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## APPENDICES

### Appendix A Experiment Data of Equilibrium Solubility of Mixed Soap Scum

**Table A1** Equilibrium solubility of calcium mixed soap scum in water at 25°C and various solution pH for 1:1 ratio

Solution pH	[Ca <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Ca <sup>2+</sup> ] (ppm)	[Ca <sup>2+</sup> ] (mM)	[Ca <sup>2+</sup> ] (M)
4	0.49	4.9	0.1225	0.000123
5	0.17	1.7	0.0425	4.25E-05
6	0.12	1.2	0.0300	0.00003
7	0.15	1.5	0.0375	3.75E-05
8	0.11	1.1	0.0275	2.75E-05
9	0.11	1.1	0.0275	2.75E-05
10	0.10	1	0.0250	0.000025
11	0.20	2	0.0500	0.000050

**Table A2** Equilibrium solubility of magnesium mixed soap scum in water at 25°C and various solution pH for 1:1 ratio

Solution pH	[Mg <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Mg <sup>2+</sup> ] (ppm)	[Mg <sup>2+</sup> ] (mM)	[Mg <sup>2+</sup> ] (M)
4	0.14	2.8	0.1152	0.00012
5	0.14	2.8	0.1152	0.00012
6	0.16	3.2	0.1316	0.00013
7	0.11	2.2	0.0905	9.05E-05
8	0.16	3.2	0.1316	0.00013
9	0.15	3.0	0.1234	0.00012
10	0.16	3.2	0.1316	0.00013
11	0.12	2.4	0.0987	9.87E-05

**Table A3** Equilibrium solubility of calcium mixed soap scum in water at 25°C and various solution pH for 4:1 ratio

Solution pH	[Ca <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Ca <sup>2+</sup> ] (ppm)	[Ca <sup>2+</sup> ] (mM)	[Ca <sup>2+</sup> ] (M)
4	0.71	7.1	0.1775	0.000178
5	0.20	2.0	0.0500	0.00005
6	0.54	5.4	0.1350	0.000135
7	0.13	1.3	0.0325	3.25E-05
8	0.13	1.3	0.0325	3.25E-05
9	0.20	2.0	0.0500	0.00005
10	0.18	1.8	0.0450	0.000045
11	0.32	3.2	0.0800	0.00008

**Table A4** Equilibrium solubility of magnesium mixed soap scum in water at 25°C and various solution pH for 4:1 ratio

Solution pH	[Mg <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Mg <sup>2+</sup> ] (ppm)	[Mg <sup>2+</sup> ] (mM)	[Mg <sup>2+</sup> ] (M)
4	0.13	2.6	0.1070	0.00011
5	0.08	0.8	0.0330	3.29E-05
6	0.06	0.6	0.0247	2.47E-05
7	0.06	0.6	0.0247	2.47E-05
8	0.04	0.4	0.0165	1.65E-05
9	0.06	0.6	0.0247	2.47E-05
10	0.12	1.2	0.0494	4.94E-05
11	0.06	0.6	0.0247	2.47E-05

**Table A5** Equilibrium solubility of calcium mixed soap scum in 0.1 M Na<sub>2</sub>EDTA at 25°C and various solution pH for 1:1 ratio

Solution pH	[Ca <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Ca <sup>2+</sup> ] (ppm)	[Ca <sup>2+</sup> ] (mM)	[Ca <sup>2+</sup> ] (M)
4	0.11	22	0.55	0.00055
5	0.33	66	1.65	0.00165
6	0.40	80	2.00	0.00200
7	0.10	20	0.50	0.00050
8	0.08	16	0.40	0.00040
9	0.45	90	2.25	0.00225
10	0.62	124	3.10	0.00310
11	0.95	190	4.75	0.00475

**Table A6** Equilibrium solubility of magnesium mixed soap scum in 0.1 M Na<sub>2</sub>EDTA at 25°C and various solution pH for 1:1 ratio

