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APPENDICES

Table A-1 Adsorption isotherm of CTAB at pH 5 and 8.

Adsorbed CTAB (μmol/g silica)	Eq conc. μM	Adsorbed CTAB (μmol/g silica)	Eq conc.(μM)
2.06	40.03	1.45	26.72
5.68	60.65	10.23	36.35
19.26	111.36	13.74	46.74
22.96	115.24	18.21	41.19
116.51	151.39	22.16	38.86
273.38	202.39	28.76	71.63
325.78	444.80	33.04	60.91
411.66	764.04	120.66	47.84
455.00	1200.00	383.66	179.44
513.57	12839.30	435.79	160.65
489.00	3699.81	633.10	595.74
499.27	12481.72	697.30	791.97
510.00	5080.05	688.15	1101.25
520.20	13005.01	718.03	2487.62
511.75	12793.68	730.23	1776.83
535.63	13390.76	747.27	3353.39
472.30	11807.49	674.37	30622.98
481.02	12025.52	618.46	38282.76
480.75	12018.82	716.59	44738.54

Table A-2 Adsorption isotherm of CTAB at pH 5 and ionic strengths (1, 10 and 100 mM).

I=1mM		I=10mM		I= 100mM	
Adsorbed CTAB (μmol/g silica)	Eq conc. (μM)	Adsorbed CTAB (μmol/g silica)	Eq conc. (μM)	Adsorbed CTAB (μmol/g silica)	Eq conc. (μM)
2.43	32.68	2.54	29.82	8.38	22.24
2.40	37.84	2.57	33.56	21.19	18.69
5.90	41.48	6.17	34.82	118.53	23.83
17.18	48.50	17.72	35.07	194.22	26.54
38.19	54.72	38.40	49.54	302.95	25.24
110.85	92.37	111.82	68.13	340.13	26.06
218.90	116.86	220.18	84.77	513.30	33.20
370.93	139.16	372.63	96.55	685.32	39.18
411.60	176.24	413.93	118.17	648.51	1009.52
617.31	654.74	631.67	295.72	692.48	1021.23
546.02	3286.49	639.20	957.20	632.65	1841.02
492.88	14113.70	668.92	9712.55	922.91	1942.75
604.28	22931.97	700.48	20526.99	1069.68	14013.47

Table A-3 Adsorption isotherm of CTAB at pH 8 and ionic strengths (1, 10 and 100 mM).

I=1 mM		I=10 mM		I=100 mM	
Adsorbed CTAB (μmol/g silica)	Eq conc. (μM)	adsorbed CTAB (μmol/g silica)	Eq conc.(μM)	Adsorbed CTAB (μmol/g silica)	Eq conc.(μM)
22.52	51.04	16.43	33.32	16551.61	30.32
36.27	48.07	25.72	34.28	25850.13	31.13
97.18	49.75	34.89	46.92	35427.39	33.56
174.70	52.98	140.74	38.31	140839.82	35.87
298.00	89.36	398.94	37.12	398619.19	45.20
484.69	99.11	722.28	50.75	722405.73	47.51
490.75	109.12	891.42	131.29	894190.90	62.03
789.00	262.03	899.01	390.33	885994.94	715.66
813.21	2060.12	926.24	6823.37	1005555.62	4840.37
773.89	3356.49	941.02	15408.67	1032347.56	13125.41

Table A-4 Adsolubilization of toluene at pH 5 and I = 0 mM.

Weight of silica = 15 g

Molecular weight of toluene = 92 g/mol

Equation from GC $Y = 4.00E^{-05}X$

Where Y = Equilibrium concentration of toluene

X = Area of toluene from head space gas chromatography

Density of toluene = 0.867 g/ml

Maximum adsorption = 600 μmol/g silica

[Toluene] initial ppm	[Toluene] initial g/l	[Toluene] initial (mol/L)	Area at equilibrium	[Toluene] eq (ppm)	[Toluene] eq (g/L)	[Toluene]eq (mol/L)	[Toluene]eq (mmol/L)	[Toluene] ads (μmole/ g silica)	Xadmic	Xbulk	K
0	0	0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	5.43E-04	7.10E+05	2.84E+01	2.84E-02	3.09E-04	3.09E-01	9.35E+00	1.53E-02	4.21E-06	3.65E+03
100.00	1.00E-01	1.09E-03	1.32E+06	5.30E+01	5.30E-02	5.76E-04	5.76E-01	2.04E+01	3.28E-02	9.17E-06	3.58E+03
500.00	5.00E-01	5.43E-03	6.32E+06	2.53E+02	2.53E-01	2.75E-03	2.75E+00	1.07E+02	1.52E-01	4.83E-05	3.14E+03
800.00	8.00E-01	8.68E-03	6.24E+06	2.49E+02	2.49E-01	2.71E-03	2.71E+00	2.39E+02	2.85E-01	1.08E-04	2.65E+03
1000.00	1.00E+00	1.09E-02	6.52E+06	2.61E+02	2.61E-01	2.83E-03	2.83E+00	3.21E+02	3.48E-01	1.44E-04	2.41E+03

Table A-5 Adsolubilization of toluene at pH 5 and I = 1 mM.

