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APPENDIX

Table A-1 The amount of surfactant adsorbed on silica Hi-Sil®255

	CTAB		
pH	Initial concentration (μM)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)
3	12000	575.071	456.997
5	12000	670.518	453.179
8	12000	78.291	476.868

	Triton X-100		
pH	Initial concentration (μM)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)
3	5000	252.143	189.914
5	5000	230.357	190.786
8	5000	242.857	190 286

	Mixed 1:1		
pH	Initial concentration (μM)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)
3	5000	179.772	192.809
5	5000	171.384	193.145
8	5000	112.290	195.508

Table A-2 Adsorption Isotherm of CTAB

pH = 3		pH = 5		pH = 8	
Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)
1.644	58.906	2.879	28.027	11.653	8.675
8.742	81.462	10.334	41.649	31.609	9.779
27.891	102.727	29.340	66.492	39.607	9.819
35.537	111.579	36.751	81.215	79.534	11.662
55.093	122.663	56.069	98.284	119.460	13.493
94.620	134.508	95.146	121.359	199.147	21.318
153.721	156.976	153.677	158.071	278.550	36.245
192.861	178.470	192.865	178.379	358.032	49.201
272.130	196.760	231.720	207.003	397.720	56.999
330.960	226.009	270.068	248.302	476.868	78.291
388.414	289.660	325.627	359.331	552.065	198.367
422.847	428.824	380.812	479.692	621.507	462.313
456.997	575.071	417.101	572.479	627.704	807.398
482.479	938.031	453.179	670.518	626.252	1343.696
483.285	1917.882	484.994	875.158	628.260	1793.505
472.578	4185.552	489.692	1757.703	629.031	2274.227
486.218	5844.547	470.329	3241.772	624.620	2884.509
470.977	7225.567	481.527	3961.835	628.065	4298.367
473.584	8160.411	480.000	5000.000	634.359	6141.021

pH = 3		pH = 5		pH = 8	
Adsorbed surfactant (μmole/g. of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g. of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g. of silica)	Equilibrium concentration (μM)
472.847	10178.824	488.782	6780.462	632.233	9194.165
473.229	13169.263	494.328	7641.807	629.899	12252.518
481.048	15973.796	496.289	12592.787	626.468	14338.312
472.805	18179.887	491.289	15717.787	634.415	17139.632
472.479	21188.031	477.101	18072.479	634.915	21127.127
488.144	24796.388	493.599	20660.014		
480.241	27993.980	495.966	24600.840		

Table A-3 Adsorption Isotherm of Triton X-100

pH = 3		pH = 5		pH = 8	
Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)
0.343	41.429	0.429	39.286	1.343	16.429
1.286	67.857	1.829	54.286	2.400	40.000
2.214	94.643	2.957	76.071	3.386	65.357
3.557	111.071	4.371	90.714	4.743	81.429
7.071	123.214	7.914	102.143	8.386	90.357
10.843	128.929	11.343	116.429	12.014	99.643
14.486	137.857	15.086	122.857	15.700	107.500
21.914	152.143	19.014	124.643	19.429	114.286
25.586	160.357	22.857	128.571	23.300	117.500
29.429	164.286	26.786	130.357	27.171	120.714
33.243	168.929	30.586	135.357	31.014	124.643
53.200	170.000	34.543	136.429	54.386	140.357
72.786	180.357	54.057	148.571	74.243	143.929
112.029	199.286	73.429	164.286	112.986	175.357
131.514	212.143	112.600	185.000	132.257	193.571
150.643	233.929	132.257	193.571	151.314	217.143
170.400	240.000	151.686	207.857	170.800	230.000
189.914	252.143	171.129	221.786	190.286	242.857
209.014	274.643	190.786	230.357	209.557	261.071

pH = 3		pH = 5		pH = 8	
Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)
228.314	292.143	209.514	262.143	228.843	278.929
248.257	293.571	228.714	282.143	248.429	289.286
267.900	302.500	235.829	304.286	268.143	296.429
305.857	353.571	243.771	305.714	302.357	441.071
325.857	603.571	262.714	432.143	302.571	935.714
314.286	1142.857	286.229	644.286	309.000	1275.000
310.000	2050.000	295.000	1125.000	311.143	1621.429
338.714	1532.143	314.286	1542.857	309.429	2064.286
352.857	3178.571	318.286	2042.857	313.429	2164.286
346.429	5339.286	321.571	3960.714	323.143	3921.429
345.714	7357.143	322.143	5946.429	327.143	5821.429
354.286	9142.857	320.714	7982.143	332.857	7678.571
355.000	11125.000	322.143	9946.429	341.429	9464.286
		322.857	11928.571	347.143	11321.429

Table A-4 Adsorption Isotherm of mixed-surfactant systems of CTAB and Triton X-100 ratio 1:1 at pH=3

Total concentration		CTAB concentration		Triton X-100 concentration	
Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)
0.827	29.335	0.412	14.710	0.414	14.643
2.377	40.567	1.390	15.257	1.071	23.214
9.985	50.380	4.979	25.516	5.000	25.000
17.692	57.708	8.851	28.726	8.843	28.929
37.255	68.629	18.478	38.039	18.714	32.143
56.872	78.205	28.326	41.851	28.500	37.500
76.299	92.529	37.989	50.271	38.243	43.929
115.714	107.138	57.490	62.752	58.071	48.214
154.475	138.129	76.910	77.260	77.429	64.286
192.809	179.772	96.241	93.978	96.500	87.500
231.060	223.488	115.215	119.635	115.714	107.143
266.135	346.629	133.453	163.687	132.843	178.929
270.510	737.259	137.578	310.546	133.900	402.500
273.745	1656.379	143.513	662.172	133.000	925.000
296.581	2585.470	156.383	1090.416	143.571	1410.714
291.409	3714.783	161.121	1471.973	136.714	2082.143
315.011	4124.723	170.866	1728.338	149.714	2257.143
306.705	5332.384	165.961	2350.985	146.000	2850.000
318.474	5538.145	176.302	2342.440	149.286	3017.857

Total concentration		CTAB concentration		Triton X-100 concentration	
Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)
316.062	6098.449	156.492	3087.704	158.929	3026.786
320.405	7989.870	160.550	3986.249	160.000	4000.000
302.273	10443.178	154.310	5142.246	149.286	5267.857
318.772	12030.706	160.170	5995.747	158.929	6026.786

Table A-5 Adsorption Isotherm of mixed-surfactant systems of CTAB and Triton X-100 ratio 1:1 at pH=5

Total concentration		CTAB concentration		Triton X-100 concentration	
Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)
1.214	19.658	0.962	0.961	0.400	15.000
2.932	26.699	1.702	7.457	1.329	16.786
10.505	37.371	5.367	15.818	5.186	20.357
18.020	49.498	9.052	23.706	8.986	25.357
37.722	56.950	18.843	28.922	18.871	28.214
57.185	70.380	28.334	41.640	28.743	31.429
76.797	80.075	38.249	43.777	38.486	37.857
115.688	107.797	57.454	63.647	58.071	48.214
154.366	140.853	76.590	85.245	77.529	61.786
193.145	171.384	95.863	103.415	96.986	75.357
231.829	204.267	115.058	123.554	116.414	89.643
238.039	299.027	119.273	143.168	118.871	153.214
241.481	462.975	124.313	142.170	118.657	283.571
266.778	830.562	136.285	342.881	131.700	457.500
271.170	1220.741	140.484	487.902	132.729	681.786
274.308	1642.297	140.358	741.049	135.286	867.857
271.541	3211.484	145.421	1364.484	130.143	1746.429
279.159	4021.023	146.698	1832.553	135.429	2114.286
291.484	4712.896	158.039	2049.031	138.571	2535.714