Solution pH	[Mg <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Mg <sup>2+</sup> ] (ppm)	[Mg <sup>2+</sup> ] (mM)	[Mg <sup>2+</sup> ] (M)
4	0.07	14	0.5759	0.00058
5	0.04	8	0.3291	0.00033
6	0.04	8	0.3291	0.00033
7	0.05	10	0.4114	0.00041
8	0.08	16	0.6582	0.00066
9	0.09	18	0.7404	0.00074
10	0.05	10	0.4114	0.00041
11	0.08	16	0.6582	0.00066

**Table A7** Equilibrium solubility of calcium mixed soap scum in 0.1 M Na<sub>2</sub>EDTA at 25°C and various solution pH for 4:1 ratio

Solution pH	[Ca <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Ca <sup>2+</sup> ] (ppm)	[Ca <sup>2+</sup> ] (mM)	[Ca <sup>2+</sup> ] (M)
4	0.08	16	0.40	0.00040
5	0.41	82	2.05	0.00205
6	0.27	54	1.35	0.00135
7	0.10	20	0.50	0.00050
8	0.44	88	2.20	0.00220
9	0.52	104	2.60	0.00260
10	0.75	150	3.75	0.00375
11	0.76	152	3.80	0.00380

**Table A8** Equilibrium solubility of magnesium mixed soap scum in 0.1 M Na<sub>2</sub>EDTA at 25°C and various solution pH for 4:1 ratio

Solution pH	[Mg <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Mg <sup>2+</sup> ] (ppm)	[Mg <sup>2+</sup> ] (mM)	[Mg <sup>2+</sup> ] (M)
4	0.05	10	0.4114	0.00041
5	0.08	16	0.6582	0.00066
6	0.07	14	0.5759	0.00058
7	0.03	6	0.2468	0.00025
8	0.04	8	0.3291	0.00033
9	0.09	18	0.7404	0.00074
10	0.21	42	1.7277	0.00173
11	0.17	34	1.3986	0.00140



**Table A9** Equilibrium solubility of calcium mixed soap scum in 0.1 M Na<sub>4</sub>GLDA at 25°C and various solution pH for 1:1 ratio

Solution pH	[Ca <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Ca <sup>2+</sup> ] (ppm)	[Ca <sup>2+</sup> ] (mM)	[Ca <sup>2+</sup> ] (M)
4	0.14	28	0.70	0.00070
5	0.09	18	0.45	0.00045
6	0.16	32	0.80	0.00080
7	0.31	62	1.55	0.00155
8	0.14	28	0.70	0.00070
9	0.16	32	0.80	0.00080
10	0.70	140	3.50	0.00350
11	0.32	64	1.60	0.00160

**Table A10** Equilibrium solubility of magnesium mixed soap scum in 0.1 M Na<sub>4</sub>GLDA at 25°C and various solution pH for 1:1 ratio

Solution pH	[Mg <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Mg <sup>2+</sup> ] (ppm)	[Mg <sup>2+</sup> ] (mM)	[Mg <sup>2+</sup> ] (M)
4	0.03	6	0.246812	0.000247
5	0.04	8	0.329083	0.000329
6	0.06	12	0.493624	0.000494
7	0.03	6	0.246812	0.000247
8	0.03	6	0.246812	0.000247
9	0.04	8	0.329083	0.000329
10	0.05	10	0.411353	0.000411
11	0.10	20	0.822707	0.000823

**Table A11** Equilibrium solubility of calcium mixed soap scum in 0.1 M Na<sub>4</sub>GLDA at 25°C and various solution pH for 4:1 ratio

Solution pH	[Ca <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Ca <sup>2+</sup> ] (ppm)	[Ca <sup>2+</sup> ] (mM)	[Ca <sup>2+</sup> ] (M)
4	0.09	18	0.45	0.00045
5	0.07	14	0.35	0.00035
6	0.11	22	0.55	0.00055
7	0.09	18	0.45	0.00045
8	0.13	26	0.65	0.00065
9	0.20	40	1.00	0.00100
10	0.24	48	1.20	0.00120
11	0.37	74	1.85	0.00185