Weight of silica = 15 g

Molecular weight of toluene = 92 g/mol

Equation from GC $Y = 4.00E^{-05}X$

Where Y = Equilibrium concentration of toluene

X = Area of toluene from head space gas chromatography

Density of toluene = 0.867 g/ml

Maximum adsorption = 700 µmol/g silica

[Toluene] initial ppm	[Toluene] initial g/l	[Toluene] initial mol/l	Area at equilibrium	[Toluene] eq (ppm)	[Toluene] eq (g/L)	[Toluene] eq (mol/L)	[Toluene]eq (mmol/L)	[Toluene] ads (µmole/ g silica)	Xadmic	Xbulk	K
0	0	0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	5.43E-04	7.45E+05	2.98E+01	2.98E-02	3.24E-04	3.24E-01	8.76E+00	1.24E-02	3.94E-06	3.14E+03
100.00	1.00E-01	1.09E-03	1.34E+06	5.35E+01	5.35E-02	5.81E-04	5.81E-01	2.02E+01	2.80E-02	9.07E-06	3.09E+03
500.00	5.00E-01	5.43E-03	5.86E+06	2.34E+02	2.34E-01	2.55E-03	2.55E+00	1.15E+02	1.41E-01	5.19E-05	2.73E+03
800.00	8.00E-01	8.68E-03	6.24E+06	2.50E+02	2.50E-01	2.71E-03	2.71E+00	2.39E+02	2.54E-01	1.08E-04	2.37E+03
1000.00	1.00E+00	1.09E-02	6.33E+06	2.53E+02	2.53E-01	2.75E-03	2.75E+00	3.24E+02	3.16E-01	1.46E-04	2.17E+03

Table A-6 Adsolubilization of toluene at pH 5 and I = 10 mM.

Weight of silica = 15 g

Molecular weight of toluene = 92 g/mol

Equation from GC $Y = 4.00E^{-05}X$

Where Y = Equilibrium concentration of toluene

X = Area of toluene from head space gas chromatography

Density of toluene = 0.867 g/ml

Maximum adsorption = 700 μmol/g silica

[Toluene] initial ppm	[Toluene] initial g/l	[Toluene] initial mol/l	Area at equilibrium	[Toluene] eq (ppm)	[Toluene] eq (g/L)	[Toluene] eq (mol/L)	[Toluene]eq (mmol/L)	[Toluene] ads (μmole/ g silica)	Xadmic	Xbulk	K
0	0	0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	5.43E-04	5.40E+05	2.16E+01	2.16E-02	2.35E-04	2.35E-01	1.23E+01	1.73E-02	5.54E-06	3.12E+03
100.00	1.00E-01	1.09E-03	9.71E+05	3.88E+01	3.88E-02	4.22E-04	4.22E-01	2.65E+01	3.65E-02	1.19E-05	3.06E+03
500.00	5.00E-01	5.43E-03	5.74E+06	2.30E+02	2.30E-01	2.50E-03	2.50E+00	1.17E+02	1.43E-01	5.27E-05	2.72E+03
800.00	8.00E-01	8.68E-03	6.12E+06	2.45E+02	2.45E-01	2.66E-03	2.66E+00	2.41E+02	2.56E-01	1.08E-04	2.36E+03
1000.00	1.00E+00	1.09E-02	6.58E+06	2.63E+02	2.63E-01	2.86E-03	2.86E+00	3.20E+02	3.13E-01	1.44E-04	2.18E+03

Table A-7 Adsolubilization of toluene at pH 5 and I = 100 mM.

Weight of silica = 15 g

Molecular weight of toluene = 92 g/mol

Equation from GC $Y = 4.00E^{-05}X$

Where Y = Equilibrium concentration of toluene

X = Area of toluene from head space gas chromatography

Density of toluene = 0.867 g/ml

Maximum adsorption = 900 μmol/g silica

[Toluene] initial ppm	[Toluene] initial g/l	[Toluene] initial mol/l	Area at equilibrium	[Toluene] eq (ppm)	[Toluene] eq (g/L)	[Toluene]eq (mol/L)	[Toluene]eq (mmol/L)	[Toluene] ads (μmole/ g silica)	Xadmic	Xbulk	K
0	0	0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	5.43E-04	4.71E+05	1.88E+01	1.88E-02	2.05E-04	2.05E-01	1.35E+01	1.48E-02	6.08E-06	2.43E+03
100.00	1.00E-01	1.09E-03	8.50E+05	3.40E+01	3.40E-02	3.69E-04	3.69E-01	2.86E+01	3.08E-02	1.29E-05	2.39E+03
500.00	5.00E-01	5.43E-03	4.74E+06	1.89E+02	1.89E-01	2.06E-03	2.06E+00	1.35E+02	1.30E-01	6.06E-05	2.15E+03
800.00	8.00E-01	8.68E-03	5.86E+06	2.34E+02	2.34E-01	2.55E-03	2.55E+00	2.45E+02	2.14E-01	1.10E-04	1.94E+03
1000.00	1.00E+00	1.09E-02	6.35E+06	2.54E+02	2.54E-01	2.76E-03	2.76E+00	3.24E+02	2.65E-01	1.46E-04	1.81E+03

Table A-8 Adsolubilization of toluene at pH 8 and I = 0 mM.

Weight of silica = 15 g

Molecular weight of toluene = 92 g/mol

Equation from GC $Y = 4.00E^{-05}X$

Where Y = Equilibrium concentration of toluene

X = Area of toluene from head space gas chromatography

Density of toluene = 0.867 g/ml

Maximum adsorption = 700 μmol/g silica

[Toluene] initial ppm	[Toluene] initial g/l	[Toluene] initial mol/L	Area at equilibrium	[Toluene]eq (mmol/L)	[Toluene] ads (μmole/ g silica)	Xadmic	Xbulk	K
0	0	0	0	0	0	0	0	0
50.00	5.00E-02	5.43E-04	5.71E+03	2.48E-01	1.18E+01	1.65E-02	5.30E-06	3.12E+03
100.00	1.00E-01	1.09E-03	7.53E+03	6.54E-01	1.72E+01	2.40E-02	7.76E-06	3.10E+03
500.00	5.00E-01	5.43E-03	6.08E+04	2.64E+00	1.11E+02	1.37E-01	5.01E-05	2.74E+03
800.00	8.00E-01	8.68E-03	3.22E+04	2.80E+00	2.35E+02	2.52E-01	1.06E-04	2.37E+03
1000.00	1.00E+00	1.09E-02	2.87E+04	2.50E+00	3.34E+02	3.23E-01	1.51E-04	2.15E+03

Table A-9 Adsolubilization of toluene at pH 8 and I = 1 mM.

