REFERENCES

Atkin, R., Craig, V.S.J., and Biggs, S. (2000) Adsorption kinetics and structural arrangements of cationic surfactants on silica surfaces. Langmuir, 16(24), 9374-9380.

Atkin, R., Craig, V.S.J., and Biggs, S. (2001) Adsorption kinetics and structural arrangements of cetylpyridinium bromide at the silica–aqueous interface. Langmuir, 17(20), 6155-6163.

Atkin, R., Craig, V.S.J., Wanless, E.J., and Biggs, S. (2003) Mechanism of cationic surfactant adsorption at the solid–aqueous interface. Advances in Colloid and Interface Science, 103(3), 219-304.

Binks, B.P. (1999) Modern Characterization Methods of Surfactant Systems. Washington, DC: Marcel Dekker.

Biswas, S.C. and Chattoraj, D.K. (1998) Kinetics of adsorption of cationic surfactants at silica-qater interface. Journal of Colloid and Interface Science, 205(1), 12-20.

Bolze, J., Hörner, K.D., and Ballauff, M. (1996) Competitive adsorption of an anionic and a nonionic surfactant on polystyrene latex particles as monitored by small x-ray scattering. Colloid and Polymer Science, 274(12), 1099-1108.

Brinck, J., Jönsson, B., and Tiberg, F. (1998) Kinetics of nonionic surfactant adsorption and desorption at the silica–water interface: one component. Langmuir, 14(5), 1058-1071.

Campo, P., Venosa, A.D., and Suidan, M.T. (2013) Biodegradability of corexit 9500 and dispersed south louisiana crude oil at 5 and 25 °C. Environmental Science & Technology, 47(4), 1960-1967.

Capovilla, L., Labbe, P., and Reverdy, G. (1991) Formation of cationic/anionic mixed surfactant bilayers on laponite clay suspensions. Langmuir, 7(10), 2000-2003.

Caruso, F., Serizawa, T., Furlong, D.N., and Okahata, Y. (1995) Quartz crystal microbalance and surface plasmon resonance study of surfactant adsorption onto gold and chromium oxide surfaces. Langmuir, 11(5), 1546-1552.

Clint, J.H. (1992) Surfactant Aggregation. New York: Blackie.

Colombié, D., Landfester, K., Sudol, E.D., and El-Aasser, M.S. (2000) Competitive adsorption of the anionic surfactant SLS and the nonionic surfactant triton X-405 on polystyrene latex particles. Langmuir, 16(21), 7905-7913.

Curwen, T.D., Warner, J.A., Bain, C.D., Compton, R.G., and Eve, J.K. (2007) Adsorption kinetics in a dual-inlet channel flow cell: I. cetyl pyridinium chloride on hydrophilic silica. Journal of Physical Chemistry C, 111(33), 12289-12304.

Denoyel, R. (2002) Microcalorimetry and ellipsometry in surfactant adsorption studies. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 205(1–2), 61-71.

Ducker, W.A. and Grant, L.M. (1996) Effect of substrate hydrophobicity on surfactant surface–aggregate geometry. Journal of Physical Chemistry, 100(28), 11507-11511.

Ducker, W.A. and Wanless, E.J. (1996) Surface-aggregate shape transformation. Langmuir, 12(24), 5915-5920.

Esumi, K., Maedomari, N., and Torigoe, K. (2001) Adsolubilization of 2-naphthol by binary mixtures of cationic and nonionic surfactants on silica. Langmuir, 17(23), 7350-7354.

Esumi, K., Sakamoto, Y., and Meguro, K. (1990) Mixed bilayers of anionic and nonionic surfactants on alumina. Journal of Colloid and Interface Science, 134(1), 283-288.

Fainerman, V.B., Aksenenko, E.V., Petkov, J.T., and Miller, R. (2011) Equilibrium adsorption layer characteristics of mixed sodium dodecyl sulphate/Triton solutions. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 385(1–3), 139-143.

Farn, R.J. (2008) Chemistry and Technology of Surfactants. Oxford: John Wiley.

Foo, K.Y. and Hameed, B.H. (2010) Insights into the modeling of adsorption isotherm systems. Chemical Engineering Journal, 156(1), 2-10.

Fragneto, G., Li, Z.X., Thomas, R.K., Rennie, A.R., and Penfold, J. (1996) A neutron reflectivity study of the adsorption of aerosol-OT on self-assembled monolayers on silicon. Journal of Colloid and Interface Science, 178(2), 531-537.

Garbassi, F. and Occhiello, E. (1998) Polymer Surfaces: From Physics to Technology. New York: John Wiley.

Giles, C.H., Smith, D., and Huitson, A. (1974) A general treatment and classification of the solute adsorption isotherm. I. Theoretical. Journal of Colloid and Interface Science, 47(3), 755-765.

Grant, L.M., Ederth, T., and Tiberg, F. (2000) Influence of surface hydrophobicity on the layer properties of adsorbed nonionic surfactants. Langmuir, 16(5), 2285-2291.

Grillo, I. and Penfold, J. (2011) Self-assembly of mixed anionic and nonionic surfactants in aqueous solution. Langmuir, 27(12), 7453-7463.

Gutig, C., Grady, B.P., and Striolo, A. (2008) Experimental studies on the adsorption of two surfactants on solid−aqueous interfaces: adsorption isotherms and kinetics. Langmuir, 24(9), 4806-4816.

Howard, S.C. and Craig, V.S.J. (2009) Very slow surfactant adsorption at the solid-liquid interface is due to long lived surface aggregates. Soft Matter, 5(16), 3061-3069.

Huang, L., Maltesh, C., and Somasundaran, P. (1996) Adsorption behavior of cationic and nonionic surfactant mixtures at the alumina–water interface. Journal of Colloid and Interface Science, 177(1), 222-228.

Huang, Z., Yan, Z., and Gu, T. (1989) Mixed adsorption of cationic and anionic surfactants from aqueous solution on silica gel. Colloids and Surfaces, 36(3), 353-358.

Ivanova, N.I., Parfenova, A.M., and Amelina, E.A. (2007) Interactions between nonpolar surfaces in mixed solutions of cationic and nonionic surfactants. Moscow University Chemistry Bulletin, 62(3), 147-151.

Karlsson, P.M., Palmqvist, A.E.C., and Holmberg, K. (2008) Adsorption of sodium dodecyl sulfate and sodium dodecyl phosphate on aluminum, studied by QCM-D, XPS, and AAS. Langmuir, 24(23), 13414-13419.

Kayes, J.B. (1976) The effect of surface active agents on the microelectrophoretic properties of a polystyrene latex dispersion. Microelectrophoretic studies. Journal of Colloid and Interface Science, 56(3), 426-442.