**Table A12** Equilibrium solubility of magnesium mixed soap scum in 0.1 M Na<sub>4</sub>GLDA at 25°C and various solution pH for 4:1 ratio

Solution pH	[Mg <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Mg <sup>2+</sup> ] (ppm)	[Mg <sup>2+</sup> ] (mM)	[Mg <sup>2+</sup> ] (M)
4	0.03	6	0.2468	0.000247
5	0.03	6	0.2468	0.000247
6	0.03	6	0.2468	0.000247
7	0.04	8	0.3291	0.000329
8	0.03	6	0.2468	0.000247
9	0.03	6	0.2468	0.000247
10	0.04	8	0.3291	0.000329
11	0.09	18	0.7404	0.000740

**Table A13** Equilibrium solubility of calcium mixed soap scum in 0.1 M DDAO at 25°C and various solution pH for 1:1 ratio

Solution pH	[Ca <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Ca <sup>2+</sup> ] (ppm)	[Ca <sup>2+</sup> ] (mM)	[Ca <sup>2+</sup> ] (M)
4	0.18	72	1.80	0.00180
5	0.13	26	0.65	0.00065
6	0.08	16	0.40	0.00040
7	0.07	14	0.35	0.00035
8	0.10	20	0.50	0.00050
9	0.07	14	0.35	0.00035
10	0.08	16	0.40	0.00040
11	0.08	16	0.40	0.00040

**Table A14** Equilibrium solubility of magnesium mixed soap scum in 0.1 M DDAO at 25°C and various solution pH for 1:1 ratio

Solution pH	[Mg <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Mg <sup>2+</sup> ] (ppm)	[Mg <sup>2+</sup> ] (mM)	[Mg <sup>2+</sup> ] (M)
4	0.2	80	3.2908	0.00329
5	0.06	24	0.9872	0.00099
6	0.03	12	0.4936	0.00049
7	0.03	12	0.4936	0.00049
8	0.04	16	0.6582	0.00066
9	0.05	20	0.8227	0.00082
10	0.02	8	0.3291	0.00033
11	0.02	8	0.3291	0.00033

**Table A15** Equilibrium solubility of calcium mixed soap scum in 0.1 M DDAO at 25°C and various solution pH for 4:1 ratio

Solution pH	[Ca <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Ca <sup>2+</sup> ] (ppm)	[Ca <sup>2+</sup> ] (mM)	[Ca <sup>2+</sup> ] (M)
4	0.44	176	4.40	0.00440
5	0.10	20	0.50	0.00050
6	0.07	14	0.35	0.00035
7	0.10	20	0.50	0.00050
8	0.07	14	0.35	0.00035
9	0.09	18	0.45	0.00045
10	0.08	16	0.40	0.00040
11	0.44	88	2.20	0.00220

**Table A16** Equilibrium solubility of magnesium mixed soap scum in 0.1 M DDAO at 25°C and various solution pH for 4:1 ratio

Solution pH	[Mg <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Mg <sup>2+</sup> ] (ppm)	[Mg <sup>2+</sup> ] (mM)	[Mg <sup>2+</sup> ] (M)
4	0.19	76	3.1263	0.00313
5	0.05	20	0.8227	0.00082
6	0.04	16	0.6582	0.00066
7	0.11	44	1.8100	0.00181
8	0.05	20	0.8227	0.00082
9	0.04	16	0.6582	0.00066
10	0.04	16	0.6582	0.00066
11	0.11	44	1.8100	0.00181

**Table A17** Equilibrium solubility of calcium mixed soap scum in 0.1 M DDAO with 0.1 M Na<sub>2</sub>EDTA at 25°C and various solution pH for 1:1 ratio

Solution pH	[Ca <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Ca <sup>2+</sup> ] (ppm)	[Ca <sup>2+</sup> ] (mM)	[Ca <sup>2+</sup> ] (M)
4	0.05	10	0.25	0.00025
5	0.07	14	0.35	0.00035
6	0.07	14	0.35	0.00035
7	0.13	26	0.65	0.00065
8	0.09	18	0.45	0.00045
9	0.4	80	2.00	0.00200
10	0.95	190	4.75	0.00475
11	1.2	240	6.00	0.00600
12	1.24	248	6.20	0.00620