Total concentration		CTAB concentration		Triton X-100 concentration	
Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)
292.532	5186.696	159.706	2257.341	138.429	2789.286
296.153	5596.172	154.087	2647.815	144.571	2885.714
292.463	8688.422	152.018	4199.544	142.857	4428.571
293.957	10651.083	154.046	5148.858	142.857	5428.571
298.463	12538.437	152.813	6179.686	147.143	6321.429

Table A-6 Adsorption Isotherm of mixed-surfactant systems of CTAB and Triton X-100 ratio 1:1 at pH=8

Total concentration		CTAB concentration		Triton X-100 concentration	
Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)	Adsorbed surfactant (μmole/g of silica)	Equilibrium concentration (μM)
10.768	30.812	5.944	1.403	5.057	23.571
38.090	47.759	19.832	4.197	18.586	35.357
77.453	63.675	39.531	11.715	38.257	43.571
156.029	99.280	79.264	18.400	77.286	67.857
175.868	103.296	89.168	20.789	87.214	69.643
195.508	112.290	99.072	23.198	96.986	75.357
332.919	177.023	151.348	37.576	166.314	92.143
352.638	184.044	178.116	47.106	175.271	118.214
387.719	307.034	196.852	78.705	192.114	197.143
405.736	356.600	204.553	136.187	201.886	202.857
417.659	558.519	211.722	206.945	207.143	321.429
449.012	774.710	231.008	224.806	220.714	482.143
458.676	1533.103	248.046	298.849	218.429	1039.286
449.187	2270.317	251.580	460.508	208.857	1528.571
451.296	2717.598	249.298	767.561	211.857	1703.571
453.869	4653.279	265.774	1355.652	204.286	2892.857
470.675	6233.135	272.663	2183.428	213.571	3660.714
469.281	8267.964	273.712	3157.212	211.857	4703.571

Table A-7 Adsolubilization of Benzene of CTAB at pH = 3
Weight of silica = 14.75 g
Molecular weight of benzene = 78 g/mol
Equation from GC Y= 210858X
Where Y = area of benzene from head space gas chromatography
X = Equilibrium concentration of benzene (mol/l)
Density of benzene = 0.873 g/ml
Adsorption = 457 μmol/g silica

[Ben] initial (μliter)	[Ben] initial (g/l)	[Ben] initial (mol/l)	Area at equilibrium	[Ben] eq (mol/l)	[Ben] ads (mol/l)	[Ben] ads (μmol/l)	[Ben] ads (μmol/g silica)	X admicelle	Mol of Ben	Mol of H_2O	X bulk	K
100	1.48E-01	1.90E-03	2.55E+02	1.21E-03	6.89E-04	6.89E+02	2.76E+01	5.69E-02	7.13E-04	3.28E+01	2.17E-05	2.61E+03
300	4.44E-01	5.69E-03	7.63E+02	3.62E-03	2.07E-03	2.07E+03	8.28E+01	1.53E-01	2.14E-03	3.28E+01	6.52E-05	2.35E+03
500	7.40E-01	9.49E-03	1.28E+03	6.05E-03	3.44E-03	3.44E+03	1.37E+02	2.31E-01	3.57E-03	3.28E+01	1.09E-04	2.12E+03
700	1.04E+00	1.33E-02	1.78E+03	8.42E-03	4.86E-03	4.86E+03	1.94E+02	2.98E-01	4.97E-03	3.28E+01	1.52E-04	1.97E+03
1000	1.48E+00	1.90E-02	2.46E+03	1.17E-02	7.29E-03	7.29E+03	2.92E+02	3.89E-01	6.89E-03	3.27E+01	2.10E-04	1.85E+03

Table A-8 Adsolubilization of Benzene of CTAB at pH = 5
Weight of silica = 14.75 g
Molecular weight of benzene = 78 g/mol
Equation from GC Y= 210858X
Where Y = area of benzene from head space gas chromatography
X = Equilibrium concentration of benzene (mol/l)
Density of benzene = 0.873 g/ml
Adsorption = 453 μmol/g silica

[Ben] initial (μliter)	[Ben] initial (g/l)	[Ben] initial (mol/l)	Area at equilibrium	[Ben] eq (mol/l)	[Ben] ads (mol/l)	[Ben] ads (μmol/l)	[Ben] ads (μmol/g silica)	X admicelle	Mol of Ben	Mol of H_2O	X bulk	K
100	1.48E-01	1.90E-03	2.50E+02	1.19E-03	7.11E-04	7.11E+02	2.85E+01	5.91E-02	7.00E-04	3.28E+01	2.13E-05	2.77E+03
300	4.44E-01	5.69E-03	7.67E+02	3.64E-03	2.05E-03	2.05E+03	8.21E+01	1.53E-01	2.15E-03	3.28E+01	6.55E-05	2.34E+03
500	7.40E-01	9.49E-03	1.27E+03	6.03E-03	3.46E-03	3.46E+03	1.38E+02	2.34E-01	3.55E-03	3.28E+01	1.08E-04	2.16E+03
700	1.04E+00	1.33E-02	1.76E+03	8.32E-03	4.95E-03	4.95E+03	1.98E+02	3.04E-01	4.91E-03	3.28E+01	1.50E-04	2.03E+03
1000	1.48E+00	1.90E-02	2.39E+03	1.13E-02	7.64E-03	7.64E+03	3.06E+02	4.03E-01	6.68E-03	3.27E+01	2.04E-04	1.97E+03

Table A-9 Adsolubilization of Benzene of CTAB at pH = 8
Weight of silica = 14.75 g
Molecular weight of benzene = 78 g/mol
Equation from GC Y= 210858X
Where Y = area of benzene from head space gas chromatography
X = Equilibrium concentration of benzene (mol/l)
Density of benzene = 0.873 g/ml
Adsorption = 477 μmol/g silica

[Ben] initial (μliter)	[Ben] initial (g/l)	[Ben] initial (mol/l)	Area at equilibrium	[Ben] eq (mol/l)	[Ben] ads (mol/l)	[Ben] ads (μmol/l)	[Ben] ads (μmol/g silica)	X admicelle	Mol of Ben	Mol of H_2O	X bulk	K
100	1.48E-01	1.90E-03	2.30E+02	1.09E-03	8.05E-04	8.05E+02	3.22E+01	6.32E-02	6.44E-04	3.28E+01	1.97E-05	3.22E+03
300	4.44E-01	5.69E-03	6.77E+02	3.21E-03	2.48E-03	2.48E+03	9.92E+01	1.72E-01	1.89E-03	3.28E+01	5.78E-05	2.98E+03
500	7.40E-01	9.49E-03	1.12E+03	5.31E-03	4.17E-03	4.17E+03	1.67E+02	2.59E-01	3.13E-03	3.28E+01	9.57E-05	2.71E+03
700	1.04E+00	1.33E-02	1.54E+03	7.32E-03	5.96E-03	5.96E+03	2.38E+02	3.33E-01	4.32E-03	3.28E+01	1.32E-04	2.53E+03
1000	1.48E+00	1.90E-02	2.15E+03	1.02E-02	8.79E-03	8.79E+03	3.52E+02	4.24E-01	6.01E-03	3.27E+01	1.83E-04	2.31E+03

Table A-10 Adsolubilization of Benzene of Triton X-100 at pH = 3
Weight of silica = 14.75 g
Molecular weight of benzene = 78 g/mol
Equation from GC Y= 191591X
Where Y = area of benzene from head space gas chromatography
X = Equilibrium concentration of benzene (mol/l)
Density of benzene = 0.873 g/ml
Adsorption = 190 μmol/g silica