Weight of silica = 15 g

Molecular weight of toluene = 92 g/mol

Equation from GC $Y = 4.00E^{-05}X$

Where Y = Equilibrium concentration of toluene

X = Area of toluene from head space gas chromatography

Density of toluene = 0.867 g/ml

Maximum adsorption = 900 μmol/g silica

[Toluene] initial ppm	[Toluene] initial g/l	[Toluene] initial mol/L	Area at equilibrium	[Toluene]eq (mmol/L)	[Toluene] ads (μmole/ g silica)	Xadmic	Xbulk	K
0	0	0	0	0	0	0	0	0
50.00	5.00E-02	5.43E-04	3.90E+05	1.70E-01	1.49E+01	1.63E-02	6.72E-06	2.43E+03
100.00	1.00E-01	1.09E-03	9.97E+05	4.34E-01	2.61E+01	2.82E-02	1.17E-05	2.40E+03
500.00	5.00E-01	5.43E-03	5.91E+06	2.57E+00	1.14E+02	1.13E-01	5.15E-05	2.19E+03
800.00	8.00E-01	8.68E-03	6.36E+06	2.77E+00	2.37E+02	2.08E-01	1.07E-04	1.95E+03
1000.00	1.00E+00	1.09E-02	6.59E+06	2.86E+00	3.20E+02	2.62E-01	1.44E-04	1.82E+03

Table A-10 Adsolubilization of toluene at pH 8 and I = 10 mM.

Weight of silica = 15 g

Molecular weight of toluene = 92 g/mol

Equation from GC $Y = 4.00E^{-05}X$

Where Y = Equilibrium concentration of toluene

X = Area of toluene from head space gas chromatography

Density of toluene = 0.867 g/ml

Maximum adsorption = 900 μmol/g silica

[Toluene] initial ppm	[Toluene] initial g/l	[Toluene] initial mol/L	Area at equilibrium	[Toluene]eq (mmol/L)	[Toluene] ads (μmole/ g silica)	Xadmic	Xbulk	K
0	0	0	0	0	0	0	0	0
50.00	5.00E-02	5.43E-04	4.77E+05	2.07E-01	1.34E+01	1.47E-02	6.03E-06	2.43E+03
100.00	1.00E-01	1.09E-03	7.29E+05	3.17E-01	3.07E+01	3.30E-02	1.38E-05	2.39E+03
500.00	5.00E-01	5.43E-03	5.09E+06	2.22E+00	1.28E+02	1.25E-01	5.78E-05	2.16E+03
800.00	8.00E-01	8.68E-03	6.07E+06	2.64E+00	2.42E+02	2.12E-01	1.09E-04	1.95E+03
1000.00	1.00E+00	1.09E-02	4.92E+06	2.14E+00	3.49E+02	2.79E-01	1.57E-04	1.78E+03

Table A-11 Adsolubilization of acetophenone at pH 5 and I = 0 mM.

Weight of silica = 15 g

Molecular weight of toluene = 120 g/mol

Equation from UV Y = 0.0925X

Where Y = Percent of absorbance

X = Equilibrium concentration of acetophenone

Density of acetophenone = 1.028 g/ml

Maximum adsorption = 600 μmol/g silica

[Ace] initial ppm	[Ace] initial g/l	[Ace] initial mol/L	A	[Ace] eq(ppm)	[Ace] eq(g/l)	[Ace] eq (mmol/l)	[Ace] ad (μmol/g silica)	Xadmicell	Xbulk	K
0	0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	4.17E-04	6.84E-03	3.70E+01	3.70E-02	3.08E-01	4.35E+00	7.20E-03	5.54E-06	1.30E+03
100.00	1.00E-01	8.33E-04	1.45E-02	7.84E+01	7.84E-02	6.53E-01	7.21E+00	1.19E-02	1.18E-05	1.01E+03
500.00	5.00E-01	4.17E-03	7.14E-02	3.86E+02	3.86E-01	3.22E+00	3.80E+01	5.96E-02	5.79E-05	1.03E+03
800.00	8.00E-01	6.67E-03	1.16E-01	6.29E+02	6.29E-01	5.24E+00	5.69E+01	8.66E-02	9.44E-05	9.17E+02
1000.00	1.00E+00	8.33E-03	1.42E-01	7.66E+02	7.66E-01	6.39E+00	7.79E+01	1.15E-01	1.15E-04	9.99E+02

Table A-12 Adsolubilization of acetophenone at pH 5 and I = 1 mM.

Weight of silica = 15 g

Molecular weight of toluene = 120 g/mol

Equation from UV Y = 0.0925X

Where Y = Percent of absorbance

X = Equilibrium concentration of acetophenone

Density of acetophenone = 1.028 g/ml

Maximum adsorption = 700 μmol/g silica

[Ace] initial ppm	[Ace] initial g/l	[Ace] initial mol/L	A	[Ace] eq(ppm)	[Ace] eq(g/l)	[Ace] eq (mmol/l)	[Ace] ad (μmol/g silica)	Xadmicell	Xbulk	K
0	0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	4.17E-04	9.16E-03	2.48E+01	2.48E-02	2.06E-01	8.41E+00	1.19E-02	3.71E-06	3.20E+03
100.00	1.00E-01	8.33E-04	2.22E-02	6.01E+01	6.01E-02	5.01E-01	1.33E+01	1.86E-02	9.02E-06	2.07E+03
500.00	5.00E-01	4.17E-03	6.54E-02	3.53E+02	3.53E-01	2.94E+00	4.89E+01	6.53E-02	5.30E-05	1.23E+03
800.00	8.00E-01	6.67E-03	1.07E-01	5.77E+02	5.77E-01	4.81E+00	7.42E+01	9.59E-02	8.66E-05	1.11E+03
1000.00	1.00E+00	8.33E-03	1.35E-01	7.31E+02	7.31E-01	6.10E+00	8.95E+01	1.13E-01	1.10E-04	1.03E+03

Table A-12 Adsolubilization of acetophenone at pH 5 and I = 10 mM.