Kharitonova, T.V., Ivanova, N.I., and Summ, B.D. (2005) Adsorption of cationic and nonionic surfactants on a SiO2 surface from aqueous solutions: 2. Adsorption of dodecylpyridinium bromide and Triton X-100 from mixed solutions. Colloid Journal, 67(2), 249-255.

Knag, M., Sjöblom, J., Øye, G., and Gulbrandsen, E. (2004) A quartz crystal microbalance study of the adsorption of quaternary ammonium derivates on iron and cementite. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 250(1–3), 269-278.

Kou, J., Tao, D., and Xu, G. (2010) A study of adsorption of dodecylamine on quartz surface using quartz crystal microbalance with dissipation. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 368(1–3), 75-83.

Kruss. "Critical Micelle Concentration", Kruss GmbH. 12 Jan 1996. 26 March 2014 <http://www.kruss.de/services/education-theory/glossary/cmc/>

Kwok, D.Y. and Neumann, A.W. (1999) Contact angle measurement and contact angle interpretation. Advances in Colloid and Interface Science, 81(3), 167-249.

Larsson, C., Rodahl, M., and Höök, F. (2003) Characterization of DNA immobilization and subsequent hybridization on a 2D arrangement of streptavidin on a biotin-modified lipid bilayer supported on SiO2. Analytical Chemistry, 75(19), 5080-5087.

Lessard, R.R. and DeMarco, G. (2000) The Significance of Oil Spill Dispersants. Spill Science & Technology Bulletin, 6(1), 59-68.

Li, Z.X., Lu, J.R., Fragneto, G., Thomas, R.K., Binks, B.P., Fletcher, P.D.I., and Penfold, J. (1998) Neutron reflectivity studies of Aerosol-OT monolayers adsorbed at the oil/water, air/water and hydrophobic solid/wate interfaces. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 135(1–3), 277-281.

Li, Z.X., Lu, J.R., Thomas, R.K., Weller, A., Penfold, J., Webster, J.R.P., Sivia, D.S., and Rennie, A.R. (2001) Conformal roughness in the adsorbed lamellar phase of aerosol-OT at the air–water and liquid–solid interfaces. Langmuir, 17(19), 5858-5864.

Lippold, H. and Quitzsch, K. (2000) Simultaneous surfactant aggregation in aqueous solution and at the solid–liquid interface. Coadsorption of decanoyl-N-methylglucamide and phenol on silica gel. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 172(1–3), 1-6.

Liu, J.-F., Min, G., and Ducker, W.A. (2001) AFM study of adsorption of cationic surfactants and cationic polyelectrolytes at the silica–water interface. Langmuir, 17(16), 4895-4903.

Liu, S.X. and Kim, J.-T. (2009) Study of adsorption kinetics of surfactants onto polyethersulfone membrane surface using QCM-D. Desalination, 247(1–3), 355-361.

Mahmood, M.E. and Al-Koofee, D.A.F. (2013) Effect of temperature changes on critical micelle concentration for tween series surfactant. Global Journal of Science Frontier Research Chemistry, 13(4), 1-7.

Manne, S., Cleveland, J.P., Gaub, H.E., Stucky, G.D., and Hansma, P.K. (1994) Direct visualization of surfactant hemimicelles by force microscopy of the electrical double layer. Langmuir, 10(12), 4409-4413.

Martin-Rodríguez, A., Cabrerizo-Vílchez, M.A., and Hidalgo-Álvarez, R. (1997) A Comparative study on the adsorption of triton X-100 and tween 20 onto latexes with different interfacial properties. Journal of Colloid and Interface Science, 187(1), 139-147.

Merta, J., Tammelin, T., and Stenius, P. (2004) Adsorption of complexes formed by cationic starch and anionic surfactants on quartz studied by QCM-D. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 250(1–3), 103-114.

Muherei, M.A., Junin, R., and Bin Merdhah, A.B. (2009) Adsorption of sodium dodecyl sulfate, Triton X100 and their mixtures to shale and sandstone: A comparative study. Journal of Petroleum Science and Engineering, 67(3–4), 149-154.

Myers, D. (2005) Surfactant Science and Technology. 3rd ed. New Jersey: John Wiley.

Ogino, K. and Abe, M. (1993) Mixed Surfactant Systems. Washington, DC: Marcel Dekker.

Pagac, E.S., Prieve, D.C., and Tilton, R.D. (1998) Kinetics and mechanism of cationic surfactant adsorption and coadsorption with cationic polyelectrolytes at the silica–water interface. Langmuir, 14(9), 2333-2342.

Paria, S. and Khilar, K.C. (2004) A review on experimental studies of surfactant adsorption at the hydrophilic solid–water interface. Advances in Colloid and Interface Science, 110(3), 75-95.

Paria, S., Manohar, C., and Khilar, K.C. (2004) Effect of cationic surfactant on the adsorption characteristics of anionic surfactant on cellulose surface. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 232(2–3), 139-142.

Penfold, J., Staples, E., Tucker, I., and Thomas, R.K. (2002) Adsorption of mixed anionic and nonionic surfactants at the hydrophilic silicon surface. Langmuir, 18(15), 5755-5760.

Place, B., Anderson, B., Mekebri, A., Furlong, E.T., Gray, J.L., Tjeerdema, R., and Field, J. (2010) A role for analytical chemistry in advancing our understanding of the occurrence, fate, and effects of corexit oil dispersants. Environmental Science & Technology, 44(16), 6016-6018.

Poptoshev, E. and Claesson, P.M. (2006) Adsorption of dimethyldodecylamine-N-oxide at the mica-solution interface studied by ellipsometry. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 291(1–3), 45-50.

Q-Sense. Cleaning and Immobilization Protocols, Maryland: Biolin Scientific.

Rodahl, M., Hook, F., Krozer, A., Brzezinski, P., and Kasemo, B. (1995) Quartz crystal microbalance setup for frequency and Q-factor measurements in gaseous and liquid environments. Review of Scientific Instruments, 66(7), 3924-3930.

Rosen, M.J. and Kunjappu, J.T. (2012) Surfactants and Interfacial Phenomena. New Jersey: John Wiley.

Sakai, K., Matsuhashi, K., Honya, A., Oguchi, T., Sakai, H., and Abe, M. (2010) Adsorption characteristics of monomeric/gemini surfactant mixtures at the silica/aqueous solution interface. Langmuir, 26(22), 17119-17125.

Sakai, K., Yoshimura, T., and Esumi, K. (2003) Interaction forces on α-alumina surfaces with coadsorption of anionic/nonionic surfactant mixtures. Journal of Physical Chemistry B, 107(44), 12227-12232.

Seo, D.-J., Fujita, H., and Sakoda, A. (2011) Effects of a non-ionic surfactant, Tween 20, on adsorption/desorption of saccharification enzymes onto/from lignocelluloses and saccharification rate. Adsorption, 17(5), 813-822.