[Ben] initial (μliter)	[Ben] initial (g/l)	[Ben] initial (mol/l)	Area at equilibrium	[Ben] eq (mol/l)	[Ben] ads (mol/l)	[Ben] ads (μmol/l)	[Ben] ads (μmol/g silica)	X admicelle	Mol of Ben	Mol of H_2O	X bulk	K
100	1.48E-01	1.90E-03	3.15E+02	1.64E-03	2.53E-04	2.53E+02	1.01E+01	5.06E-02	9.70E-04	3.28E+01	2.96E-05	1.71E+03
300	4.44E-01	5.69E-03	9.40E+02	4.91E-03	7.85E-04	7.85E+02	3.14E+01	1.42E-01	2.89E-03	3.28E+01	8.83E-05	1.61E+03
500	7.40E-01	9.49E-03	1.55E+03	8.10E-03	1.39E-03	1.39E+03	5.55E+01	2.26E-01	4.78E-03	3.28E+01	1.46E-04	1.55E+03
700	1.04E+00	1.33E-02	2.15E+03	1.12E-02	2.04E-03	2.04E+03	8.17E+01	3.01E-01	6.63E-03	3.27E+01	2.02E-04	1.49E+03
1000	1.48E+00	1.90E-02	3.04E+03	1.59E-02	3.10E-03	3.10E+03	1.24E+02	3.95E-01	9.36E-03	3.27E+01	2.86E-04	1.38E+03

Table A-11 Adsolubilization of Benzene of Triton X-100 at pH = 5
Weight of silica = 14.75 g
Molecular weight of benzene = 78 g/mol
Equation from GC Y= 191591X
Where Y = area of benzene from head space gas chromatography
X = Equilibrium concentration of benzene (mol/l)
Density of benzene = 0.873 g/ml
Adsorption = 190 μmol/g silica

[Ben] initial (μliter)	[Ben] initial (g/l)	[Ben] initial (mol/l)	Area at equilibrium	[Ben] eq (mol/l)	[Ben] ads (mol/l)	[Ben] ads (μmol/l)	[Ben] ads (μmol/g silica)	X admicelle	Mol of Ben	Mol of H_2O	X bulk	K
100	1.48E-01	1.90E-03	3.15E+02	1.65E-03	2.51E-04	2.51E+02	1.00E+01	5.01E-02	9.71E-04	3.28E+01	2.96E-05	1.69E+03
300	4.44E-01	5.69E-03	9.39E+02	4.90E-03	7.91E-04	7.91E+02	3.16E+01	1.43E-01	2.89E-03	3.28E+01	8.82E-05	1.62E+03
500	7.40E-01	9.49E-03	1.55E+03	8.10E-03	1.38E-03	1.38E+03	5.52E+01	2.25E-01	4.78E-03	3.28E+01	1.46E-04	1.54E+03
700	1.04E+00	1.33E-02	2.16E+03	1.13E-02	2.00E-03	2.00E+03	8.02E+01	2.97E-01	6.65E-03	3.27E+01	2.03E-04	1.46E+03
1000	1.48E+00	1.90E-02	3.04E+03	1.58E-02	3.12E-03	3.12E+03	1.25E+02	3.97E-01	9.35E-03	3.27E+01	2.86E-04	1.39E+03

Table A-12 Adsolubilization of Benzene of Triton X-100 at pH = 8
Weight of silica = 14.75 g
Molecular weight of benzene = 78 g/mol
Equation from GC Y= 191591X
Where Y = area of benzene from head space gas chromatography
X = Equilibrium concentration of benzene (mol/l)
Density of benzene = 0.873 g/ml
Adsorption = 190 μmol/g silica

[Ben] initial (μliter)	[Ben] initial (g/l)	[Ben] initial (mol/l)	Area at equilibrium	[Ben] eq (mol/l)	[Ben] ads (mol/l)	[Ben] ads (μmol/l)	[Ben] ads (μmol/g silica)	X admicelle	Mol of Ben	Mol of H_2O	X bulk	K
100	1.48E-01	1.90E-03	2.94E+02	1.53E-03	3.64E-04	3.64E+02	1.46E+01	7.12E-02	9.04E-04	3.28E+01	2.76E-05	2.58E+03
300	4.44E-01	5.69E-03	8.79E+02	4.59E-03	1.10E-03	1.10E+03	4.41E+01	1.88E-01	2.71E-03	3.28E+01	8.26E-05	2.28E+03
500	7.40E-01	9.49E-03	1.46E+03	7.61E-03	1.87E-03	1.87E+03	7.48E+01	2.83E-01	4.49E-03	3.28E+01	1.37E-04	2.06E+03
700	1.04E+00	1.33E-02	2.03E+03	1.06E-02	2.66E-03	2.66E+03	1.07E+02	3.59E-01	6.26E-03	3.27E+01	1.91E-04	1.88E+03
1000	1.48E+00	1.90E-02	2.85E+03	1.49E-02	4.02E-03	4.02E+03	1.61E+02	4.58E-01	8.82E-03	3.27E+01	2.69E-04	1.70E+03

Table A-13 Adsolubilization of Benzene of CTAB/Triton ratio 1:1 at pH = 3
Weight of silica = 14.75 g
Molecular weight of benzene = 78 g/mol
Equation from GC Y= 204340X
Where Y = area of benzene from head space gas chromatography
X = Equilibrium concentration of benzene (mol/l)
Density of benzene = 0.873 g/ml
Adsorption = 193 μmol/g silica

[Ben] initial (μliter)	[Ben] initial (g/l)	[Ben] initial (mol/l)	Area at equilibrium	[Ben] eq (mol/l)	[Ben] ads (mol/l)	[Ben] ads (μmol/l)	[Ben] ads (μmol/g silica)	X admicelle	Mol of Ben	Mol of H_2O	X bulk	K
100	1.48E-01	1.90E-03	3.09E+02	1.51E-03	3.82E-04	3.82E+02	1.53E+01	7.35E-02	8.94E-04	3.28E+01	2.73E-05	2.69E+03
300	4.44E-01	5.69E-03	9.21E+02	4.51E-03	1.18E-03	1.18E+03	4.74E+01	1.97E-01	2.66E-03	3.28E+01	8.12E-05	2.43E+03
500	7.40E-01	9.49E-03	1.50E+03	7.35E-03	2.13E-03	2.13E+03	8.54E+01	3.07E-01	4.34E-03	3.28E+01	1.32E-04	2.32E+03
700	1.04E+00	1.33E-02	2.04E+03	9.99E-03	3.29E-03	3.29E+03	1.31E+02	4.05E-01	5.90E-03	3.27E+01	1.80E-04	2.25E+03
1000	1.48E+00	1.90E-02	2.75E+03	1.35E-02	5.49E-03	5.49E+03	2.20E+02	5.32E-01	7.95E-03	3.27E+01	2.43E-04	2.19E+03

Table A-14 Adsolubilization of Benzene of CTAB/Triton ratio 1:1 at pH = 5
Weight of silica = 14.75 g
Molecular weight of benzene = 78 g/mol
Equation from GC Y= 204340X
Where Y = area of benzene from head space gas chromatography
X = Equilibrium concentration of benzene (mol/l)
Density of benzene = 0.873 g/ml
Adsorption = 193 μmol/g silica

[Ben] initial (μliter)	[Ben] initial (g/l)	[Ben] initial (mol/l)	Area at equilibrium	[Ben] eq (mol/l)	[Ben] ads (mol/l)	[Ben] ads (μmol/l)	[Ben] ads (μmol/g silica)	X admicelle	Mol of Ben	Mol of H_2O	X bulk	K
100	1.48E-01	1.90E-03	2.73E+02	1.34E-03	5.60E-04	5.60E+02	2.24E+01	1.04E-01	7.89E-04	3.28E+01	2.41E-05	4.32E+03
300	4.44E-01	5.69E-03	8.42E+02	4.12E-03	1.57E-03	1.57E+03	6.28E+01	2.46E-01	2.43E-03	3.28E+01	7.42E-05	3.31E+03
500	7.40E-01	9.49E-03	1.43E+03	7.00E-03	2.48E-03	2.48E+03	9.94E+01	3.40E-01	4.13E-03	3.28E+01	1.26E-04	2.70E+03
700	1.04E+00	1.33E-02	1.98E+03	9.70E-03	3.57E-03	3.57E+03	1.43E+02	4.26E-01	5.73E-03	3.27E+01	1.75E-04	2.43E+03
1000	1.48E+00	1.90E-02	2.79E+03	1.37E-02	5.31E-03	5.31E+03	2.12E+02	5.24E-01	8.06E-03	3.27E+01	2.46E-04	2.13E+03