Weight of silica = 15 g

Molecular weight of toluene = 120 g/mol

Equation from UV Y = 0.0925X

Where Y = Percent of absorbance

X = Equilibrium concentration of acetophenone

Density of acetophenone = 1.028 g/ml

Maximum adsorption = 700 μmol/g silica

[Ace] initial ppm	[Ace] initial g/l	[Ace] initial mol/L	A	[Ace] eq(ppm)	[Ace] eq(g/l)	[Ace] eq (mmol/l)	[Ace] ad (μmol/g silica)	Xadmicell	Xbulk	K
0	0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	4.17E-04	5.67E-03	1.53E+01	1.53E-02	1.28E-01	1.16E+01	1.62E-02	2.30E-06	7.06E+03
100.00	1.00E-01	8.33E-04	2.03E-02	5.49E+01	5.49E-02	4.58E-01	1.50E+01	2.10E-02	8.24E-06	2.55E+03
500.00	5.00E-01	4.17E-03	6.24E-02	3.37E+02	3.37E-01	2.81E+00	5.42E+01	7.19E-02	5.06E-05	1.42E+03
800.00	8.00E-01	6.67E-03	1.05E-01	5.69E+02	5.69E-01	4.74E+00	7.70E+01	9.92E-02	8.54E-05	1.16E+03
1000.00	1.00E+00	8.33E-03	1.29E-01	6.96E+02	6.96E-01	5.80E+00	1.01E+02	1.26E-01	1.04E-04	1.21E+03

Table A-13 Adsolubilization of acetophenone at pH 5 and I = 100 mM.

Weight of silica = 15 g

Molecular weight of toluene = 120 g/mol

Equation from UV Y = 0.0925X

Where Y = Percent of absorbance

X = Equilibrium concentration of acetophenone

Density of acetophenone = 1.028 g/ml

Maximum adsorption = 900 μmol/g silica

[Ace] initial ppm	[Ace] initial g/l	[Ace] initial mol/L	A	[Ace] eq(ppm)	[Ace] eq (g/l)	[Ace] eq (mmol/l)	[Ace] ad (μmol/g silica)	Xadmicell	Xbulk	K
0	0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	4.17E-04	4.52E-03	1.22E+01	1.22E-02	1.02E-01	1.26E+01	1.38E-02	1.83E-06	7.54E+03
100.00	1.00E-01	8.33E-04	1.73E-02	4.67E+01	4.67E-02	3.89E-01	1.78E+01	1.94E-02	7.00E-06	2.77E+03
500.00	5.00E-01	4.17E-03	5.34E-02	2.89E+02	2.89E-01	2.41E+00	7.04E+01	7.25E-02	4.33E-05	1.67E+03
800.00	8.00E-01	6.67E-03	7.80E-02	4.22E+02	4.22E-01	3.52E+00	1.26E+02	1.23E-01	6.33E-05	1.94E+03
1000.00	1.00E+00	8.33E-03	9.57E-02	5.17E+02	5.17E-01	4.31E+00	1.61E+02	1.52E-01	7.76E-05	1.96E+03

Table A-14 Adsolubilization of acetophenone at pH 8 and I = 0 mM.

Weight of silica = 15 g

Molecular weight of toluene = 120 g/mol

Equation from UV Y = 0.0925X

Where Y = Percent of absorbance

X = Equilibrium concentration of acetophenone

Density of acephenone = 1.028 g/ml

Maximum adsorption = 700 μmol/g silica

[Ace] initial ppm	[Ace] initial g/l	[Ace] initial mol/L	A	[Ace] eq (mol/l)	[Ace] eq (mmol/l)	[Ace] ad (μmol/g silica)	Xadmicell	Xbulk	K
0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	4.17E-04	4.77E-03	2.15E-04	2.15E-01	8.08E+00	1.14E-02	3.86E-06	2.95E+03
100.00	1.00E-01	8.33E-04	1.21E-02	5.46E-04	5.46E-01	1.15E+01	1.61E-02	9.83E-06	1.64E+03
500.00	5.00E-01	4.17E-03	7.08E-02	3.19E-03	3.19E+00	3.91E+01	5.29E-02	5.74E-05	9.22E+02
800.00	8.00E-01	6.67E-03	1.18E-01	5.32E-03	5.32E+00	5.38E+01	7.14E-02	9.58E-05	7.45E+02
1000.00	1.00E+00	8.33E-03	1.44E-01	6.51E-03	6.51E+00	7.31E+01	9.45E-02	1.17E-04	8.07E+02

Table A-15 Adsolubilization of acetophenone at pH 8 and I = 1 mM.