Shen, L., Guo, A., and Zhu, X. (2011) Tween surfactants: Adsorption, self-organization, and protein resistance. Surface Science, 605(5–6), 494-499.

Shi, L., Ghezzi, M., Caminati, G., Lo Nostro, P., Grady, B.P., and Striolo, A. (2009) adsorption isotherms of aqueous C12E6 and cetyltrimethylammonium bromide surfactants on solid surfaces in the presence of low molecular weight coadsorbents. Langmuir, 25(10), 5536-5544.

Soboleva, O.A., Yaroslavtsev, A.A., Badun, G.A., and Summ, B.D. (2004) Mixed adsorption layers of nonionic and cationic surfactants on quartz. Colloid Journal, 66(4), 470-476.

Stålgren, J.J.R., Eriksson, J., and Boschkova, K. (2002) A comparative study of surfactant adsorption on model surfaces using the quartz crystal microbalance and the ellipsometer. Journal of Colloid and Interface Science, 253(1), 190-195.

Tabor, R.F., Eastoe, J., and Dowding, P. (2009) Adsorption and desorption of cationic surfactants onto silica from toluene studied by ATR-FTIR. Langmuir, 26(2), 671-677.

Tabor, R.F., Eastoe, J., and Dowding, P. (2009) Adsorption and desorption of nonionic surfactants on silica from toluene studied by ATR-FTIR. Langmuir, 25(17), 9785-9791.

Thibaut, A., Misselyn-Bauduin, A.M., Grandjean, J., Broze, G., and Jérôme, R. (2000) Adsorption of an aqueous mixture of surfactants on silica. Langmuir, 16(24), 9192-9198.

Tiab, D. and Donaldson, E.C. (2012) Petrophysics - Theory and Practice of Measuring Reservoir Rock and Fluid Transport Properties. 3rd ed. New Jersey: Elsevier.

Tiberg, F. and Ederth, T. (2000) Interfacial properties of nonionic surfactants and decane–surfactant microemulsions at the silica–water interface. An ellipsometry and surface force study. Journal of Physical Chemistry B, 104(41), 9689-9695.

Vacklin, H.P., Tiberg, F., Fragneto, G., and Thomas, R.K. (2005) Composition of supported model membranes determined by neutron reflection. Langmuir, 21(7), 2827-2837.

Velegol, S.B., Fleming, B.D., Biggs, S., Wanless, E.J., and Tilton, R.D. (2000) counterion effects on hexadecyltrimethylammonium surfactant adsorption and self-assembly on silica. Langmuir, 16(6), 2548-2556.

Vogt, B.D., Lin, E.K., Wu, W.-l., and White, C.C. (2004) Effect of film thickness on the validity of the sauerbrey equation for hydrated polyelectrolyte films. Journal of Physical Chemistry B, 108(34), 12685-12690.

Voinova, M.V., Rodahl, M., Jonson, M., and Kasemo, B. (1999) Viscoelastic acoustic response of layered polymer films at fluid-solid interfaces: continuum mechanics approach. Physica Scripta, 59, 391-396.

Wall, J.F. and Zukoski, C.F. (1999) Alcohol-induced structural transformations of surfactant aggregates. Langmuir, 15(22), 7432-7437.

Wang, X., Lee, S.Y., Miller, K., Welbourn, R., Stocker, I., Clarke, S., Casford, M., Gutfreund, P., and Skoda, M.W.A. (2013) Cation bridging studied by specular neutron reflection. Langmuir, 29(18), 5520-5527.

Woods, D.A., Petkov, J., and Bain, C.D. (2011) Surfactant adsorption kinetics by total internal reflection raman spectroscopy. 1. pure surfactants on silica. Journal of Physical Chemistry B, 115(22), 7341-7352.

Woods, D.A., Petkov, J., and Bain, C.D. (2011) Surfactant adsorption kinetics by total internal reflection raman spectroscopy. 2. CTAB and triton X-100 mixtures on silica. Journal of Physical Chemistry B, 115(22), 7353-7363.

Wu, S., Shi, L., Garfield, L.B., Tabor, R.F., Striolo, A., and Grady, B.P. (2011) Influence of surface roughness on cetyltrimethylammonium bromide adsorption from aqueous solution. Langmuir, 27(10), 6091-6098.

Yaseen, M., Wang, Y., Su, T.J., and Lu, J.R. (2005) Surface adsorption of zwitterionic surfactants: n-alkyl phosphocholines characterised by surface tensiometry and neutron reflection. Journal of Colloid and Interface Science, 288(2), 361-370.

Yuan, Y. and Lee, T.R. (2013) Contact Angle and Wetting Properties. In Bracco, G. and Holst, B. Surface Science Techniques. (3-34), Berlin: Springer.

Zhang, Y., Zhao, Y., Zhu, Y., Wu, H., Wang, H., and Lu, W. (2012) Adsorption of mixed cationic-nonionic surfactant and its effect on bentonite structure. Journal of Environmental Sciences, 24(8), 1525-1532.

APPENDICIS

Appendix A Surface Tension of Surfactant Solutions

Table A1 Surface tension for solution of AOT

Surfactant concentration (M)	1st measured surface tension (mM/m)	2nd measured surface tension (mM/m)	3rd measured surface tension (mM/m)
0.0001	57.9402	57.9356	57.9632
0.0005	46.6202	46.638	46.638
0.001	39.86	39.8561	40.3698
0.0015	36.5459	37.0926	36.1151
0.002	33.3324	34.2029	33.9336
0.0025	30.147	30.3574	31.6094
0.003	31.4535	30.8193	30.8226
0.005	29.5855	30.1657	29.288
0.01	28.5669	29.3417	29.1976
0.02	27.896	27.7403	27.5446
0.025	27.4609	27.1779	27.4787