Table A-15 Adsolubilization of Benzene of CTAB/Triton ratio 1:1 at pH = 8
Weight of silica = 14.75 g
Molecular weight of benzene = 78 g/mol
Equation from GC Y= 204340X
Where Y = area of benzene from head space gas chromatography
X = Equilibrium concentration of benzene (mol/l)
Density of benzene = 0.873 g/ml
Adsorption = 196 μmol/g silica

[Ben] initial (μliter)	[Ben] initial (g/l)	[Ben] initial (mol/l)	Area at equilibrium	[Ben] eq (mol/l)	[Ben] ads (mol/l)	[Ben] ads (μmol/l)	[Ben] ads (μmol/g silica)	X admicelle	Mol of Ben	Mol of H_2O	X bulk	K
100	1.48E-01	1.90E-03	2.90E+02	1.42E-03	4.80E-04	4.80E+02	1.92E+01	8.93E-02	8.36E-04	3.28E+01	2.55E-05	3.50E+03
300	4.44E-01	5.69E-03	8.68E+02	4.25E-03	1.45E-03	1.45E+03	5.78E+01	2.28E-01	2.50E-03	3.28E+01	7.64E-05	2.98E+03
500	7.40E-01	9.49E-03	1.44E+03	7.06E-03	2.43E-03	2.43E+03	9.71E+01	3.31E-01	4.16E-03	3.28E+01	1.27E-04	2.61E+03
700	1.04E+00	1.33E-02	1.98E+03	9.68E-03	3.60E-03	3.60E+03	1.44E+02	4.24E-01	5.71E-03	3.27E+01	1.74E-04	2.43E+03
1000	1.48E+00	1.90E-02	2.77E+03	1.36E-02	5.41E-03	5.41E+03	2.16E+02	5.25E-01	8.00E-03	3.27E+01	2.44E-04	2.15E+03

Table A-16 Adsolubilization of Toluene of CTAB at pH = 3
Weight of silica = 14.75 g
Molecular weight of toluene = 92 g/mol
Equation from GC Y= 251284X
Where Y = area of toluene from head space gas chromatography
X = Equilibrium concentration of toluene (mol/l)
Density of toluene = 0.867 g/ml
Adsorption = 457 μmol/g silica

[Tol] initial (μliter)	[Tol] initial (g/l)	[Tol] initial (mol/l)	Area at equilibrium	[Tol] eq (mol/l)	[Tol] ads (mol/l)	[Tol] ads (μmol/l)	[Tol] ads (μmol/g silica)	X admicelle	Mol of Tol	Mol of H_2O	X bulk	K
50	7.35E-02	7.99E-04	8.29E+01	3.30E-04	4.69E-04	4.69E+02	1.88E+01	3.94E-02	1.95E-04	3.28E+01	5.94E-06	6.64E+03
100	1.47E-01	1.60E-03	1.56E+02	6.20E-04	9.77E-04	9.77E+02	3.91E+01	7.88E-02	3.66E-04	3.28E+01	1.12E-05	7.06E+03
200	2.94E-01	3.19E-03	3.00E+02	1.19E-03	2.00E-03	2.00E+03	8.00E+01	1.49E-01	7.05E-04	3.28E+01	2.15E-05	6.93E+03
300	4.41E-01	4.79E-03	4.29E+02	1.71E-03	3.08E-03	3.08E+03	1.23E+02	2.13E-01	1.01E-03	3.28E+01	3.07E-05	6.92E+03
350	5.14E-01	5.59E-03	4.86E+02	1.93E-03	3.66E-03	3.66E+03	1.46E+02	2.42E-01	1.14E-03	3.28E+01	3.48E-05	6.96E+03

Table A-17 Adsolubilization of Toluene of CTAB at pH = 5
Weight of silica = 14.75 g
Molecular weight of toluene = 92 g/mol
Equation from GC Y= 251284X
Where Y = area of toluene from head space gas chromatography
X = Equilibrium concentration of toluene (mol/l)
Density of toluene = 0.867 g/ml
Adsorption = 453 μmol/g silica

[Tol] initial (μliter)	[Tol] initial (g/l)	[Tol] initial (mol/l)	Area at equilibrium	[Tol] eq (mol/l)	[Tol] ads (mol/l)	[Tol] ads (μmol/l)	[Tol] ads (μmol/g silica)	X admicelle	Mol of Tol	Mol of H_2O	X bulk	K
50	7.35E-02	7.99E-04	7.33E+01	2.92E-04	5.07E-04	5.07E+02	2.03E+01	4.29E-02	1.72E-04	3.28E+01	5.25E-06	8.17E+03
100	1.47E-01	1.60E-03	1.41E+02	5.62E-04	1.04E-03	1.04E+03	4.14E+01	8.38E-02	3.31E-04	3.28E+01	1.01E-05	8.29E+03
200	2.94E-01	3.19E-03	2.73E+02	1.09E-03	2.11E-03	2.11E+03	8.43E+01	1.57E-01	6.42E-04	3.28E+01	1.96E-05	8.01E+03
300	4.41E-01	4.79E-03	3.82E+02	1.52E-03	3.27E-03	3.27E+03	1.31E+02	2.24E-01	8.96E-04	3.28E+01	2.73E-05	8.20E+03
350	5.14E-01	5.59E-03	4.22E+02	1.68E-03	3.91E-03	3.91E+03	1.56E+02	2.57E-01	9.91E-04	3.28E+01	3.02E-05	8.48E+03

Table A-18 Adsolubilization of Toluene of CTAB at pH = 8
Weight of silica = 14.75 g
Molecular weight of toluene = 92 g/mol
Equation from GC Y= 251284X
Where Y = area of toluene from head space gas chromatography
X = Equilibrium concentration of toluene (mol/l)
Density of toluene = 0.867 g/ml
Adsorption = 477 μmol/g silica

[Tol] initial (μliter)	[Tol] initial (g/l)	[Tol] initial (mol/l)	Area at equilibrium	[Tol] eq (mol/l)	[Tol] ads (mol/l)	[Tol] ads (μmol/l)	[Tol] ads (μmol/g silica)	X admicelle	Mol of Tol	Mol of H_2O	X bulk	K
50	7.35E-02	7.99E-04	6.44E+01	2.56E-04	5.42E-04	5.42E+02	2.17E+01	4.35E-02	1.51E-04	3.28E+01	4.61E-06	9.44E+03
100	1.47E-01	1.60E-03	1.23E+02	4.91E-04	1.11E-03	1.11E+03	4.43E+01	8.49E-02	2.90E-04	3.28E+01	8.83E-06	9.61E+03
200	2.94E-01	3.19E-03	2.31E+02	9.17E-04	2.28E-03	2.28E+03	9.11E+01	1.60E-01	5.41E-04	3.28E+01	1.65E-05	9.71E+03
300	4.41E-01	4.79E-03	3.28E+02	1.30E-03	3.49E-03	3.49E+03	1.39E+02	2.26E-01	7.70E-04	3.28E+01	2.35E-05	9.63E+03
350	5.14E-01	5.59E-03	3.87E+02	1.54E-03	4.05E-03	4.05E+03	1.62E+02	2.53E-01	9.10E-04	3.28E+01	2.78E-05	9.13E+03

Table A-19 Adsolubilization of Toluene of Triton X-100 at pH = 3
Weight of silica = 14.75 g
Molecular weight of toluene = 92 g/mol
Equation from GC Y= 227594X
Where Y = area of toluene from head space gas chromatography
X = Equilibrium concentration of toluene (mol/l)
Density of toluene = 0.867 g/ml
Adsorption = 190 μmol/g silica