Weight of silica = 15 g

Molecular weight of toluene = 120 g/mol

Equation from UV Y = 0.0925X

Where Y = Percent of absorbance

X = Equilibrium concentration of acetophenone

Density of acetophenone = 1.028 g/ml

Maximum adsorption = 900 μmol/g silica

[Ace] initial ppm	[Ace] initial g/l	[Ace] initial mol/L	A	[Ace] eq (mol/l)	[Ace] eq (mmol/l)	[Ace] ad (μmol/g silica)	Xadmicell	Xbulk	K
0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	4.17E-04	8.07E-03	1.82E-04	1.82E-01	9.40E+00	1.03E-02	3.27E-06	3.16E+03
100.00	1.00E-01	8.33E-04	1.94E-02	4.36E-04	4.36E-01	1.59E+01	1.73E-02	7.85E-06	2.21E+03
500.00	5.00E-01	4.17E-03	6.23E-02	2.80E-03	2.80E+00	5.45E+01	5.71E-02	5.05E-05	1.13E+03
800.00	8.00E-01	6.67E-03	1.05E-01	4.72E-03	4.72E+00	7.77E+01	7.95E-02	8.51E-05	9.34E+02
1000.00	1.00E+00	8.33E-03	2.56E-01	5.77E-03	5.77E+00	1.02E+02	1.02E-01	1.04E-04	9.84E+02

Table A-16 Adsolubilization of acetophenone at pH 8 and I = 10 mM.

Weight of silica = 15 g

Molecular weight of toluene = 120 g/mol

Equation from UV Y = 0.0925X

Where Y = Percent of absorbance

X = Equilibrium concentration of acetophenone

Density of acetophenone = 1.028 g/ml

Maximum adsorption = 900 μmol/g silica

[Ace] initial ppm	[Ace] initial g/l	[Ace] initial mol/L	A	[Ace] eq (mol/l)	[Ace] eq (mmol/l)	[Ace] ad (μmol/g silica)	Xadmicell	Xbulk	K
0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	4.17E-04	5.92E-03	1.33E-04	1.33E-01	1.13E+01	1.24E-02	2.40E-06	5.18E+03
100.00	1.00E-01	8.33E-04	1.77E-02	3.98E-04	3.98E-01	1.74E+01	1.90E-02	7.17E-06	2.65E+03
500.00	5.00E-01	4.17E-03	5.20E-02	2.34E-03	2.34E+00	7.29E+01	7.50E-02	4.22E-05	1.78E+03
800.00	8.00E-01	6.67E-03	9.01E-02	4.06E-03	4.06E+00	1.04E+02	1.04E-01	7.30E-05	1.42E+03
1000.00	1.00E+00	8.33E-03	1.19E-01	5.37E-03	5.37E+00	1.19E+02	1.17E-01	9.66E-05	1.21E+03

Table A-17 Adsolubilization of toluene in the presence of acetophenone at pH 5 and I = 0 mM.

Weight of silica = 15 g

Molecular weight of acetophenone = 92 g/mol

Molecular weight of toluene = 120 g/mol

Equation from UV Y = 0.0925X

Equation from GC $Y = 4.00E^{-05}X$

Density of toluene = 0.87 g/ml

Initial concentration of acetophenone = 500 ppm

Maximum adsorption = 600 μmol/g silica

[Toluene] initial ppm	[Toluene] initial g/l	[Toluene] initial mol/L	Area at equilibrium	[Toluene]eq (mol/L)	[Toluene] ad (μmole/ g silica)	Area Tol after	[Tol] mmol/l	[Tol] ads (mmol/g silica)	A	[Ace] eq mol/l	[Ace] ads (μmol/ g silica)	Xadmic	Xbulk	K
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	5.43E-04	1.29E+04	5.63E-06	2.15E+01	8.97E+03	3.90E-03	6.91E-02	5.33E-03	1.20E-04	1.62E+02	2.75E-02	7.02E-08	3.92E+05
100.00	1.00E-01	1.09E-03	5.99E+04	2.60E-05	4.24E+01	3.33E+04	1.45E-02	4.62E-01	1.86E-02	4.18E-04	1.50E+02	5.40E-02	2.61E-07	2.07E+05
500.00	5.00E-01	5.43E-03	2.83E+05	1.23E-04	2.12E+02	1.41E+05	6.14E-02	2.46E+00	2.50E-02	1.13E-03	1.22E+02	2.29E-01	1.11E-06	2.07E+05
800.00	8.00E-01	8.68E-03	4.90E+05	2.13E-04	3.39E+02	2.06E+05	8.94E-02	4.95E+00	6.82E-02	3.07E-03	4.38E+01	3.48E-01	1.61E-06	2.16E+05
1000.00	1.00E+00	1.09E-02	5.49E+05	2.39E-04	4.25E+02	2.47E+05	1.07E-01	5.26E+00	7.39E-02	3.33E-03	3.35E+01	4.04E-01	1.93E-06	2.09E+05

Table A-18 Adsolubilization of toluene in the presence of acetophenone at pH 5 and I = 1 mM.

Weight of silica = 15 g

Molecular weight of acetophenone = 92 g/mol

Molecular weight of toluene = 120 g/mol

Equation from UV Y = 0.0925X

Equation from GC $Y = 4.00E^{-05}X$

Density of toluene = 0.87 g/ml

Initial concentration of acetophenone = 500 ppm

Maximum adsorption = 700 μmol/g silica

[Toluene] initial ppm	[Toluene] initial g/l	[Toluene] initial mol/L	Area at equilibrium	[Toluene]eq (mol/L)	[Toluene] ads (μmole/ g silica)	Area Tol after	[Tol] mmol/l	[Tol] ads (μmol/g silica)	A	[Ace] eq mol/l	[Ace] ads (μmol/ g silica)	Xadmic	Xbulk	K
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	5.43E-04	1.43E+04	6.21E-06	2.15E+01	9.39E+03	4.08E-03	8.52E-02	1.68E-01	2.52E-03	6.59E+01	2.74E-02	7.35E-08	3.72E+05
100.00	1.00E-01	1.09E-03	1.61E+05	7.01E-05	4.06E+01	3.22E+04	1.40E-02	2.25E+00	1.69E-01	2.53E-03	6.54E+01	6.05E-02	2.52E-07	2.40E+05
500.00	5.00E-01	5.43E-03	2.39E+05	1.04E-04	2.13E+02	1.20E+05	5.21E-02	2.07E+00	1.67E-01	2.50E-03	6.66E+01	2.19E-01	9.37E-07	2.34E+05
800.00	8.00E-01	8.68E-03	3.46E+05	1.51E-04	3.41E+02	1.66E+05	7.21E-02	3.14E+00	1.71E-01	2.56E-03	6.43E+01	3.11E-01	1.30E-06	2.39E+05
1000.00	1.00E+00	1.09E-02	4.39E+05	1.91E-04	4.26E+02	2.04E+05	8.85E-02	4.10E+00	2.75E-01	4.12E-03	1.75E+00	3.80E-01	1.59E-06	2.38E+05