From Figure A1,

1st CMC determination: AOT CMC = 2.911 mM

2nd CMC determination: AOT CMC = 2.797 mM

3rd CMC determination: AOT CMC = 2.813 mM

Average value for AOT CMC = 2.91 mM

Standard deviation = 0.12

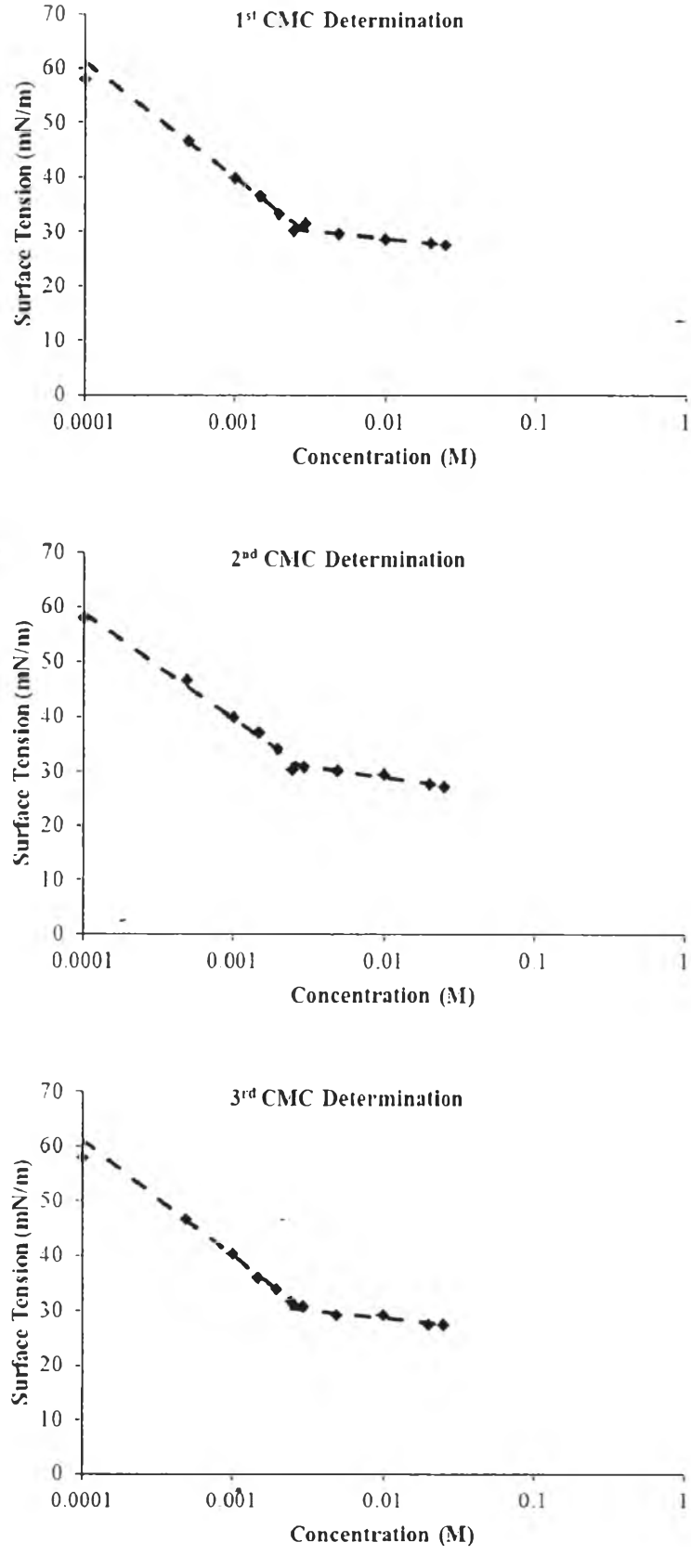

Figure A1 Surface tension isotherms for AOT.

Table A2 Surface tension for solution of Tween 20

Surfactant concentration (M)	**1st measured surface tension (mM/m)**	**2nd measured surface tension (mM/m)**	**3rd measured surface tension (mM/m)**
0.000005	46.4428	46.6305	48.0511
0.00001	45.4234	45.873	45.3954
0.00002	43.1539	43.2322	43.18
0.00003	42.4893	42.8512	42.5022
0.00005	41.0145	41.0764	41.0569
0.00006	39.8848	40.6025	39.8538
0.00007	39.368	40.1882	39.3703
0.0001	39.1452	40.0181	39.1642
0.0005	38.1379	37.8705	38.2444
0.01	38.7281	37.7884	38.7442
0.02	37.1885	36.2994	37.2017

From Figure A2,

1st CMC determination: Tween 20 CMC = 0.087 mM

2nd CMC determination: Tween 20 CMC = 0.084 mM

3rd CMC determination: Tween 20 CMC = 0.081 mM

Average value for Tween 20 CMC = 0.08 mM

Standard deviation = 0.002

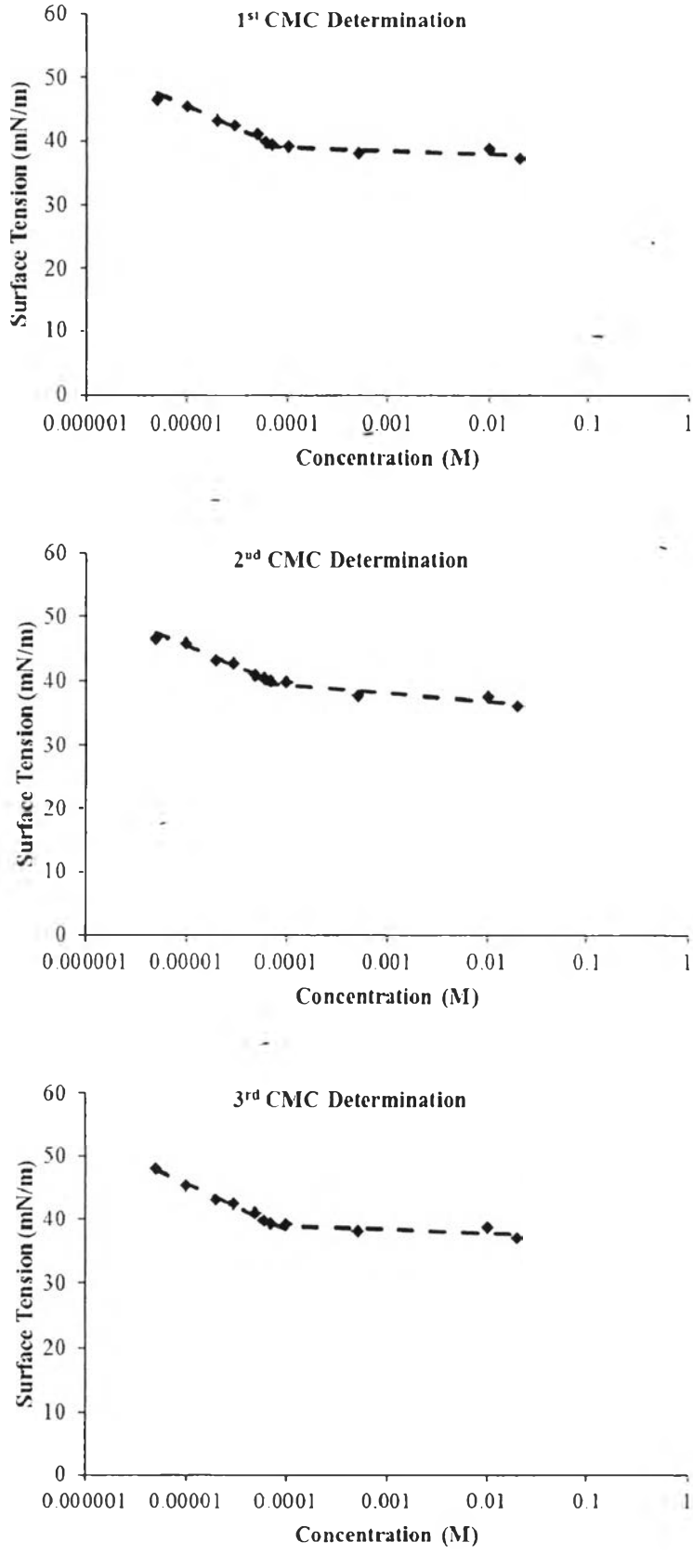

Figure A2 Surface tension isotherms for Tween 20.