[Tol] initial (μliter)	[Tol] initial (g/l)	[Tol] initial (mol/l)	Area at equilibrium	[Tol] eq (mol/l)	[Tol] ads (mol/l)	[Tol] ads (μmol/l)	[Tol] ads (μmol/g silica)	X admicelle	Mol of Tol	Mol of H_2O	X bulk	K
50	7.35E-02	7.99E-04	1.24E+02	5.43E-04	2.55E-04	2.55E+02	1.02E+01	5.10E-02	3.21E-04	3.28E+01	9.78E-06	5.22E+03
100	1.47E-01	1.60E-03	2.43E+02	1.07E-03	5.29E-04	5.29E+02	2.12E+01	1.00E-01	6.30E-04	3.28E+01	1.92E-05	5.21E+03
200	2.94E-01	3.19E-03	4.66E+02	2.05E-03	1.15E-03	1.15E+03	4.59E+01	1.94E-01	1.21E-03	3.28E+01	3.69E-05	5.27E+03
300	4.41E-01	4.79E-03	6.66E+02	2.93E-03	1.87E-03	1.87E+03	7.46E+01	2.82E-01	1.73E-03	3.28E+01	5.27E-05	5.35E+03
350	5.14E-01	5.59E-03	7.61E+02	3.34E-03	2.25E-03	2.25E+03	8.99E+01	3.21E-01	1.97E-03	3.28E+01	6.02E-05	5.33E+03

Table A-20 Adsolubilization of Toluene of Triton X-100 at pH = 5
Weight of silica = 14.75 g
Molecular weight of toluene = 92 g/mol
Equation from GC Y= 227594X
Where Y = area of toluene from head space gas chromatography
X = Equilibrium concentration of toluene (mol/l)
Density of toluene = 0.867 g/ml
Adsorption = 190 μmol/g silica

[Tol] initial (μliter)	[Tol] initial (g/l)	[Tol] initial (mol/l)	Area at equilibrium	[Tol] eq (mol/l)	[Tol] ads (mol/l)	[Tol] ads (μmol/l)	[Tol] ads (μmol/g silica)	X admicelle	Mol of Tol	Mol of H_2O	X bulk	K
50	7.35E-02	7.99E-04	1.28E+02	5.64E-04	2.35E-04	2.35E+02	9.38E+00	4.71E-02	3.33E-04	3.28E+01	1.02E-05	4.64E+03
100	1.47E-01	1.60E-03	2.44E+02	1.07E-03	5.26E-04	5.26E+02	2.10E+01	9.96E-02	6.32E-04	3.28E+01	1.93E-05	5.16E+03
200	2.94E-01	3.19E-03	4.70E+02	2.07E-03	1.13E-03	1.13E+03	4.51E+01	1.92E-01	1.22E-03	3.28E+01	3.72E-05	5.16E+03
300	4.41E-01	4.79E-03	6.68E+02	2.93E-03	1.86E-03	1.86E+03	7.43E+01	2.81E-01	1.73E-03	3.28E+01	5.28E-05	5.32E+03
350	5.14E-01	5.59E-03	7.57E+02	3.32E-03	2.27E-03	2.27E+03	9.07E+01	3.23E-01	1.96E-03	3.28E+01	5.99E-05	5.40E+03

Table A-21 Adsolubilization of Toluene of Triton X-100 at pH = 8
Weight of silica = 14.75 g
Molecular weight of toluene = 92 g/mol
Equation from GC Y= 227594X
Where Y = area of toluene from head space gas chromatography
X = Equilibrium concentration of toluene (mol/l)
Density of toluene = 0.867 g/ml
Adsorption = 190 μmol/g silica

[Tol] initial (μliter)	[Tol] initial (g/l)	[Tol] initial (mol/l)	Area at equilibrium	[Tol] eq (mol/l)	[Tol] ads (mol/l)	[Tol] ads (μmol/l)	[Tol] ads (μmol/g silica)	X admicelle	Mol of Tol	Mol of H_2O	X bulk	K
50	7.35E-02	7.99E-04	1.16E+02	5.08E-04	2.91E-04	2.91E+02	1.16E+01	5.77E-02	3.00E-04	3.28E+01	9.14E-06	6.30E+03
100	1.47E-01	1.60E-03	2.33E+02	1.02E-03	5.76E-04	5.76E+02	2.30E+01	1.08E-01	6.03E-04	3.28E+01	1.84E-05	5.88E+03
200	2.94E-01	3.19E-03	4.25E+02	1.87E-03	1.33E-03	1.33E+03	5.32E+01	2.19E-01	1.10E-03	3.28E+01	3.36E-05	6.51E+03
300	4.41E-01	4.79E-03	6.19E+02	2.72E-03	2.07E-03	2.07E+03	8.29E+01	3.04E-01	1.60E-03	3.28E+01	4.89E-05	6.21E+03
350	5.14E-01	5.59E-03	6.92E+02	3.04E-03	2.55E-03	2.55E+03	1.02E+02	3.49E-01	1.79E-03	3.28E+01	5.48E-05	6.38E+03

Table A-22 Adsolubilization of Toluene of CTAB/Triton ratio 1:1 at pH = 3
Weight of silica = 14.75 g
Molecular weight of toluene = 92 g/mol
Equation from GC Y= 196596X
Where Y = area of toluene from head space gas chromatography
X = Equilibrium concentration of toluene (mol/l)
Density of toluene = 0.867 g/ml
Adsorption = 193 μmol/g silica

[Tol] initial (μliter)	[Tol] initial (g/l)	[Tol] initial (mol/l)	Area at equilibrium	[Tol] eq (mol/l)	[Tol] ads (mol/l)	[Tol] ads (μmol/l)	[Tol] ads (μmol/g silica)	X admicelle	Mol of Tol	Mol of H_2O	X bulk	K
50	7.35E-02	7.99E-04	1.13E+02	5.77E-04	2.22E-04	2.22E+02	8.88E+00	4.40E-02	3.40E-04	3.28E+01	1.04E-05	4.24E+03
100	1.47E-01	1.60E-03	2.24E+02	1.14E-03	4.56E-04	4.56E+02	1.83E+01	8.64E-02	6.73E-04	3.28E+01	2.05E-05	4.21E+03
200	2.94E-01	3.19E-03	4.37E+02	2.22E-03	9.70E-04	9.70E+02	3.88E+01	1.67E-01	1.31E-03	3.28E+01	4.00E-05	4.18E+03
300	4.41E-01	4.79E-03	6.36E+02	3.24E-03	1.56E-03	1.56E+03	6.23E+01	2.44E-01	1.91E-03	3.28E+01	5.82E-05	4.19E+03
350	5.14E-01	5.59E-03	7.27E+02	3.70E-03	1.89E-03	1.89E+03	7.58E+01	2.82E-01	2.18E-03	3.28E+01	6.66E-05	4.24E+03

Table A-23 Adsolubilization of Toluene of CTAB/Triton ratio 1:1 at pH = 5
Weight of silica = 14.75 g
Molecular weight of toluene = 92 g/mol
Equation from GC Y= 196596X
Where Y = area of toluene from head space gas chromatography
X = Equilibrium concentration of toluene (mol/l)
Density of toluene = 0.867 g/ml
Adsorption = 193 μmol/g silica