**Table A18** Equilibrium solubility of magnesium mixed soap scum in 0.1 M DDAO with 0.1 M Na<sub>2</sub>EDTA at 25°C and various solution pH for 1:1 ratio

Solution pH	[Mg <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Mg <sup>2+</sup> ] (ppm)	[Mg <sup>2+</sup> ] (mM)	[Mg <sup>2+</sup> ] (M)
4	0.04	16	0.6582	0.00066
5	0.03	12	0.4936	0.00049
6	0.08	32	1.3163	0.00132
7	0.09	36	1.4809	0.00148
8	0.07	28	1.1518	0.00115
9	0.09	36	1.4809	0.00148
10	0.08	32	1.3163	0.00132
11	0.1	40	1.6454	0.00165
12	0.06	24	0.9872	0.00099

**Table A19** Equilibrium solubility of calcium mixed soap scum in 0.1 M DDAO with 0.1 M Na<sub>2</sub>EDTA at 25°C and various solution pH for 4:1 ratio

Solution pH	[Ca <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Ca <sup>2+</sup> ] (ppm)	[Ca <sup>2+</sup> ] (mM)	[Ca <sup>2+</sup> ] (M)
4	0.08	16	0.40	0.0004
5	0.06	12	0.30	0.0003
6	0.06	12	0.30	0.0003
7	0.12	24	0.60	0.0006
8	0.10	20	0.50	0.0005
9	0.16	32	0.80	0.0008
10	0.86	172	4.30	0.0043
11	1.37	274	6.85	0.0069
12	0.91	182	4.55	0.0046

**Table A20** Equilibrium solubility of magnesium mixed soap scum in 0.1 M DDAO with 0.1 M Na<sub>2</sub>EDTA at 25°C and various solution pH for 4:1 ratio

Solution pH	[Mg <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Mg <sup>2+</sup> ] (ppm)	[Mg <sup>2+</sup> ] (mM)	[Mg <sup>2+</sup> ] (M)
4	0.03	12	0.4936	0.00049
5	0.03	12	0.4936	0.0004
6	0.03	12	0.4936	0.00049
7	0.04	16	0.6582	0.00066
8	0.04	16	0.6582	0.00066
9	0.04	16	0.6582	0.00066
10	0.05	20	0.8227	0.00082
11	0.05	20	0.8227	0.00082
12	0.04	16	0.6582	0.00066

**Table A21** Equilibrium solubility of calcium mixed soap scum in 0.1 M DDAO with 0.1 M Na<sub>4</sub>GLDA at 25°C and various solution pH for 1:1 ratio

Solution pH	[Ca <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Ca <sup>2+</sup> ] (ppm)	[Ca <sup>2+</sup> ] (mM)	[Ca <sup>2+</sup> ] (M)
4	0.10	40	1.0	0.0010
5	0.08	32	0.8	0.0008
6	0.09	36	0.9	0.0009
7	0.09	36	0.9	0.0009
8	0.25	100	2.5	0.0025
9	0.27	108	2.7	0.0027
10	0.30	120	3.0	0.0030
11	0.72	288	7.2	0.0072
12	0.72	288	7.2	0.0072

**Table A22** Equilibrium solubility of magnesium mixed soap scum in 0.1 M DDAO with 0.1 M Na<sub>4</sub>GLDA at 25°C and various solution pH for 1:1 ratio

Solution pH	[Mg <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Mg <sup>2+</sup> ] (ppm)	[Mg <sup>2+</sup> ] (mM)	[Mg <sup>2+</sup> ] (M)
4	0.03	12	0.4936	0.00049
5	0.05	20	0.8227	0.00082
6	0.09	36	1.4809	0.00148
7	0.10	40	1.6454	0.00165
8	0.05	20	0.8228	0.00082
9	0.14	56	2.3036	0.00230
10	0.21	84	3.4554	0.00346
11	0.44	176	7.2398	0.00724
12	0.20	80	3.2908	0.00329