Appendix B Adsorption Isotherm of Surfactant Solutions

Table B1 Amount of mass adsorbed for AOT on gold surface

Bulk concentration (mM)	C/CMC	Amount of surfactant adsorbed ($ng \cdot cm^{-2}$)	Standard deviation of surfactant adsorbed
0.25	0.1	36.96	8.66
0.50	0.2	52.26	9.46
0.75	0.3	61.96	12.81
1.00	0.3	66.59	11.13
1.25	0.4	69.43	11.40
1.50	0.5	75.43	12.95
2.00	0.7	84.71	15.49
2.50	0.9	95.56	17.85
3.00	1.0	108.62	17.42
3.50	1.2	119.77	18.55
4.00	1.4	129.97	19.08
4.50	1.5	141.24	22.38
5.00	1.7	145.69	22.16
6.25	2.1	135.42	19.74

Table B2 Amount of mass adsorbed for Tween 20 on gold surface

Bulk concentration (mM)	**C/CMC**	**Amount of surfactant adsorbed ($ng \cdot cm^{-2}$)**	**Standard deviation of surfactant adsorbed**
0.0002	0.003	35.60	3.61
0.0004	0.005	68.94	9.91
0.0005	0.006	93.76	13.57
0.0006	0.008	134.51	15.45
0.0012	0.015	158.59	9.79
0.0024	0.03	172.67	14.27
0.0036	0.05	178.43	13.79
0.0048	0.06	179.73	14.48
0.006	0.08	182.32	14.00
0.012	0.15	186.26	19.09
0.018	0.2	189.05	22.66
0.024	0.3	191.95	24.61
0.03	0.4	191.93	22.77
0.04	0.5	196.46	23.41
0.05	0.6	194.11	21.42
0.06	0.8	192.46	20.18
0.07	0.9	192.17	19.27
0.08	1.1	193.54	19.60
0.10	1.2	196.99	24.38
0.11	1.4	196.94	24.09
0.12	1.5	197.80	23.03
0.15	1.9	197.57	24.38

Table B3 Amount of mass adsorbed for AOT preadsorbed with Tween 20 on gold surface

Bulk AOT concentration (mM)	**C/AOT CMC**	**Amount of surfactant adsorbed (ng·cm^{-2})**	**Standard deviation of surfactant adsorbed**
0.11 (1.4 Tween 20 CMC)	0	181.48	14.63
0.25	0.1	154.81	17.28
0.50	0.2	147.21	26.81
0.75	0.3	143.66	24.24
1.00	0.3	140.87	26.05
1.25	0.4	141.37	25.78
1.50	0.5	142.50	28.72
2.00	0.7	140.11	27.90
2.50	0.9	140.29	26.06
3.00	1.0	141.72	27.64
3.50	1.2	152.59	30.81
4.00	1.4	166.55	35.46
4.50	1.5	177.39	34.00
5.00	1.7	180.46	35.19
6.25	2.1	171.66	33.74

Table B4 Amount of mass adsorbed for Tween 20 preadsorbed with AOT on gold surface

Bulk Tween 20 concentration (mM)	**C/ Tween 20 CMC**	**Amount of surfactant adsorbed ($ng \cdot cm^{-2}$)**	**Standard deviation of surfactant adsorbed**
4.00 (1.4 AOT CMC)	0	88.19	18.35
0.006	0.1	109.45	29.28
0.012	0.2	119.05	25.84
0.018	0.2	123.42	25.28
0.024	0.3	133.35	25.50
0.03	0.4	141.70	27.79
0.036	0.5	147.70	26.65
0.048	0.6	155.73	28.05
0.06	0.8	162.04	28.44
0.072	0.9	169.06	28.85
0.084	1.1	174.54	28.05
0.096	1.2	182.50	27.74
0.108	1.4	188.11	28.30
0.12	1.5	193.88	26.70
0.15	1.9	200.21	27.48

Appendix C Dissipation of Surfactant Solutions

Table C1 Dissipation for AOT on gold surface

Bulk concentration (mM)	C/CMC	Dissipation factor x 10^{-6}	Standard deviation of dissipation
0.25	0.1	0.0950	0.0728
0.50	0.2	0.1406	0.1221
0.75	0.3	0.1844	0.1290
1.00	0.3	0.2140	0.1267
1.25	0.4	0.2752	0.1386
1.50	0.5	0.2707	0.1446
2.00	0.7	0.3187	0.1494
2.50	0.9	0.3739	0.1527
3.00	1.0	0.4896	0.1868
3.50	1.2	0.6674	0.2228
4.00	1.4	0.8970	0.2494
4.50	1.5	1.1748	0.2946
5.00	1.7	1.2638	0.3028
6.25	2.1	1.1542	0.2509

Table C2 Dissipation for Tween 20 on gold surface

Bulk concentration (mM)	C/CMC	Dissipation factor x 10^{-6}	Standard deviation of dissipation
0.0002	0.003	0.0472	0.0402
0.0004	0.005	0.1756	0.0592
0.0005	0.006	0.2493	0.0610
0.0006	0.008	0.2939	0.0588
0.0012	0.015	0.3558	0.0740
0.0024	0.03	0.3829	0.0605
0.0036	0.05	0.4004	0.0640
0.0048	0.06	0.3886	0.0608
0.006	0.08	0.4140	0.0624
0.012	0.15	0.4031	0.0640
0.018	0.2	0.3867	0.0710
0.024	0.3	0.4216	0.0701
0.03	0.4	0.4038	0.0740
0.04	0.5	0.4024	0.0694
0.05	0.6	0.3989	0.0832
0.06	0.8	0.3979	0.0918
0.07	0.9	0.4150	0.0680
0.08	1.1	0.4203	0.0822
0.10	1.2	0.4520	0.0602
0.11	1.4	0.4358	0.0692
0.12	1.5	0.4692	0.0536
0.15	1.9	0.4767	0.0756