[Tol] initial (μliter)	[Tol] initial (g/l)	[Tol] initial (mol/l)	Area at equilibrium	[Tol] eq (mol/l)	[Tol] ads (mol/l)	[Tol] ads (μmol/l)	[Tol] ads (μmol/g silica)	X admicelle	Mol of Tol	Mol of H_2O	X bulk	K
50	7.35E-02	7.99E-04	1.19E+02	6.03E-04	1.95E-04	1.95E+02	7.81E+00	3.89E-02	3.56E-04	3.28E+01	1.09E-05	3.58E+03
100	1.47E-01	1.60E-03	2.30E+02	1.17E-03	4.25E-04	4.25E+02	1.70E+01	8.10E-02	6.92E-04	3.28E+01	2.11E-05	3.84E+03
200	2.94E-01	3.19E-03	4.50E+02	2.29E-03	9.04E-04	9.04E+02	3.62E+01	1.58E-01	1.35E-03	3.28E+01	4.12E-05	3.83E+03
300	4.41E-01	4.79E-03	6.57E+02	3.34E-03	1.45E-03	1.45E+03	5.79E+01	2.31E-01	1.97E-03	3.28E+01	6.02E-05	3.83E+03
350	5.14E-01	5.59E-03	7.59E+02	3.86E-03	1.73E-03	1.73E+03	6.93E+01	2.64E-01	2.28E-03	3.28E+01	6.95E-05	3.80E+03

Table A-24 Adsolubilization of Toluene of CTAB/Triton ratio 1:1 at pH = 8
Weight of silica = 14.75 g
Molecular weight of toluene = 92 g/mol
Equation from GC Y= 196596X
Where Y = area of toluene from head space gas chromatography
X = Equilibrium concentration of toluene (mol/l)
Density of toluene = 0.867 g/ml
Adsorption = 196 μmol/g silica

[Tol] initial (μliter)	[Tol] initial (g/l)	[Tol] initial (mol/l)	Area at equilibrium	[Tol] eq (mol/l)	[Tol] ads (mol/l)	[Tol] ads (μmol/l)	[Tol] ads (μmol/g silica)	X admicelle	Mol of Tol	Mol of H_2O	X bulk	K
50	7.35E-02	7.99E-04	1.14E+02	5.81E-04	2.17E-04	2.17E+02	8.69E+00	4.25E-02	3.43E-04	3.28E+01	1.05E-05	4.06E+03
100	1.47E-01	1.60E-03	2.16E+02	1.10E-03	5.00E-04	5.00E+02	2.00E+01	9.26E-02	6.47E-04	3.28E+01	1.98E-05	4.69E+03
200	2.94E-01	3.19E-03	4.13E+02	2.10E-03	1.09E-03	1.09E+03	4.37E+01	1.82E-01	1.24E-03	3.28E+01	3.79E-05	4.81E+03
300	4.41E-01	4.79E-03	6.01E+02	3.06E-03	1.73E-03	1.73E+03	6.93E+01	2.61E-01	1.80E-03	3.28E+01	5.51E-05	4.74E+03
350	5.14E-01	5.59E-03	6.82E+02	3.47E-03	2.12E-03	2.12E+03	8.49E+01	3.02E-01	2.05E-03	3.28E+01	6.24E-05	4.84E+03

Table A-25 Adsolubilization of Ethylbenzene of CTAB at pH = 3
Weight of silica = 14.75 g
Molecular weight of ethylbenzene = 106 g/mol
Equation from GC Y= 284082X
Where Y = area of ethylbenzene from head space gas chromatography
X = Equilibrium concentration of ethylbenzene (mol/l)
Density of ethylbenzene = 0.867 g/ml
Adsorption = 457 μmol/g silica

[Etb] initial (μliter)	[Etb] initial (g/l)	[Etb] initial (mol/l)	Area at equilibrium	[Etb] eq (mol/l)	[Etb] ads (mol/l)	[Etb] ads (μmol/l)	[Etb] ads (μmol/g silica)	X admicelle	Mol of Etb	Mol of H_2O	X bulk	K
10	1.47E-02	1.39E-04	1.41E+01	4.95E-05	8.92E-05	8.92E+01	3.57E+00	7.74E-03	2.92E-05	3.28E+01	8.90E-07	8.70E+03
30	4.41E-02	4.16E-04	3.64E+01	1.28E-04	2.88E-04	2.88E+02	1.15E+01	2.46E-02	7.56E-05	3.28E+01	2.31E-06	1.07E+04
50	7.35E-02	6.93E-04	5.40E+01	1.90E-04	5.03E-04	5.03E+02	2.01E+01	4.22E-02	1.12E-04	3.28E+01	3.42E-06	1.23E+04
70	1.03E-01	9.70E-04	6.67E+01	2.35E-04	7.36E-04	7.36E+02	2.94E+01	6.05E-02	1.39E-04	3.28E+01	4.23E-06	1.43E+04
90	1.32E-01	1.25E-03	7.73E+01	2.72E-04	9.76E-04	9.76E+02	3.90E+01	7.87E-02	1.60E-04	3.28E+01	4.90E-06	1.61E+04

Table A-26 Adsolubilization of Ethylbenzene of CTAB at pH = 5
Weight of silica = 14.75 g
Molecular weight of ethylbenzene = 106 g/mol
Equation from GC Y= 284082X
Where Y = area of ethylbenzene from head space gas chromatography
X = Equilibrium concentration of ethylbenzene (mol/l)
Density of ethylbenzene = 0.867 g/ml
Adsorption = 453 μmol/g silica

[Etb] initial (μliter)	[Etb] initial (g/l)	[Etb] initial (mol/l)	Area at equilibrium	[Etb] eq (mol/l)	[Etb] ads (mol/l)	[Etb] ads (μmol/l)	[Etb] ads (μmol/g silica)	X admicelle	Mol of Etb	Mol of H_2O	X bulk	K
10	1.47E-02	1.39E-04	1.28E+01	4.51E-05	9.35E-05	9.35E+01	3.74E+00	8.19E-03	2.66E-05	3.28E+01	8.13E-07	1.01E+04
30	4.41E-02	4.16E-04	3.35E+01	1.18E-04	2.98E-04	2.98E+02	1.19E+01	2.57E-02	6.95E-05	3.28E+01	2.12E-06	1.21E+04
50	7.35E-02	6.93E-04	4.73E+01	1.66E-04	5.27E-04	5.27E+02	2.11E+01	4.45E-02	9.81E-05	3.28E+01	2.99E-06	1.48E+04
70	1.03E-01	9.70E-04	5.98E+01	2.11E-04	7.60E-04	7.60E+02	3.04E+01	6.29E-02	1.24E-04	3.28E+01	3.79E-06	1.66E+04
90	1.32E-01	1.25E-03	6.89E+01	2.42E-04	1.01E-03	1.01E+03	4.02E+01	8.15E-02	1.43E-04	3.28E+01	4.36E-06	1.87E+04

Table A-27 Adsolubilization of Ethylbenzene of CTAB at pH = 8
Weight of silica = 14.75 g
Molecular weight of ethylbenzene = 106 g/mol
Equation from GC Y= 284082X
Where Y = area of ethylbenzene from head space gas chromatography
X = Equilibrium concentration of ethylbenzene (mol/l)
Density of ethylbenzene = 0.867 g/ml
Adsorption = 477 μmol/g silica

[Etb] initial (μliter)	[Etb] initial (g/l)	[Etb] initial (mol/l)	Area at equilibrium	[Etb] eq (mol/l)	[Etb] ads (mol/l)	[Etb] ads (μmol/l)	[Etb] ads (μmol/g silica)	X admicelle	Mol of Etb	Mol of H_2O	X bulk	K
10	-	-	-	-	-	-	-	-	-	-	-	-
30	4.41E-02	4.16E-04	2.15E+01	7.57E-05	3.40E-04	3.40E+02	1.36E+01	2.77E-02	4.47E-05	3.28E+01	1.36E-06	2.04E+04
50	7.35E-02	6.93E-04	3.39E+01	1.19E-04	5.74E-04	5.74E+02	2.30E+01	4.59E-02	7.03E-05	3.28E+01	2.14E-06	2.14E+04
70	1.03E-01	9.70E-04	4.51E+01	1.59E-04	8.12E-04	8.12E+02	3.25E+01	6.37E-02	9.36E-05	3.28E+01	2.86E-06	2.23E+04
90	1.32E-01	1.25E-03	5.43E+01	1.91E-04	1.06E-03	1.06E+03	4.23E+01	8.14E-02	1.13E-04	3.28E+01	3.44E-06	2.37E+04

