	0.0281
13.0	0.7208	0.0281
14.0	0.7190	0.0278
15.0	0.7220	0.0280

Table D3 The contact angle as a function of reciprocal of liquid/vapor interfacial tension of mixed surfactant solution between saturated CaC_{12} and subsaturated NaDS in the system with 0.03 M NaCl added

NaDS concentration (mM)	cos θ	$1/\gamma_{LV}$
0	0.1502	0.0142
0.5	0.3026	0.0200
1.0	0.4472	0.0216
1.5	0.5050	0.0241
2.0	0.5945	0.0254
2.5	0.7012	0.0277
3.0	0.7532	0.0291
3.5	0.7581	0.0291
4.0	0.7564	0.0290
4.5	0.7565	0.0289
5.0	0.7549	0.0287
5.5	0.7498	0.0288

NaDS concentration (mM)	cos θ	$1/\gamma_{LV}$
6.0	0.7504	0.0288
6.5	0.7422	0.0288
7.0	0.7443	0.0289
7.5	0.7387	0.0291
8.0	0.7402	0.0290
8.5	0.7364	0.0290
9.0	0.7405	0.0289
9.5	0.7393	0.0290
10.0	0.7402	0.0292
11.0	0.7375	0.0288
12.0	0.7346	0.0288
13.0	0.7313	0.0291
14.0	0.7298	0.0293
15.0	0.7352	0.0291

Table D4 The contact angle as a function of reciprocal of liquid/vapor interfacial tension of mixed surfactant solution between saturated CaC_{12} and NPE

NPE concentration (μM)	cos θ	$1/\gamma_{LV}$
0	0.0148	0.0140
10	0.0641	0.0185
20	0.1035	0.0223
30	0.1938	0.0239
40	0.3284	0.0267
50	0.3530	0.0274
60	0.3622	0.0289
70	0.4020	0.0303

NPE concentration (μM)	cos θ	$1/\gamma_{LV}$
80	0.4679	0.0307
90	0.4653	0.0309
100	0.4529	0.0312
110	0.4700	0.0312
120	0.4451	0.0312
130	0.4477	0.0312
140	0.4326	0.0312
150	0.4493	0.0312
160	0.4352	0.0311
170	0.4581	0.0312
180	0.4394	0.0311
190	0.4493	0.0312
200	0.4509	0.0311

Table D5 The contact angle as a function of reciprocal of liquid/vapor interfacial tension of mixed surfactant solution between saturated CaC_{12} and NaC_8

NaC_8 concentration (mM)	cos θ	$1/\gamma_{LV}$
0	0.0769	0.0141
20	0.3421	0.0164
40	0.4684	0.0185
60	0.6328	0.0204
80	0.6882	0.0216
100	0.7004	0.0240
120	0.7037	0.0256
140	0.7461	0.0272
160	0.7580	0.0290

NaC_8 concentration (mM)	cos θ	$1/\gamma_{LV}$
180	0.7850	0.0307
200	0.8030	0.0322
220	0.8112	0.0336
240	0.8305	0.0356
260	0.8344	0.0365
280	0.8531	0.0383
300	0.8552	0.0390
320	0.8525	0.0383
340	0.8494	0.0377
360	0.8473	0.0374
380	0.8460	0.0362
400	0.8561	0.0348

Appendix E Calculation of solid/liquid interfacial tension.

Table E1 The reduction of solid/liquid surface tension as a function of NaDS concentration in the system without NaCl added

NaDS concentration (mM)	γ^{o}_{SL}-γ_{SL}
0.5	5.06
1.0	11.58
1.5	16.74
2.0	19.71
2.5	22.78
3.0	24.19
3.5	24.10
4.0	24.74
4.5	25.04
5.0	25.64
5.5	25.50
6.0	25.63
6.5	25.92
7.0	25.66
7.5	25.64
8.0	25.65
8.5	25.89
9.0	26.01
9.5	26.18
10.0	26.70
11.0	26.70
12.0	26.52
13.0	26.29

NaDS concentration (mM)	γ^{o}_{SL}-γ_{SL}
14.0	26.09
15.0	26.35

Table E2 The reduction of solid/liquid surface tension as a function of NaDS concentration in the system with 0.01 M NaCl added

NaDS concentration (mM)	γ^{o}_{SL}-γ_{SL}
0.5	7.43
1.0	7.99
1.5	11.57
2.0	15.13
2.5	16.76
3.0	17.86
3.5	19.81
4.0	19.69
4.5	18.88
5.0	18.84
5.5	18.91
6.0	19.01
6.5	18.89
7.0	18.67
7.5	18.65
8.0	18.53
8.5	18.16
9.0	18.15
9.5	18.09
10.0	18.03

NaDS concentration (mM)	γ^{o}_{SL}-γ_{SL}
11.0	18.05
12.0	18.09
13.0	17.80
14.0	17.99
15.0	17.92

Table E3 The reduction of solid/liquid surface tension as a function of NaDS concentration in the system with 0.03 M NaCl added

NaDS concentration (mM)	γ^{o}_{SL}-γ_{SL}
0.5	4.52
1.0	10.08
1.5	10.32
2.0	12.78
2.5	14.67
3.0	15.29
3.5	15.47
4.0	15.49
4.5	15.56
5.0	15.72
5.5	15.44
6.0	15.45
6.5	15.19
7.0	15.12
7.5	14.80
8.0	14.94
8.5	14.79

NaDS concentration (mM)	γ^{o}_{SL}-γ_{SL}
9.0	15.06
9.5	14.90
10.0	14.76
11.0	15.04
12.0	14.89
13.0	14.51
14.0	14.31
15.0	14.65

Table E4 The reduction of solid/liquid surface tension as a function of NPE concentration

NPE concentration (μM)	γ^{o}_{SL}-γ_{SL}
10	2.42
20	3.59
30	7.07
40	11.25
50	11.83
60	11.47
70	12.21
80	14.18
90	14.02
100	13.48
110	14.03
120	13.23
130	13.31
140	12.82

NPE concentration (μM)	γ^{o}_{SL}-γ_{SL}
150	13.33
160	12.92
170	13.65
180	13.08
190	13.36
200	13.43

Table E5 The reduction of solid/liquid surface tension as a function of NaC_8 concentration

NaC_8 concentration (mM)	γ^{o}_{SL}-γ_{SL}
20	15.40
40	19.82
60	25.57
80	26.45
100	23.78
120	22.07
140	22.03
160	20.67
180	20.14
200	19.51
220	18.67
240	17.86
260	17.40
280	16.84
300	16.46
320	16.79

NaC_8 concentration (mM)	γ^{o}_{SL}-γ_{SL}
340	17.11
360	17.21
380	17.91
400	19.19

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