Table A-19 Adsolubilization of toluene in the presence of acetophenone at pH 5 and I = 10 mM.

Weight of silica = 15 g

Molecular weight of acetophenone = 92 g/mol

Molecular weight of toluene = 120 g/mol

Equation from UV Y = 0.0925X

Equation from GC $Y = 4.00E^{-05}X$

Density of toluene = 0.87 g/ml

Initial concentration of acetophenone = 500 ppm

Maximum adsorption = 700 μmol/g silica

[Toluene] initial ppm	[Toluene] initial g/l	[Toluene] initial mol/L	Area at equilibrium	[Toluene]eq (mol/L)	[Toluene] ads (μmole/ g silica)	Area Tol after	[Tol] mmol/l	[Tol] ads (μmol/g silica)	A	[Ace] eq mol/l	[Ace] ads (μmol/ g silica)	Xadmic	Xbulk	K
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	5.43E-04	2.78E+04	1.21E-05	2.12E+01	7.10E+03	3.09E-03	3.60E-01	1.65E-01	2.48E-03	6.76E+01	2.73E-02	5.56E-08	4.92E+05
100.00	1.00E-01	1.09E-03	4.82E+04	2.09E-05	4.26E+01	2.51E+04	1.09E-02	4.01E-01	2.08E-01	3.13E-03	4.15E+01	5.48E-02	1.97E-07	2.79E+05
500.00	5.00E-01	5.43E-03	2.38E+05	1.03E-04	2.13E+02	9.85E+04	4.28E-02	2.43E+00	1.59E-01	2.39E-03	7.11E+01	2.18E-01	7.71E-07	2.83E+05
800.00	8.00E-01	8.68E-03	3.27E+05	1.42E-04	3.42E+02	1.42E+05	6.18E-02	3.22E+00	1.38E-01	2.08E-03	8.36E+01	3.06E-01	1.11E-06	2.75E+05
1000.00	1.00E+00	1.09E-02	4.64E+05	2.02E-04	4.26E+02	1.60E+05	6.96E-02	5.29E+00	1.36E-01	2.04E-03	8.49E+01	3.55E-01	1.25E-06	2.83E+05

Table A-19 Adsolubilization of toluene in the presence of acetophenone at pH 5 and I = 100 mM.

Weight of silica = 15 g

Molecular weight of acetophenone = 92 g/mol

Molecular weight of toluene = 120 g/mol

Equation from UV Y = 0.0925X

Equation from GC $Y = 4.00E^{-05}X$

Density of toluene = 0.87 g/ml

Initial concentration of acetophenone = 500 ppm

Maximum adsorption = 900 μmol/g silica

[Toluene] initial ppm	[Toluene] initial g/l	[Toluene] initial mol/L	Area at equilibrium	[Toluene] eq (mol/L)	[Toluene] ads (μmole/ g silica)	Area Tol after	[Tol] mmol/l	[Tol] ads (μmol/g silica)	A	[Ace] eq mol/l	[Ace] ads (μmol/ g silica)	Xadmic	Xbulk	K
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	5.43E-04	2.64E+04	1.15E-05	2.12E+01	7.06E+03	3.07E-03	3.36E-01	8.88E-02	1.33E-03	1.13E+02	2.09E-02	5.52E-08	3.78E+05
100.00	1.00E-01	1.09E-03	6.22E+04	2.70E-05	4.23E+01	1.78E+04	7.72E-03	7.72E-01	1.12E-01	1.68E-03	9.95E+01	4.13E-02	1.39E-07	2.97E+05
500.00	5.00E-01	5.43E-03	1.89E+05	8.23E-05	2.14E+02	7.71E+04	3.35E-02	1.95E+00	1.17E-01	1.75E-03	9.65E+01	1.78E-01	6.04E-07	2.95E+05
800.00	8.00E-01	8.68E-03	2.14E+05	9.30E-05	3.44E+02	1.11E+05	4.83E-02	1.79E+00	1.23E-01	1.85E-03	9.26E+01	2.58E-01	8.69E-07	2.97E+05
1000.00	1.00E+00	1.09E-02	2.52E+05	1.10E-04	4.30E+02	1.28E+05	5.57E-02	2.15E+00	1.57E-01	2.36E-03	7.23E+01	3.08E-01	1.00E-06	3.07E+05

Table A-20 Adsolubilization of toluene in the presence of acetophenone at pH 8 and I = 0 mM.