**Table A23** Equilibrium solubility of calcium mixed soap scum in 0.1 M DDAO with 0.1 M Na<sub>4</sub>GLDA at 25°C and various solution pH for 4:1 ratio

Solution pH	[Ca <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Ca <sup>2+</sup> ] (ppm)	[Ca <sup>2+</sup> ] (mM)	[Ca <sup>2+</sup> ] (M)
4	0.07	28	1.1518	0.00115
5	0.03	12	0.4936	0.00049
6	0.05	20	0.8227	0.00082
7	0.03	12	0.4936	0.00049
8	0.07	28	1.1518	0.00115
9	0.03	12	0.4936	0.00049
10	0.04	16	0.6582	0.00066
11	0.36	144	5.9235	0.00592
12	0.04	16	0.6582	0.00066

**Table A24** Equilibrium solubility of magnesium mixed soap scum in 0.1 M DDAO with 0.1 M Na<sub>4</sub>GLDA at 25°C and various solution pH for 4:1 ratio

Solution pH	[Mg <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Mg <sup>2+</sup> ] (ppm)	[Mg <sup>2+</sup> ] (mM)	[Mg <sup>2+</sup> ] (M)
4	0.09	36	0.9	0.0009
5	0.06	24	0.6	0.0006
6	0.23	92	2.3	0.0023
7	0.28	112	2.8	0.0028
8	0.07	28	0.7	0.0007
9	0.24	96	2.4	0.0024
10	0.39	156	3.9	0.0039
11	0.79	316	7.9	0.0079
12	0.78	312	7.8	0.0078



## Appendix B Experiment Data of Dissolution Rate of Mixed Soap Scum

**Table B1** Dissolution of calcium mixed soap scum in 0.1 M DDAO with 0.1 M Na<sub>2</sub>EDTA at 25°C and pH 11 for 1:1 ratio

Time	[Ca <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Ca <sup>2+</sup> ] (ppm)	[Ca <sup>2+</sup> ] (mM)	% dissolved
0	0	0	0	0
5	0.79	316	7.9	50.48
10	0.73	292	7.3	97.12
15	0.67	268	6.7	100
20	0.62	248	6.2	100
25	0.73	292	7.3	100
30	0.62	248	6.2	100

**Table B2** Dissolution of magnesium mixed soap scum in 0.1 M DDAO with 0.1 M Na<sub>2</sub>EDTA at 25°C and pH 11 for 1:1 ratio

Time	[Mg <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Mg <sup>2+</sup> ] (ppm)	[Mg <sup>2+</sup> ] (mM)	% dissolved
0	0	0	0	0
5	0.22	88	3.67	22.82
10	0.12	48	2.00	35.26
15	0.03	12	0.50	38.37
20	0.04	16	0.67	42.52
25	0.04	16	0.67	46.67
30	0.03	12	0.50	49.78

**Table B3** Dissolution of calcium mixed soap scum in 0.1 M DDAO with 0.1 M Na<sub>2</sub>EDTA at 25°C and pH 11 for 4:1 ratio

Time	[Ca <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Ca <sup>2+</sup> ] (ppm)	[Ca <sup>2+</sup> ] (mM)	% dissolved
0	0	0	0	0
5-	0.35	280	7.00	27.95
10	0.56	448	11.2	72.68
15	0.54	432	10.8	99
20	0.53	424	10.6	100
25	0.63	504	12.6	100
30	0.46	368	9.20	100

**Table B4** Dissolution of magnesium mixed soap scum in 0.1 M DDAO with 0.1 M Na<sub>2</sub>EDTA at 25°C and pH 11 for 4:1 ratio

Time	[Mg <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Mg <sup>2+</sup> ] (ppm)	[Mg <sup>2+</sup> ] (mM)	% dissolved
0	0	0	0	0
5	0.04	16	0.67	10.37
10	0.05	20	0.83	23.34
15	0.05	20	0.83	36.30
20	0.05	20	0.83	49.26
25	0.02	8	0.33	54.45
30	0.08	32	1.33	75.19