Table C3 Dissipation for AOT preadsorbed with Tween 20 on gold surface

Bulk AOT concentration (mM)	**C/AOT CMC**	**Dissipation factor x 10^{-6}**	**Standard deviation of dissipation**
0.11 (1.4 Tween 20 CMC)	0	0.4071	0.0674
0.25	0.1	0.3607	0.0663
0.50	0.2	0.3568	0.0699
0.75	0.3	0.3577	0.0751
1.00	0.3	0.3665	0.0813
1.25	0.4	0.3799	0.0836
1.50	0.5	0.3953	0.0809
2.00	0.7	0.4074	0.0787
2.50	0.9	0.4359	0.0838
3.00	1.0	0.4705	0.0916
3.50	1.2	0.5466	0.1137
4.00	1.4	0.7462	0.1933
4.50	1.5	0.9232	0.2180
5.00	1.7	1.0386	0.2160
6.25	2.1	1.0303	0.2189

Table C4 Dissipation for Tween 20 preadsorbed with AOT on gold surface

Bulk Tween 20 concentration (mM)	**C/ Tween 20 CMC**	**Dissipation factor x 10^{-6}**	**Standard deviation of dissipation**
4.00 (1.4 AOT CMC)	0	0.4634	0.1452
0.006	0.1	0.5942	0.1193
0.012	0.2	0.6816	0.1133
0.018	0.2	0.7687	0.1340
0.024	0.3	0.7930	0.1416
0.03	0.4	0.8960	0.1392
0.036	0.5	0.9284	0.1823
0.048	0.6	0.9962	0.1964
0.06	0.8	1.0526	0.2000
0.072	0.9	1.1191	0.1787
0.084	1.1	1.1684	0.1803
0.096	1.2	1.2446	0.1765
0.108	1.4	1.3114	0.1648
0.12	1.5	1.3902	0.1621
0.15	1.9	1.4494	0.1689

Appendix D Dynamics of Adsorption Data

Table D1 Adsorption Data for AOT at 0.1(CMC) and 1.4(CMC)

Time (s)	Mass adsorbed at 0.1(CMC) ($ng \cdot cm^{-2}$)	Mass adsorbed at 1.4(CMC) ($ng \cdot cm^{-2}$)	Fractional adsorption at 0.1(CMC)	Fractional adsorption at 1.4(CMC)
0	0.5479	0.0595	0.0101	0.0005
11	0.3194	0.4842	0.0059	0.0037
22	0.7205	0.2518	0.0132	0.0019
33	0.6404	0.3789	0.0118	0.0029
40	0.4044	0.2083	0.0074	0.0016
51	0.1824	0.3809	0.0034	0.0029
61	-0.1127	0.7695	-0.0021	0.0059
72	0.1255	0.9152	0.0023	0.0070
80	0.1000	0.2129	0.0018	0.0016
90	0.6102	0.5071	0.0112	0.0039
101	0.6055	0.4918	0.0111	0.0038
112	0.5104	0.1083	0.0094	0.0008
123	0.2878	0.0033	0.0053	0.0000
130	0.9763	0.2213	0.0179	0.0017
141	0.0282	0.0734	0.0005	0.0006
152	0.4998	0.0662	0.0092	0.0005
163	0.1938	0.0295	0.0036	0.0002
170	0.1574	1.4496	0.0029	0.0111
181	0.4604	5.4263	0.0085	0.0417
192	1.7237	7.5053	0.0317	0.0576
200	3.2734	11.3424	0.0602	0.0871
222	6.0839	21.7421	0.1118	0.1670
240	9.1692	27.6897	0.1685	0.2127
262	11.7120	32.4783	0.2153	0.2495
280	13.7430	45.5365	0.2526	0.3498
302	16.1668	52.9166	0.2971	0.4064
321	17.7765	58.6671	0.3267	0.4506
343	19.9446	63.2514	0.3666	0.4858
362	21.3161	65.4391	0.3918	0.5026
380	22.4953	67.6297	0.4135	0.5195
402	23.3212	68.8627	0.4286	0.5289

Time (s)	Mass adsorbed at 0.1(CMC) ($ng \cdot cm^{-2}$)	Mass adsorbed at 1.4(CMC) ($ng \cdot cm^{-2}$)	Fractional adsorption at 0.1(CMC)	Fractional adsorption at 1.4(CMC)
421	24.5405	70.7433	0.4511	0.5434
443	25.2421	71.7526	0.4640	0.5511
462	25.5636	72.6401	0.4699	0.5579
480	26.2434	72.6782	0.4824	0.5582
502	27.0737	74.1802	0.4976	0.5698
521	27.8471	74.3676	0.5118	0.5712
540	27.8264	73.9386	0.5115	0.5679
562	28.5441	75.1263	0.5246	0.5770
581	28.7624	74.5281	0.5287	0.5724
603	29.3793	74.7592	0.5400	0.5742
622	29.0378	75.3549	0.5337	0.5788
641	29.9073	75.6293	0.5497	0.5809
663	30.2685	75.9703	0.5563	0.5835
682	30.7763	75.9955	0.5657	0.5837
701	30.8183	76.5683	0.5664	0.5881
723	31.1264	76.1598	0.5721	0.5850
742	31.3661	76.7995	0.5765	0.5899
761	31.3408	76.3510	0.5760	0.5864
780	32.0928	76.3872	0.5899	0.5867
802	31.8416	76.1834	0.5853	0.5852
821	32.1131	77.0659	0.5902	0.5919
840	32.1069	76.5267	0.5901	0.5878
863	32.0621	77.0914	0.5893	0.5921
882	31.8691	76.8140	0.5858	0.5900
901	32.0832	77.0799	0.5897	0.5920
920	32.3075	77.1096	0.5938	0.5923
942	32.4745	76.8597	0.5969	0.5903
961	32.2299	77.0161	0.5924	0.5915
980	32.7496	76.9334	0.6019	0.5909
1003	32.8868	77.4194	0.6045	0.5946
1102	33.4505	77.8759	0.6148	0.5982
1201	34.1891	79.1112	0.6284	0.6076
1300	34.5043	79.2421	0.6342	0.6086
1400	35.0298	79.6291	0.6439	0.6116
1503	36.0636	80.3329	0.6629	0.6170
1602	36.5625	81.1433	0.6720	0.6232
1702	37.3832	81.6146	0.6871	0.6269

Time (s)	Mass adsorbed at 0.1(CMC) ($ng \cdot cm^{-2}$)	Mass adsorbed at 1.4(CMC) ($ng \cdot cm^{-2}$)	Fractional adsorption at 0.1(CMC)	Fractional adsorption at 1.4(CMC)
1801	37.6850	82.1028	0.6927	0.6306
1901	37.9117	82.9153	0.6968	0.6369
2000	38.6128	82.7480	0.7097	0.6356
2200	38.9644	83.4955	0.7162	0.6413
2403	39.6286	84.2497	0.7284	0.6471
2603	39.9986	85.6297	0.7352	0.6577
2801	40.6248	85.9123	0.7467	0.6599
3000	41.0694	86.7882	0.7549	0.6666
3203	41.2725	87.6202	0.7586	0.6730
3401	41.4448	87.7851	0.7618	0.6743
3603	42.3924	88.6846	0.7792	0.6812
3801	41.8889	89.2867	0.7699	0.6858
4003	43.6180	90.1749	0.8017	0.6926
4201	43.2654	90.8545	0.7952	0.6978
4400	43.6939	92.3809	0.8031	0.7096
4602	44.2840	92.4063	0.8139	0.7098
4801	44.3706	93.3919	0.8155	0.7173
5000	44.9832	94.0477	0.8268	0.7224
5201	44.9900	94.5120	0.8269	0.7259
5400	45.5387	96.2206	0.8370	0.7391
5603	45.5634	96.5011	0.8375	0.7412
5803	45.7190	96.7414	0.8403	0.7431
6000	46.1516	97.4653	0.8483	0.7486
6202	46.4385	99.1096	0.8535	0.7612
6401	46.3183	99.1319	0.8513	0.7614
6601	46.5673	100.8425	0.8559	0.7746
6801	46.5899	101.3315	0.8563	0.7783
7003	47.2425	102.2169	0.8683	0.7851
7202	47.1444	103.1943	0.8665	0.7926
7401	46.3949	103.5442	0.8527	0.7953
7601	46.8173	105.3210	0.8605	0.8090
7801	47.2798	106.1467	0.8690	0.8153
8001	48.1833	106.7168	0.8856	0.8197
8201	48.0022	107.4779	0.8823	0.8255
8401	48.9292	108.4718	0.8993	0.8332
8600	49.3270	109.4753	0.9066	0.8409
8802	48.9879	109.9737	0.9004	0.8447

Time (s)	Mass adsorbed at 0.1(CMC) ($ng \cdot cm^{-2}$)	Mass adsorbed at 1.4(CMC) ($ng \cdot cm^{-2}$)	Fractional adsorption at 0.1(CMC)	Fractional adsorption at 1.4(CMC)
9003	49.6456	110.9690	0.9125	0.8523
9203	49.9011	111.6753	0.9172	0.8578
9401	50.1427	112.8283	0.9216	0.8666
9602	50.4576	113.0609	0.9274	0.8684
9800	49.6593	114.0254	0.9127	0.8758
10002	50.2407	114.9943	0.9234	0.8832
10200	50.0371	115.6913	0.9197	0.8886
10401	50.7322	116.5893	0.9325	0.8955
10602	50.9130	116.9597	0.9358	0.8983
10801	51.8400	117.7830	0.9528	0.9047
11000	52.2545	118.9720	0.9604	0.9138
11202	52.2173	119.4304	0.9598	0.9173
11401	52.5877	120.1377	0.9666	0.9228
11601	52.3448	120.4193	0.9621	0.9249
11801	53.0571	121.4548	0.9752	0.9329
12001	53.1910	121.6806	0.9777	0.9346
12202	53.3709	122.6138	0.9810	0.9418
12402	53.0123	123.6281	0.9744	0.9496
12600	53.1476	123.9457	0.9769	0.9520
12802	53.7519	124.4160	0.9880	0.9556
13001	52.9668	124.9481	0.9735	0.9597
13201	54.5510	125.8021	1.0027	0.9663
13400	54.5614	126.3998	1.0028	0.9709
13601	54.3561	127.0163	0.9991	0.9756
13801	53.9191	127.8935	0.9910	0.9823
14002	54.3590	128.3367	0.9991	0.9857
14203	54.8527	129.0164	1.0082	0.9910
14402	54.6081	129.4651	1.0037	0.9944
14603	53.9325	129.9956	0.9913	0.9985
14606	54.1683	129.8602	0.9956	0.9974
14610	54.8237	129.7204	1.0077	0.9964
14613	54.4067	130.1945	1.0000	1.0000

Table D2 Adsorption Data for Tween 20

Time (s)	Mass adsorbed at 0.1(CMC) ($ng \cdot cm^{-2}$)	Mass adsorbed at 1.4(CMC) ($ng \cdot cm^{-2}$)	Fractional adsorption at 0.1(CMC)	Fractional adsorption at 1.4(CMC)
0	0.8318	0.2548	0.0042	0.0013
11	1.0571	0.8072	0.0053	0.0042
25	1.2475	0.3953	0.0063	0.0021
36	1.4625	0.6847	0.0074	0.0036
46	1.1555	0.1175	0.0058	0.0006
57	1.3136	0.1553	0.0066	0.0008
68	1.0016	0.4503	0.0051	0.0024
78	0.9744	0.7101	0.0049	0.0037
89	1.0697	0.8304	0.0054	0.0043
96	1.3411	0.7823	0.0068	0.0041
100	1.1390	0.4505	0.0058	0.0024
111	1.2518	0.7254	0.0063	0.0038
121	1.1385	0.3031	0.0057	0.0016
132	0.8209	0.7652	0.0041	0.0040
143	0.9382	0.5977	0.0047	0.0031
150	1.0310	0.5361	0.0052	0.0028
161	1.0153	0.3373	0.0051	0.0018
172	0.9221	1.9326	0.0047	0.0101
182	1.4500	10.8402	0.0073	0.0567
190	1.7843	24.5883	0.0090	0.1286
201	4.4979	51.2807	0.0227	0.2683
223	11.3126	102.9689	0.0571	0.5387
241	17.9490	141.7873	0.0906	0.7418
263	26.6423	168.7032	0.1345	0.8826
281	33.8795	174.5716	0.1710	0.9133
300	40.0164	177.1879	0.2020	0.9270
321	47.4205	179.5700	0.2394	0.9395
340	53.3751	181.1703	0.2695	0.9478
362	59.7865	182.6235	0.3018	0.9554
380	64.7136	183.9073	0.3267	0.9622
402	68.4268	184.1687	0.3455	0.9635
420	70.8935	184.8999	0.3579	0.9673
442	73.4740	186.1728	0.3710	0.9740

Time (s)	Mass adsorbed at 0.1(CMC) ($ng \cdot cm^{-2}$)	Mass adsorbed at 1.4(CMC) ($ng \cdot cm^{-2}$)	Fractional adsorption at 0.1(CMC)	Fractional adsorption at 1.4(CMC)
460	75.7997	186.1732	0.3827	0.9740
482	79.4416	186.4002	0.4011	0.9752
501	82.8561	186.8760	0.4183	0.9777
523	86.9819	186.8921	0.4391	0.9778
541	91.4264	187.2311	0.4616	0.9795
563	96.0542	186.9247	0.4850	0.9779
582	100.2157	187.1848	0.5060	0.9793
600	103.9339	187.2052	0.5247	0.9794
622	108.5359	187.4907	0.5480	0.9809
641	112.7023	187.3213	0.5690	0.9800
663	117.2407	187.1140	0.5919	0.9789
682	120.3762	187.2626	0.6077	0.9797
700	124.4126	186.7165	0.6281	0.9768
722	128.1924	186.8590	0.6472	0.9776
741	131.3393	186.7617	0.6631	0.9771
760	135.0286	186.8450	0.6817	0.9775
782	138.3250	186.4297	0.6984	0.9753
801	142.0174	186.1749	0.7170	0.9740
849	148.8094	185.7468	0.7513	0.9718
902	155.9802	186.1401	0.7875	0.9738
951	161.2496	185.4918	0.8141	0.9704
1000	166.0123	185.6303	0.8382	0.9712
1201	175.5144	185.1816	0.8861	0.9688
1300	178.8532	184.6253	0.9030	0.9659
1403	180.8208	184.6743	0.9129	0.9662
1502	182.4466	184.4276	0.9211	0.9649
1602	182.5378	184.0699	0.9216	0.9630
1701	183.5317	184.1754	0.9266	0.9636
1800	184.1697	184.2663	0.9298	0.9640
1903	185.3804	184.2460	0.9359	0.9639
2002	186.2736	184.2099	0.9404	0.9637
2202	187.7204	184.5316	0.9478	0.9654
2400	187.6135	184.5380	0.9472	0.9655
2603	188.2114	185.1321	0.9502	0.9686
2607	188.6332	184.7960	0.9524	0.9668
2802	188.6953	184.6512	0.9527	0.9660
2806	188.8666	184.9522	0.9535	0.9676

Time (s)	Mass adsorbed at 0.1(CMC) ($ng \cdot cm^{-2}$)	Mass adsorbed at 1.4(CMC) ($ng \cdot cm^{-2}$)	Fractional adsorption at 0.1(CMC)	Fractional adsorption at 1.4(CMC)
3001	189.4742	184.7748	0.9566	0.9667
3201	189.0044	185.2277	0.9542	0.9691
3400	189.6834	185.2144	0.9577	0.9690
3602	189.5819	185.2309	0.9572	0.9691
3800	190.6731	185.4713	0.9627	0.9703
4003	190.3078	185.4072	0.9608	0.9700
4201	190.5629	186.0161	0.9621	0.9732
4400	190.8618	185.8120	0.9636	0.9721
4603	190.6461	186.3322	0.9625	0.9748
4801	190.9670	186.3797	0.9641	0.9751
5000	191.1594	186.7126	0.9651	0.9768
5202	190.6382	187.0872	0.9625	0.9788
5400	191.1301	186.8994	0.9650	0.9778
5602	191.2862	187.0603	0.9658	0.9786
5801	191.2512	187.5229	0.9656	0.9811
6000	191.9102	187.9002	0.9689	0.9830
6202	192.7221	187.9908	0.9730	0.9835
6401	192.3550	187.7131	0.9712	0.9821
6603	193.1594	187.9261	0.9752	0.9832
6801	192.3779	188.2727	0.9713	0.9850
7000	193.0923	188.5252	0.9749	0.9863
7202	192.3765	188.6452	0.9713	0.9869
7400	192.7539	188.1542	0.9732	0.9844
7603	193.0355	188.8223	0.9746	0.9879
7801	193.3795	189.4573	0.9763	0.9912
8003	193.2348	189.3452	0.9756	0.9906
8202	194.1854	189.6270	0.9804	0.9921
8403	193.9006	189.8136	0.9790	0.9931
8603	194.2328	189.6980	0.9806	0.9924
8800	194.6047	190.1313	0.9825	0.9947
9000	194.6518	190.3723	0.9827	0.9960
9200	195.0226	190.3111	0.9846	0.9957
9401	195.6021	190.7534	0.9875	0.9980
9601	195.4325	190.9151	0.9867	0.9988
9806	195.6531	190.6528	0.9878	0.9974
10003	195.1547	190.4553	0.9853	0.9964
10200	195.6857	190.9352	0.9880	0.9989

Time (s)	Mass adsorbed at 0.1(CMC) ($ng \cdot cm^{-2}$)	Mass adsorbed at 1.4(CMC) ($ng \cdot cm^{-2}$)	Fractional adsorption at 0.1(CMC)	Fractional adsorption at 1.4(CMC)
10401	195.1418	190.5719	0.9852	0.9970
10601	196.4856	190.8308	0.9920	0.9984
10802	196.4688	190.7231	0.9919	0.9978
11002	196.7218	190.6310	0.9932	0.9973
11202	196.4435	190.6049	0.9918	0.9972
11403	196.9196	191.3288	0.9942	1.0010
11600	196.8384	191.0626	0.9938	0.9996
11800	197.2024	191.2157	0.9956	1.0004
12000	197.1880	191.4838	0.9956	1.0018
12200	197.0638	191.6350	0.9949	1.0026
12400	197.4670	191.7533	0.9970	1.0032
12601	197.5193	191.2967	0.9972	1.0008
12801	198.1721	191.3373	1.0005	1.0010
12805	198.1896	191.6892	1.0006	1.0029
12852	198.0296	191.3382	0.9998	1.0010
12902	198.1127	191.2506	1.0002	1.0006
12952	197.9228	191.7420	0.9993	1.0031
12956	197.5073	191.4388	0.9972	1.0016
12959	198.0398	191.3863	0.9999	1.0013
12963	198.1403	191.1539	1.0004	1.0001
12967	197.7916	191.3339	0.9986	1.0010
12971	198.2353	191.2887	1.0008	1.0008
12975	197.8651	191.6562	0.9990	1.0027
12979	197.9523	191.2703	0.9994	1.0007
12983	198.1535	191.3103	1.0004	1.0009
12987	198.0690	191.1417	- 1	1

CURRICULUM VITAE

Name: Mr. Jakkrit Thavorn

Date of Birth: May 20, 1990

Nationality: Thai

University Education:

2008-2012 Bachelor Degree of Chemical -Engineering, Faculty of Engineering, King Mongkut's Institute of Technology Ladkrabang (KMITL), Bangkok, Thailand.

Working Experience:

Mar 2011 - May 2011	Position:	Trainee (Process Engineer Position)
	Company name:	Bis-phenol A Plant of PTT Phenol Company Limited, Rayong, Thailand

Proceedings:

1. Thavorn, J.; Hamon, J.J.; Kitiyanan, B.; Striolo, A.; and Grady, B.P. (2014, April 22) Competitive surfactant adsorption of AOT and TWEEN 20 on gold using quartz crystal microbalance with dissipation. Proceedings of The 5th Research Symposium on Petrochemical and Materials and The 20th PPC Symposium on Petroleum, Petrochemicals, and Polymers, Bangkok, Thailand.