Weight of silica = 15 g

Molecular weight of acetophenone = 92 g/mol

Molecular weight of toluene = 120 g/mol

Equation from UV Y = 0.0925X

Equation from GC $Y = 4.00E^{-05}X$

Density of toluene = 0.87 g/ml

Initial concentration of acetophenone = 500 ppm

Maximum adsorption = 700 μmol/g silica

[Toluene] initial ppm	[Toluene] initial g/l	[Toluene] initial mol/L	Area at equilibrium	[Toluene]eq (mol/L)	[Toluene] ads (μmole/ g silica)	Area Tol after	[Tol] mmol/l	[Tol] ads (μmol/g silica)	A	[Ace] eq mol/l	[Ace] ads (μmol/ g silica)	Xadmic	Xbulk	K
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	5.43E-04	1.33E+04	5.76E-06	2.15E+01	1.05E+04	4.58E-03	4.74E-02	6.41E-02	1.44E-03	1.09E+02	2.59E-02	8.24E-08	3.14E+05
100.00	1.00E-01	1.09E-03	4.56E+04	1.98E-05	4.26E+01	2.54E+04	1.10E-02	3.51E-01	9.28E-02	2.09E-03	8.31E+01	5.20E-02	1.99E-07	2.62E+05
500.00	5.00E-01	5.43E-03	2.36E+05	1.02E-04	2.13E+02	1.19E+05	5.17E-02	2.03E+00	8.81E-02	3.97E-03	8.00E+00	2.33E-01	9.31E-07	2.50E+05
800.00	8.00E-01	8.68E-03	3.18E+05	1.38E-04	3.42E+02	1.69E+05	7.33E-02	2.60E+00	9.16E-02	4.12E-03	1.68E+00	3.29E-01	1.32E-06	2.49E+05
1000.00	1.00E+00	1.09E-02	5.37E+05	2.33E-04	4.25E+02	2.53E+05	1.10E-01	4.94E+00	9.13E-02	4.11E-03	2.10E+00	3.80E-01	1.98E-06	1.92E+05

Table A-21 Adsolubilization of toluene in the presence of acetophenone at pH 8 and I = 1 mM.

Weight of silica = 15 g

Molecular weight of acetophenone = 92 g/mol

Molecular weight of toluene = 120 g/mol

Equation from UV Y = 0.0925X

Equation from GC $Y = 4.00E^{-05}X$

Density of toluene = 0.87 g/ml

Initial concentration of acetophenone = 500 ppm

Maximum adsorption = 900 μmol/g silica

[Toluene] initial ppm	[Toluene] initial g/l	[Toluene] initial mol/L	Area at equilibrium	[Toluene]eq (mol/L)	[Toluene] ads (μmole/ g silica)	Area Tol after	[Tol] mmol/l	[Tol] ads (μmol/g silica)	A	[Ace] eq mol/l	[Ace] ads (μmol/ g silica)	Xadmic	Xbulk	K
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	5.43E-04	1.27E+04	5.53E-06	2.15E+01	7.25E+03	3.15E-03	9.52E-02	5.04E-02	7.57E-04	1.36E+02	2.04E-02	5.67E-08	3.60E+05
100.00	1.00E-01	1.09E-03	4.23E+04	1.84E-05	4.27E+01	2.35E+04	1.02E-02	3.28E-01	1.03E-01	1.55E-03	1.05E+02	4.10E-02	1.84E-07	2.23E+05
500.00	5.00E-01	5.43E-03	2.29E+05	9.95E-05	2.13E+02	1.09E+05	4.73E-02	2.09E+00	1.06E-01	1.59E-03	1.03E+02	1.77E-01	8.51E-07	2.07E+05
800.00	8.00E-01	8.68E-03	3.05E+05	1.33E-04	3.42E+02	1.52E+05	6.59E-02	2.68E+00	1.61E-01	2.42E-03	7.00E+01	2.62E-01	1.19E-06	2.21E+05
1000.00	1.00E+00	1.09E-02	3.86E+05	1.68E-04	4.27E+02	1.91E+05	8.33E-02	3.38E+00	1.62E-01	2.43E-03	6.95E+01	3.08E-01	1.50E-06	2.05E+05

Table A-22 Adsolubilization of toluene in the presence of acetophenone at pH 8 and I = 10 mM.

Weight of silica = 15 g

Molecular weight of acetophenone = 92 g/mol

Molecular weight of toluene = 120 g/mol

Equation from UV Y = 0.0925X

Equation from GC $Y = 4.00E^{-05}X$

Density of toluene = 0.87 g/ml

Initial concentration of acetophenone = 500 ppm

Maximum adsorption = 900 µmol/g silica

[Toluene] initial ppm	[Toluene] initial g/l	[Toluene] initial mol/L	Area at equilibrium	[Toluene]eq (mol/L)	[Toluene] ads (µmole/ g silica)	Area Tol after	[Tol] mmol/l	[Tol] ads (µmol/g silica)	A	[Ace] eq mol/l	[Ace] ads (µmol/ g silica)	Xadmic	Xbulk	K
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50.00	5.00E-02	5.43E-04	1.22E+04	5.31E-06	2.15E+01	7.41E+03	3.22E-03	8.35E-02	5.31E-02	7.97E-04	1.35E+02	2.04E-02	5.80E-08	3.52E+05
100.00	1.00E-01	1.09E-03	3.66E+04	1.59E-05	4.28E+01	1.57E+04	6.81E-03	3.63E-01	1.37E-01	2.05E-03	8.45E+01	4.20E-02	1.23E-07	3.42E+05
500.00	5.00E-01	5.43E-03	1.68E+05	7.32E-05	2.14E+02	8.02E+04	3.49E-02	1.53E+00	1.45E-01	2.18E-03	7.96E+01	1.80E-01	6.28E-07	2.87E+05
800.00	8.00E-01	8.68E-03	2.18E+05	9.49E-05	3.44E+02	1.14E+05	4.97E-02	1.81E+00	1.50E-01	2.25E-03	7.68E+01	2.61E-01	8.95E-07	2.92E+05
1000.00	1.00E+00	1.09E-02	3.57E+05	1.55E-04	4.28E+02	1.50E+05	6.52E-02	3.59E+00	1.60E-01	2.40E-03	7.08E+01	3.08E-01	1.17E-06	2.62E+05

Sample calculation A

Surfactant adsorption isotherms

CTAB adsorption isotherm was constructed by plotting the amount of CTAB adsorbed per gram silica versus equilibrium concentration of CTAB.