Table A-28 Adsolubilization of Ethylbenzene of Triton X-100 at pH = 3
Weight of silica = 14.75 g
Molecular weight of ethylbenzene = 106 g/mol
Equation from GC Y= 267195X
Where Y = area of ethylbenzene from head space gas chromatography
X = Equilibrium concentration of ethylbenzene (mol/l)
Density of ethylbenzene = 0.867 g/ml
Adsorption = 190 μmol/g silica

[Etb] initial (μliter)	[Etb] initial (g/l)	[Etb] initial (mol/l)	Area at equilibrium	[Etb] eq (mol/l)	[Etb] ads (mol/l)	[Etb] ads (μmol/l)	[Etb] ads (μmol/g silica)	X admicelle	Mol of Etb	Mol of H_2O	X bulk	K
10	1.47E-02	1.39E-04	1.80E+01	6.72E-05	7.15E-05	7.15E+01	2.86E+00	1.48E-02	3.96E-05	3.28E+01	1.21E-06	1.23E+04
30	4.41E-02	4.16E-04	4.96E+01	1.85E-04	2.30E-04	2.30E+02	9.22E+00	4.63E-02	1.09E-04	3.28E+01	3.34E-06	1.39E+04
50	7.35E-02	6.93E-04	7.80E+01	2.92E-04	4.01E-04	4.01E+02	1.61E+01	7.79E-02	1.72E-04	3.28E+01	5.25E-06	1.48E+04
70	1.03E-01	9.70E-04	1.03E+02	3.84E-04	5.86E-04	5.86E+02	2.34E+01	1.10E-01	2.27E-04	3.28E+01	6.92E-06	1.59E+04
90	1.32E-01	1.25E-03	1.24E+02	4.63E-04	7.84E-04	7.84E+02	3.14E+01	1.42E-01	2.73E-04	3.28E+01	8.34E-06	1.70E+04

Table A-29 Adsolubilization of Ethylbenzene of Triton X-100 at pH = 5
Weight of silica = 14.75 g
Molecular weight of ethylbenzene = 106 g/mol
Equation from GC Y= 267195X
Where Y = area of ethylbenzene from head space gas chromatography
X = Equilibrium concentration of ethylbenzene (mol/l)
Density of ethylbenzene = 0.867 g/ml
Adsorption = 190 μmol/g silica

[Etb] initial (μliter)	[Etb] initial (g/l)	[Etb] initial (mol/l)	Area at equilibrium	[Etb] eq (mol/l)	[Etb] ads (mol/l)	[Etb] ads (μmol/l)	[Etb] ads (μmol/g silica)	X admicelle	Mol of Etb	Mol of H_2O	X bulk	K
10	1.47E-02	1.39E-04	1.89E+01	7.05E-05	6.81E-05	6.81E+01	2.72E+00	1.41E-02	4.16E-05	3.28E+01	1.27E-06	1.11E+04
30	4.41E-02	4.16E-04	5.16E+01	1.93E-04	2.23E-04	2.23E+02	8.91E+00	4.48E-02	1.14E-04	3.28E+01	3.47E-06	1.29E+04
50	7.35E-02	6.93E-04	7.75E+01	2.90E-04	4.03E-04	4.03E+02	1.61E+01	7.83E-02	1.71E-04	3.28E+01	5.22E-06	1.50E+04
70	1.03E-01	9.70E-04	1.01E+02	3.78E-04	5.93E-04	5.93E+02	2.37E+01	1.11E-01	2.23E-04	3.28E+01	6.80E-06	1.63E+04
90	1.32E-01	1.25E-03	1.23E+02	4.59E-04	7.88E-04	7.88E+02	3.15E+01	1.42E-01	2.71E-04	3.28E+01	8.27E-06	1.72E+04

Table A-30 Adsolubilization of Ethylbenzene of Triton X-100 at pH = 8
Weight of silica = 14.75 g
Molecular weight of ethylbenzene = 106 g/mol
Equation from GC Y= 26.195X
Where Y = area of ethylbenzene from head space gas chromatography
X = Equilibrium concentration of ethylbenzene (mol/l)
Density of ethylbenzene = 0.867 g/ml
Adsorption = 190 μmol/g silica

[Etb] initial (μliter)	[Etb] initial (g/l)	[Etb] initial (mol/l)	Area at equilibrium	[Etb] eq (mol/l)	[Etb] ads (mol/l)	[Etb] ads (μmol/l)	[Etb] ads (μmol/g silica)	X admicelle	Mol of Etb	Mol of H_2O	X bulk	K
10	1.47E-02	1.39E-04	1.88E+01	7.02E-05	6.85E-05	6.85E+01	2.74E+00	1.42E-02	4.14E-05	3.28E+01	1.26E-06	1.12E+04
30	4.41E-02	4.16E-04	5.26E+01	1.97E-04	2.19E-04	2.19E+02	8.77E+00	4.41E-02	1.16E-04	3.28E+01	3.54E-06	1.25E+04
50	7.35E-02	6.93E-04	8.19E+01	3.07E-04	3.87E-04	3.87E+02	1.55E+01	7.53E-02	1.81E-04	3.28E+01	5.52E-06	1.36E+04
70	1.03E-01	9.70E-04	1.07E+02	3.99E-04	5.72E-04	5.72E+02	2.29E+01	1.07E-01	2.35E-04	3.28E+01	7.18E-06	1.50E+04
90	1.32E-01	1.25E-03	1.24E+02	4.65E-04	7.83E-04	7.83E+02	3.13E+01	1.42E-01	2.74E-04	3.28E+01	8.36E-06	1.69E+04

Table A-31 Adsolubilization of Ethylbenzene of CTAB/Triton ratio 1:1 at pH = 3
Weight of silica = 14.75 g
Molecular weight of ethylbenzene = 106 g/mol
Equation from GC Y= 247383X
Where Y = area of ethylbenzene from head space gas chromatography
X = Equilibrium concentration of ethylbenzene (mol/l)
Density of ethylbenzene = 0.867 g/ml
Adsorption = 193 μmol/g silica

[Etb] initial (μliter)	[Etb] initial (g/l)	[Etb] initial (mol/l)	Area at equilibrium	[Etb] eq (mol/l)	[Etb] ads (mol/l)	[Etb] ads (μmol/l)	[Etb] ads (μmol/g silica)	X admicelle	Mol of Etb	Mol of H_2O	X bulk	K
10	1.47E-02	1.39E-04	1.83E+01	7.39E-05	6.48E-05	6.48E+01	2.59E+00	1.32E-02	4.36E-05	3.28E+01	1.33E-06	9.96E+03
30	4.41E-02	4.16E-04	4.76E+01	1.93E-04	2.23E-04	2.23E+02	8.94E+00	4.42E-02	1.14E-04	3.28E+01	3.47E-06	1.28E+04
50	7.35E-02	6.93E-04	7.37E+01	2.98E-04	3.95E-04	3.95E+02	1.58E+01	7.57E-02	1.76E-04	3.28E+01	5.36E-06	1.41E+04
70	1.03E-01	9.70E-04	9.83E+01	3.97E-04	5.73E-04	5.73E+02	2.29E+01	1.06E-01	2.34E-04	3.28E+01	7.15E-06	1.48E+04
90	1.32E-01	1.25E-03	1.21E+02	4.89E-04	7.58E-04	7.58E+02	3.03E+01	1.36E-01	2.89E-04	3.28E+01	8.81E-06	1.54E+04

Table A-32 Adsolubilization of Ethylbenzene of CTAB/Triton ratio 1:1 at pH = 5
Weight of silica = 14.75 g
Molecular weight of ethylbenzene = 106 g/mol
Equation from GC Y= 247383X
Where Y = area of ethylbenzene from head space gas chromatography
X = Equilibrium concentration of ethylbenzene (mol/l)
Density of ethylbenzene = 0.867 g/ml
Adsorption = 193 μmol/g silica

[Etb] initial (μliter)	[Etb] initial (g/l)	[Etb] initial (mol/l)	Area at equilibrium	[Etb] eq (mol/l)	[Etb] ads (mol/l)	[Etb] ads (μmol/l)	[Etb] ads (μmol/g silica)	X admicelle	Mol of Etb	Mol of H_2O	X bulk	K
10	1.47E-02	1.39E-04	1.96E+01	7.90E-05	5.96E-05	5.96E+01	2.38E+00	1.22E-02	4.66E-05	3.28E+01	1.42E-06	8.58E+03
30	4.41E-02	4.16E-04	5.13E+01	2.07E-04	2.08E-04	2.08E+02	8.34E+00	4.14E-02	1.22E-04	3.28E+01	3.73E-06	1.11E+04
50	7.35E-02	6.93E-04	7.88E+01	3.19E-04	3.75E-04	3.75E+02	1.50E+01	7.20E-02	1.88E-04	3.28E+01	5.74E-06	1.26E+04
70	1.03E-01	9.70E-04	1.04E+02	4.20E-04	5.50E-04	5.50E+02	2.20E+01	1.02E-01	2.48E-04	3.28E+01	7.57E-06	1.35E+04
90	1.32E-01	1.25E-03	1.28E+02	5.18E-04	7.29E-04	7.29E+02	2.92E+01	1.31E-01	3.06E-04	3.28E+01	9.33E-06	1.41E+04

Table A-33 Adsolubilization of Ethylbenzene of CTAB/Triton ratio 1:1 at pH = 8
Weight of silica = 14.75 g
Molecular weight of ethylbenzene = 106 g/mol
Equation from GC Y= 247383X
Where Y = area of ethylbenzene from head space gas chromatography
X = Equilibrium concentration of ethylbenzene (mol/l)
Density of ethylbenzene = 0.867 g/ml
Adsorption = 196 μmol/g silica

[Etb] initial (μliter)	[Etb] initial (g/l)	[Etb] initial (mol/l)	Area at equilibrium	[Etb] eq (mol/l)	[Etb] ads (mol/l)	[Etb] ads (μmol/l)	[Etb] ads (μmol/g silica)	X admicelle	Mol of Etb	Mol of H_2O	X bulk	K
10	1.47E-02	1.39E-04	1.78E+01	7.21E-05	6.66E-05	6.66E+01	2.66E+00	1.34E-02	4.25E-05	3.28E+01	1.30E-06	1.03E+04
30	4.41E-02	4.16E-04	5.15E+01	2.08E-04	2.08E-04	2.08E+02	8.30E+00	4.06E-02	1.23E-04	3.28E+01	3.75E-06	1.08E+04
50	7.35E-02	6.93E-04	8.33E+01	3.37E-04	3.56E-04	3.56E+02	1.43E+01	6.78E-02	1.99E-04	3.28E+01	6.06E-06	1.12E+04
70	1.03E-01	9.70E-04	1.12E+02	4.55E-04	5.16E-04	5.16E+02	2.06E+01	9.52E-02	2.68E-04	3.28E+01	8.18E-06	1.16E+04
90	1.32E-01	1.25E-03	1.34E+02	5.42E-04	7.06E-04	7.06E+02	2.82E+01	1.26E-01	3.20E-04	3.28E+01	9.75E-06	1.29E+04

Sample Calculation A

Surfactant Adsorptin Isotherms

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

Adsorption of CTAB at pH 3

1. To convert the amount of carbon from TOC (ppm) to equilibrium concentration of CTAB (μM).

   Equation from TOC $Y = \frac{X}{0.2824}$

   X = the amount of carbon from TOC (ppm) = 3719.0 ppm

   Y = equilibrium concentration of CTAB (μM) $= \frac{3719.0}{0.2824}$

   $= 13169.263$ μM

2. Finding CTAB adsorbed concentration (μM).

   [Adsorbed CTAB] = [Initial CTAB] – [Equilibrium CTAB]

   [Initial CTAB] = 25000 μM

   [Equilibrium CTAB] = 13169.263 μM

   [Adsorbed CTAB] = 25000 – 13169.263 = 11830.737 μM

3. To convert adsorption concentration to moles of adsorption.

   $\text{Mol} = \frac{\text{Concentration x Volume}}{1000}$

   $\text{Adsorbed (μmol)} = \frac{\text{(Adsorbed (μM)) x Volume of solution}}{1000}$

   $\text{Adsorbed (μmol)} = \frac{11830.737 \times 20}{1000} = 236.615$

4. Finding CTAB adsorbed per gram silica.

   $\text{CTAB adsorbed (μmol/ g silica)} = \frac{\text{Adsorbed (μmol)}}{\text{The amount of silica (g)}}$

   $\text{CTAB adsorbed (μmol/ g silica)} = \frac{236.615}{0.5} = 473.229$

Sample Calculation B

Partition Coefficient

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

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

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

Adsolubilization of benzene (in CTAB system) at pH 3

Weight of silica = 14.75 g

Molecular weight of benzene = 78 g/mol

Equation from GC-Head space Y = 210858 X

Where Y = Area of benzene from head space gas chromatography

X = Equilibrium concentration of benzene (mol/l)

$\rho_{benzene}$ = 0.873 g/ml

Adsorption of CTAB = 457 μmol/g silica

Initial concentration of benzene (g/l) convert to (mol/l)

$$[Benzene, mol/l] = \frac{[Benzene, g/l]}{Molecular\ weight}$$

$$[Benzene, mol/l] = \frac{1.48E\text{-}01}{78} = 1.90E\text{-}03$$

At equilibrium benzene concentration from area of GC

From Y = 210858 X

Y = Area = 254.750 Replace in the equation

$$X = \frac{254.750}{210858} = 1.21E\text{-}03 \text{ mol/l}$$

Benzene adsolubilization = [Benzene] initial – [Benzene] equilibrium

= 1.90E-03 – 1.21E-03

= 6.89E-04 mol/l

Benzene adsolubilization = 6.89E+02 μmol/l

$$\text{Benzene adsolubilization (μmol/g silica)} = \frac{([Benzene] \times volume)/1000}{14.75}$$

$$= \frac{(6.89E+02 \times 590)/1000}{14.75}$$

= 27.5537

$$X_{admicelle} = \frac{\text{Mol of benzene}}{\text{(Mol of adsorbed CTAB + Mol of benzene)}}$$

$$X_{admicelle} = \frac{27.5537}{(457+27.5537)} = 5.69E\text{-}02$$

At the supernatant

Benzene concentration at equilibrium is converted to mol

$$\text{Mol of benzene} = \frac{\text{concentration x volume}}{1000}$$

$$= \frac{1.21E\text{-}03 \times 590}{1000}$$

$$= 7.13E\text{-}04$$

Total volume = Volume of benzene + Volume of H_2O

$$\text{Volume of benzene (ml)} = \frac{\text{mol of benzene x MW}}{\text{Density}}$$

$$= \frac{7.13E\text{-}04 \times 78}{0.873}$$

$$= 6.38E\text{-}02$$

Volume of H_2O = Total volume – Volume of benzene

= 590 ml – 6.38E-02 ml

= 5.90E+02 ml

Assume density of water = 1 g/ml

Mass of H_2O = Volume of H_2O

= 5.90E+02 g

$$\text{Mol of } H_2O = \frac{\text{Mass of } H_2O}{18} = \frac{5.90E+02}{18} = 3.28E+01$$

$$X_{bulk} = \frac{\text{Mol of benzene}}{\text{Mol of } H_2O + \text{Mol of benzene}}$$

$$= \frac{7.13E\text{-}04}{(3.28E+01 + 7.13E\text{-}04)}$$

$$= 2.17E\text{-}05$$

$$K = \frac{X_{admicelle}}{X_{bulk}} = \frac{5.69E\text{-}02}{2.17E\text{-}05} = 2.61E+03$$

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