**Table B5** Dissolution of calcium mixed soap scum in 0.1 M DDAO with 0.1 M Na<sub>4</sub>GLDA at 25°C and pH 11 for 1:1 ratio

Time	[Ca <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Ca <sup>2+</sup> ] (ppm)	[Ca <sup>2+</sup> ] (mM)	% dissolved
0	0	0	0	0
5	0.32	128	3.2	20.44699
10	0.77	308	7.7	69.64756
15	0.62	248	6.2	99
20	0.59	236	5.9	100
25	0.81	324	8.1	100
30	0.64	256	6.4	100

**Table B6** Dissolution of magnesium mixed soap scum in 0.1 M DDAO with 0.1 M Na<sub>4</sub>GLDA at 25°C and pH 11 for 1:1 ratio

Time	[Mg <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Mg <sup>2+</sup> ] (ppm)	[Mg <sup>2+</sup> ] (mM)	% dissolved
0	0	0	0	0
5	0.06	24	1.0000	6.222740
10	0.08	32	1.3333	14.51972
15	0.13	52	2.1667	28.00232
20	0.1	40	1.6667	38.37354
25	0.08	32	1.3333	46.67053
30	0.18	72	3.0000	65.33874

**Table B7** Dissolution of calcium mixed soap scum in 0.1 M DDAO with 0.1 M Na<sub>4</sub>GLDA at 25°C and pH 11 for 4:1 ratio

Time	[Ca <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Ca <sup>2+</sup> ] (ppm)	[Ca <sup>2+</sup> ] (mM)	% dissolved
0	0	0	0	0
5	0.5	200	5.0	19.96776
10	0.4	160	4.0	35.94197
15	0.3	120	3.0	47.92263
20	0.33	132	3.3	61.10136
25	0.32	128	3.2	73.88072
30	0.34	136	3.4	87.45880

**Table B8** Dissolution of magnesium mixed soap scum in 0.1 M DDAO with 0.1 M Na<sub>4</sub>GLDA at 25°C and pH 11 for 4:1 ratio

Time	[Mg <sup>2+</sup> ] <sub>dilute</sub> (ppm)	[Mg <sup>2+</sup> ] (ppm)	[Mg <sup>2+</sup> ] (mM)	% dissolved
0	0	0	0	0
5	0.04	16	0.6667	10.37123
10	0.03	12	0.5000	18.14965
15	0.05	20	0.8333	31.11368
20	0.04	16	0.6667	41.48491
25	0.04	16	0.6667	51.85614
30	0.10	40	1.6667	77.78421

**Appendix C Dissolution Rate of Mixed Soap Scum****Table C1** Initial rate constant of mixed soap scum

Solution	Initial rate constant (min <sup>-1</sup> ) of 1:1 Ratio		Initial rate constant (min <sup>-1</sup> ) of 4:1 Ratio	
	Calcium	Magnesium	Calcium	Magnesium
0.1 M DDAO + 0.1 Na <sub>2</sub> EDTA	0.3120	0.0451	0.1169	0.0256
0.1 M DDAO + 0.1 Na <sub>4</sub> GLDA	0.1045	0.0151	0.0445	0.0204

## CURRICULUM VITAE

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**Proceeding:**

1. Siripaisan, R.; Itsadanont, S.; Scamehorn, J.F.; and Chavadej, S. (2014, April 22). Dissolution Kinetics of Mixed Soap Scums at Different Molar Ratios of Ca and Mg in an Amphoteric Surfactant System with Different Chelating Agents. Proceedings of the 5<sup>th</sup> Research Symposium on Petrochemical and Materials Technology and 20<sup>th</sup> PPC Symposium on Petroleum, Petrochemicals, and Polymers, Bangkok, Thailand.

**Presentation:**

1. Siripaisan, R.; Itsadanont, S.; Scamehorn, J.F.; and Chavadej, S. (2014, May 7-8). Dissolution Kinetics of Mixed Soap Scums in an Amphoteric Surfactant System with a Chelating Agent. Paper presented at 2014 International Conference on Environment and Renewable Energy, Paris, France.