1. Finding CTAB adsorbed concentration (ppm).
   [Adsorbed CTAB] = [Initial CTAB]-[Equilibrium CTAB]
   [Initial CTAB] = 149.70 ppm.
   [Equilibrium CTAB] = 32.00 ppm.
   [Adsorbed CTAB] = 149.70-32.00 = 117.70 ppm.

2. To convert unit of ppm to micromolar by parameter from calibration curve.
   Micromolar = ppm/0.3137
   Adsorbed concentration (μM) = Adsorbed concentration (ppm)/0.3137
   Adsorbed concentration (μM) = 117.70/0.3137 = 477.21
   Equilibrium concentration (μM) = Equilibrium concentration (ppm)/0.3137
   Equilibrium concentration (μM) =32.00/0.3137 = 102.01

3. To convert adsorption concentration to moles of adsorption.

$$\text{Mole} = \frac{\text{concentretion} \times \text{volume}}{1000}$$

$$\text{Adsorbed}(\mu\text{moles}) = \frac{\text{Adsorbed}(\mu\text{M}) \times \text{volume of solution}}{1000}$$

Adsorbed (μmoles) = (477.21 × 20)/1000 = 9.54

4. Finding CTAB adsorbed per gram silica.

$$\text{CTAB adsorbed}\,(\mu\text{moles / g silica}) = \frac{\text{Adsorbed}\,(\mu\text{moles})}{0.5\,\text{g}}$$

CTAB adsorbed (μmoles/g silica) = 9.54/0.5 = 19.09

5. Ionic strength

   Stock solution of sodium bromine (NaBr) = 0.1 M

   From

$$\frac{W}{MW} = \frac{C \times V}{1000}$$

   W = (0.1× 100× 102.9)/1000

   = 1.029 g

   Ionic strength = 1mM or 0.001M

   From $C_1V_2 = C_2V_2$

   $0.1\times V_2 = 0.001\times 20$

   $V_2 = 0.2$ ml

Hence, adding NaBr 0.2 ml and CTAB solution 19.8 ml in vial.

Sample calculation B

Partition ratio

$$K = \frac{X_{admicelle}}{X_{bulk}}$$

Where $X_{admicelle}$ = mole fraction of solute in the surfactant coverage.

X_{bulk} = mole fraction of solute in the bulk.

Adsolubilization of toluene at pH 5

Weight of silica = 15 g

Molecular weight of toluene = 92 g/mol

Equation from GC Y= 4.00E-05 X

Where X = Area of head space gas chromatography

Y = Equilibrium concentration of toluene

$\rho_{toluene}$ = 0.867 g/mL

Maximum adsorption of CTAB = 700 μmol/ g silica

Initial concentration of toluene (g/L) convert to (mol/L)

$$[Toluene](mol/L) = \frac{[Toluene](g/L)}{\text{Molecular weight}} = \frac{[Toluene](g/L)}{92}$$

$$[Toluene](mol/L) = \frac{5.00E-02}{92} = 5.43E-04$$

At equilibrium toluene concentration from area of GC

From Y= 4.00E-05 X

X = Area = 7.10E+05 replace in the equation

Y = 4.00E-05×7.10E+05 = 2.84E+01(ppm) = 2.84E-02 (g/L)

Convert unit of toluene concentration from (g/L) to (mol/L)

$$[\text{Toluene}](\text{mol}/\text{L}) = \frac{2.84\text{E}-02}{92} = 3.09\text{E}-04$$

Toluene adsolubilization = [Toluene] initial – [Toluene] equilibrium

= 5.43E-04 – 3.09E-04

= 2.34E-04 mol/L

Toluene adsolubilization = 2.34E+02 μmol/L

Toluene adsolubilization (μmol/ g silica) = ((([Toluene] × volume)/1000)/15)

= (((2.34E+02 × 600)/1000)/15)

= 9.35E+00

$$X_{admicelle} = \frac{\text{Mole of Toluene}}{(\text{Mole of CTAB adsorption} + \text{Mole of Toluene})} = \frac{9.35}{(700 + 9.35)}$$

$X_{admicelle}$ = 1.53E-02

At the surpernatant

Toluene concentration at equilibrium is converted to mole

$$\text{Mole of Toluene} = \frac{[\text{Toluene}] \times \text{volume}}{1000}$$

$$\text{Mole of Toluene} = \frac{(3.09\text{E}-04 \times 600)}{1000} = 1.40\text{E}-04$$

Total volume = Volume of toluene + Volume of H_2O

$$\text{Volume of Toluene} = \frac{\text{g of toluene at equilibrium}}{\text{Density of toluene}} = \frac{2.84\text{E}-02 \times 1000}{0.867}$$

Volume of Toluene = 3.28E+01 ml

Volume of H_2O = Total volume - Volume of toluene

= 600 ml- 3.28E+01ml

= 5.67E+02 ml

Assume density of water = 1 g/ml

Mass of water = Volume of H_2O

= 5.67E+02 g

$$X_{bulk} = \frac{\text{Mole of toluene}}{(\text{Mole of toluene} + \text{Mole } H_2O)} = \frac{1.40E-04}{(1.40E-04 + 31.5)} = 4.45E-06$$

$$K = \frac{X_{admicelle}}{X_{bulk}} = \frac{1.53E-02}{4.45E-06} = 3.45E+03$$

CURRICURUM VITAE

Name: Ms. Thunyarak Kanjanakhunthakul

Date of Birth: Oct 17, 1977

Nationality: Thai

University Education:

1996-1999 Bachelor Degree of Science in Industrial Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand.