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## **APPENDICES**



APPENDIX A

Blank @ pH 11.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	0.000	0.000	0.026	0.003	0.119	0.000	0.017
2	0.033	0.000	0.024	0.006	1.325	0.000	0.069
3	0.000	0.000	0.020	0.005	0.576	0.000	0.022
4	0.000	0.000	0.019	0.005	0.845	0.000	0.027
5	0.000	0.000	0.018	0.004	0.461	0.000	0.024
6	0.000	0.000	0.017	0.004	0.526	0.000	0.019
7	0.000	0.000	0.017	0.004	0.567	0.000	0.018
8	0.000	0.000	0.016	0.004	0.322	0.000	0.023
9	0.000	0.000	0.019	0.069	1.452	0.398	0.184
10	0.000	0.000	0.016	0.023	0.711	0.029	0.088
11	0.000	0.000	0.021	0.029	0.751	0.080	0.108
12	0.000	0.000	0.017	0.014	0.442	0.000	0.061
13	0.000	0.000	0.016	0.038	0.791	0.259	0.155
14	0.000	0.000	0.017	0.023	0.612	0.055	0.101
15	0.000	0.123	0.022	0.038	0.955	0.204	0.157
16	0.088	0.000	0.000	0.000	0.280	0.053	0.086
17	0.151	0.464	0.000	0.061	0.805	0.387	0.182
18	0.073	0.000	0.000	0.000	0.312	0.115	0.093
19	0.108	0.000	0.000	0.050	0.725	0.325	0.162
20	0.108	0.000	0.000	0.065	0.945	0.424	0.178
21	0.124	0.000	0.000	0.075	0.950	0.462	0.188
22	0.109	0.000	0.000	0.000	0.634	0.248	0.127
23	0.000	0.000	0.017	0.078	0.642	0.113	0.096
24	0.088	0.000	0.025	0.000	0.550	0.098	0.094
25	0.102	0.093	0.000	0.000	0.593	0.000	0.082
26	0.000	0.083	0.000	0.054	0.391	0.000	0.174
27	0.095	0.128	0.028	0.064	0.386	0.148	0.129
28	0.000	0.118	0.013	0.000	0.590	0.285	0.097

Blank @ pH 12

Day	Si	Al	Fe	Mg	Ca	Na	K
1	0.059	0.018	0.000	0.000	0.442	0.055	0.061
2	0.000	0.017	0.000	0.000	0.845	0.000	0.108
3	0.000	0.028	0.000	0.000	0.322	0.000	0.086
4	0.000	0.000	0.000	0.000	0.791	0.387	0.157
5	0.000	0.000	0.018	0.000	0.567	0.298	0.162
6	0.151	0.038	0.000	0.000	0.564	0.325	0.093
7	0.000	0.018	0.000	0.000	0.635	0.287	0.084
8	0.000	0.015	0.000	0.000	0.711	0.462	0.101
9	0.000	0.027	0.019	0.000	0.945	0.398	0.127
10	0.284	0.000	0.013	0.000	0.983	0.329	0.094
11	0.373	0.030	0.021	0.023	0.782	0.220	0.182
12	0.275	0.000	0.024	0.018	0.643	0.097	0.093
13	0.499	0.000	0.000	0.018	0.955	0.053	0.073
14	0.185	0.000	0.020	0.004	0.365	0.000	0.178
15	0.000	0.000	0.000	0.023	0.461	0.115	0.086
16	0.073	0.000	0.016	0.008	0.312	0.000	0.094
17	0.187	0.000	0.028	0.008	0.449	0.000	0.155
18	0.487	0.000	0.017	0.018	0.526	0.424	0.129
19	0.587	0.018	0.019	0.029	0.950	0.000	0.178
20	0.284	0.009	0.000	0.000	0.864	0.204	0.115
21	0.124	0.019	0.000	0.000	0.938	0.094	0.140
22	0.108	0.029	0.000	0.000	0.725	0.173	0.096
23	0.387	0.032	0.000	0.003	0.612	0.205	0.128
24	0.287	0.017	0.019	0.010	0.675	0.187	0.082
25	0.187	0.000	0.000	0.019	0.805	0.176	0.095
26	0.290	0.000	0.017	0.027	0.751	0.187	0.188
27	0.579	0.017	0.016	0.019	0.474	0.094	0.182
28	0.483	0.000	0.016	0.000	0.280	0.084	0.162

Blank @ pH 12.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	0.791	0.031	0.000	0.000	1.041	0.317	0.206
2	0.893	0.025	0.000	0.000	1.061	0.344	0.187
3	0.921	0.040	0.000	0.008	1.158	0.604	0.318
4	1.070	0.030	0.000	0.009	1.289	0.472	0.280
5	0.935	0.025	0.000	0.008	1.325	0.528	0.281
6	0.877	0.014	0.000	0.006	0.821	0.410	0.226
7	0.675	0.000	0.000	0.009	0.736	0.298	0.198
8	0.719	0.000	0.000	0.018	0.927	0.385	0.179
9	0.673	0.000	0.000	0.018	0.937	0.347	0.274
10	0.938	0.000	0.027	0.019	0.824	0.483	0.277
11	0.673	0.000	0.002	0.028	0.905	0.387	0.387
12	0.716	0.018	0.029	0.025	0.785	0.289	0.187
13	0.864	0.000	0.026	0.016	0.972	0.175	0.248
14	0.538	0.000	0.038	0.010	1.185	0.097	0.476
15	0.719	0.000	0.035	0.017	1.299	0.085	0.287
16	0.719	0.000	0.000	0.011	0.974	0.187	0.109
17	0.974	0.000	0.047	0.010	0.827	0.154	0.010
18	0.674	0.000	0.049	0.008	1.185	0.146	0.176
19	0.477	0.024	0.039	0.008	1.138	0.264	0.096
20	0.387	0.019	0.058	0.000	1.387	0.376	0.176
21	0.476	0.029	0.000	0.000	0.973	0.228	0.188
22	0.378	0.039	0.000	0.000	1.103	0.237	0.248
23	0.386	0.036	0.041	0.020	1.217	0.376	0.277
24	0.576	0.028	0.038	0.017	0.937	0.187	0.295
25	0.762	0.019	0.030	0.010	0.784	0.247	0.197
26	0.673	0.048	0.025	0.008	0.879	0.167	0.196
27	0.681	0.029	0.039	0.000	1.187	0.265	0.285
28	0.503	0.017	0.018	0.012	1.205	0.175	0.178

Sample C1 @ pH 11.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	12.353	10.130	0.107	0.006	0.000	82.045	92.512
2	11.789	11.128	0.183	0.060	0.679	43.821	48.531
3	10.726	10.255	0.226	0.076	0.760	36.403	40.872
4	10.373	9.763	0.264	0.093	1.031	31.154	35.642
5	9.732	9.192	0.250	0.107	1.096	26.689	31.199
6	9.229	8.735	0.198	0.110	1.238	22.532	27.303
7	9.288	8.758	0.148	0.078	1.584	21.893	27.489
8	9.189	8.598	0.188	0.067	1.287	20.928	28.928
9	9.184	8.689	0.147	0.032	1.440	21.298	27.240
10	9.039	8.498	0.149	0.047	1.393	20.298	29.287
11	9.024	8.299	0.197	0.039	1.388	19.238	28.929
12	8.817	8.438	0.185	0.059	1.340	18.295	26.398
13	8.978	8.875	0.189	0.050	1.484	20.109	27.350
14	9.198	8.598	0.279	0.039	1.285	22.395	25.295
15	8.924	8.399	0.276	0.057	1.299	20.924	24.298
16	8.773	8.109	0.190	0.068	1.218	18.298	25.289
17	8.684	8.047	0.187	0.027	1.198	19.024	27.239
18	9.182	7.984	0.212	0.028	1.078	21.291	26.298
19	9.289	7.990	0.299	0.040	1.085	21.028	27.298
20	9.483	8.039	0.220	0.044	1.018	22.282	26.350
21	9.198	8.340	0.278	0.037	0.973	21.082	27.350
22	8.824	8.350	0.238	0.034	0.917	20.982	26.287
23	9.187	8.587	0.228	0.049	0.959	21.034	26.287
24	8.973	8.561	0.219	0.043	0.895	19.924	25.348
25	8.830	8.883	0.203	0.059	0.888	19.458	24.295
26	9.190	8.793	0.197	0.039	0.939	19.038	25.240
27	9.294	8.338	0.178	0.039	0.839	21.824	25.440
28	9.383	7.997	0.178	0.048	0.992	20.235	26.350

Sample C1 @ pH 12

Day	Si	Al	Fe	Mg	Ca	Na	K
1	44.600	39.375	0.157	0.004	3.583	98.514	147.900
2	33.221	29.048	0.152	0.009	3.783	70.460	99.293
3	27.907	24.106	0.100	0.008	4.087	59.838	82.225
4	19.120	18.883	0.093	0.003	3.982	47.602	64.192
5	15.418	15.016	0.102	0.008	3.938	37.855	51.797
6	13.462	13.043	0.102	0.007	3.574	30.136	43.894
7	15.328	12.984	0.183	0.006	3.438	30.398	41.329
8	17.289	12.733	0.136	0.005	3.287	31.398	44.329
9	1.938	12.893	0.176	0.004	3.198	33.938	42.330
10	18.289	12.684	0.093	0.005	3.390	32.395	43.294
11	18.935	12.987	0.094	0.003	3.510	32.395	42.483
12	18.284	12.495	0.092	0.000	3.591	33.398	42.398
13	17.329	12.759	0.097	0.000	3.691	31.980	41.348
14	19.189	12.488	0.179	0.000	3.792	31.130	41.974
15	18.198	12.298	0.176	0.000	3.335	32.395	41.398
16	19.189	12.179	0.094	0.001	3.290	33.298	40.289
17	17.189	12.009	0.093	0.003	3.399	31.330	42.439
18	17.274	12.138	0.089	0.000	3.191	30.938	42.241
19	18.138	11.992	0.084	0.004	2.978	29.385	41.329
20	17.289	11.978	0.082	0.000	3.293	29.978	43.982
21	19.284	11.982	0.092	0.000	3.540	29.385	40.398
22	15.238	12.022	0.092	0.000	3.492	28.384	39.398
23	15.198	12.189	0.085	0.000	3.798	29.284	38.393
24	14.187	12.332	0.097	0.002	3.938	30.825	40.287
25	12.195	12.342	0.094	0.000	3.389	31.329	41.398
26	13.190	12.449	0.096	0.000	3.689	32.285	39.935
27	15.239	12.496	0.099	0.000	3.191	31.935	39.624
28	13.189	12.521	0.189	0.002	2.830	31.035	40.292

Sample C1 @ pH12.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	53.599	47.643	0.123	0.001	2.658	109.260	171.640
2	60.329	59.975	0.130	0.000	2.801	91.093	160.160
3	56.530	57.930	0.137	0.000	2.596	88.891	153.900
4	58.452	60.683	0.130	0.000	2.461	88.487	153.870
5	55.824	57.921	0.147	0.000	2.447	83.856	148.130
6	55.008	56.155	0.136	0.000	2.324	80.854	144.990
7	52.238	55.832	0.138	0.000	2.344	78.487	140.948
8	52.189	55.734	0.133	0.000	2.492	78.437	137.294
9	51.939	54.283	0.129	0.000	2.684	79.298	139.382
10	51.287	54.290	0.185	0.000	2.836	77.440	136.382
11	53.289	54.872	0.165	0.000	2.689	77.293	135.384
12	50.189	53.872	0.126	0.000	2.935	78.874	133.436
13	51.298	53.877	0.129	0.000	2.829	77.370	134.488
14	48.294	53.987	0.126	0.000	2.589	76.837	136.328
15	47.982	53.193	0.137	0.002	2.982	79.285	133.349
16	45.385	52.873	0.139	0.000	2.482	78.844	139.440
17	46.239	52.875	0.127	0.000	2.828	80.290	136.283
18	44.030	52.199	0.124	0.000	3.083	81.385	132.348
19	41.328	53.287	0.120	0.000	2.893	80.440	130.382
20	42.298	53.739	0.129	0.000	2.584	79.287	131.329
21	44.294	53.287	0.139	0.001	2.350	75.395	133.398
22	46.298	52.278	0.118	0.002	2.382	77.398	135.239
23	45.329	52.018	0.127	0.002	2.250	79.239	135.938
24	44.198	51.728	0.125	0.000	2.490	80.329	136.390
25	43.209	51.872	0.119	0.000	2.493	79.287	134.395
26	46.391	51.276	0.139	0.000	2.438	81.436	137.385
27	48.941	52.147	0.139	0.000	2.460	80.679	139.298
28	43.240	52.822	0.150	0.000	2.391	79.385	136.874

Sample C2 @ pH11.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	16.246	14.956	0.068	0.026	7.134	41.038	50.396
2	10.331	9.329	0.068	0.027	5.916	24.317	31.769
3	10.043	9.007	0.070	0.036	5.056	20.782	27.590
4	9.834	8.853	0.071	0.035	4.678	18.239	24.562
5	9.004	8.042	0.072	0.055	4.292	15.407	21.268
6	8.472	7.654	0.078	0.054	3.656	13.308	18.859
7	8.439	7.598	0.079	0.038	3.398	12.398	18.176
8	8.348	7.540	0.073	0.028	3.289	12.938	18.736
9	8.187	7.487	0.068	0.049	3.198	11.328	18.364
10	8.583	7.698	0.043	0.039	3.284	12.239	18.374
11	7.983	7.493	0.053	0.029	3.198	12.931	17.938
12	7.799	7.299	0.073	0.048	3.093	13.124	17.385
13	8.184	7.398	0.078	0.048	2.998	13.746	17.387
14	8.398	7.295	0.079	0.037	2.974	13.194	18.847
15	8.683	7.109	0.082	0.039	2.902	12.874	18.372
16	8.388	6.975	0.081	0.037	2.849	12.130	19.102
17	8.438	6.798	0.076	0.029	3.017	13.383	19.349
18	8.198	7.187	0.080	0.047	3.190	13.902	18.978
19	8.085	7.039	0.072	0.029	3.229	12.623	18.640
20	7.928	6.938	0.070	0.018	3.028	11.240	18.285
21	7.889	6.938	0.078	0.039	3.298	12.982	17.948
22	8.028	7.388	0.069	0.049	3.193	12.328	18.346
23	8.189	7.487	0.071	0.053	2.938	11.982	18.577
24	8.298	7.498	0.079	0.059	2.874	11.348	18.235
25	8.289	7.398	0.083	0.063	2.687	12.948	17.782
26	8.529	7.198	0.084	0.049	2.819	12.050	17.835
27	8.824	7.038	0.077	0.042	2.942	13.048	17.597
28	8.598	6.935	0.071	0.049	3.019	13.128	18.293

Sample C2 @ pH12

Day	Si	Al	Fe	Mg	Ca	Na	K
1	21.568	23.836	0.066	0.000	4.719	44.648	74.097
2	13.480	15.793	0.070	0.000	7.576	26.509	42.752
3	15.309	16.914	0.067	0.002	4.414	29.275	44.640
4	15.440	16.159	0.066	0.001	6.557	29.254	45.304
5	14.331	14.354	0.067	0.004	4.547	27.393	41.701
6	13.917	13.490	0.073	0.006	5.127	24.452	38.384
7	13.298	13.872	0.067	0.007	4.325	24.289	37.398
8	13.193	13.184	0.078	0.004	4.250	24.198	35.485
9	12.938	12.998	0.067	0.003	4.984	23.395	35.386
10	12.827	12.874	0.059	0.004	4.488	23.976	36.765
11	12.975	12.379	0.064	0.002	5.175	23.349	37.395
12	13.139	12.634	0.068	0.002	5.039	23.249	38.349
13	13.081	12.490	0.074	0.001	5.398	23.985	37.895
14	12.827	12.873	0.072	0.001	5.187	24.183	37.325
15	12.718	12.348	0.065	0.001	4.928	24.082	38.439
16	12.948	12.039	0.072	0.000	4.825	24.195	36.589
17	13.130	11.935	0.061	0.000	4.728	23.875	38.398
18	13.249	11.893	0.065	0.000	4.249	24.642	35.284
19	12.905	12.285	0.065	0.000	4.388	24.248	36.338
20	12.892	12.834	0.074	0.001	4.498	24.191	35.384
21	12.981	12.485	0.075	0.000	4.184	23.187	35.982
22	13.249	13.194	0.075	0.000	3.903	23.898	36.493
23	12.948	12.984	0.076	0.000	3.895	23.659	36.049
24	12.733	12.627	0.070	0.000	4.193	24.330	36.409
25	12.589	12.593	0.054	0.000	4.591	22.329	37.705
26	12.398	12.298	0.069	0.002	4.298	23.329	37.019
27	12.531	12.085	0.078	0.001	4.493	21.287	38.002
28	12.493	11.949	0.068	0.001	4.698	22.385	38.334

Sample C2 @ pH12.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	20.694	22.999	0.064	0.000	2.683	45.498	80.671
2	16.958	20.129	0.083	0.000	10.548	30.201	63.789
3	20.305	30.755	0.083	0.000	9.177	38.336	80.955
4	25.853	49.042	0.086	0.000	6.691	57.331	115.140
5	27.594	59.095	0.090	0.000	5.639	67.211	131.050
6	28.504	63.811	0.090	0.000	5.554	71.349	139.270
7	26.392	62.984	0.085	0.000	5.430	70.194	144.328
8	25.340	60.484	0.098	0.001	5.295	68.385	138.282
9	21.981	59.385	0.078	0.001	5.235	69.235	133.128
10	19.938	51.385	0.076	0.001	5.247	66.984	129.287
11	17.395	49.274	0.083	0.002	5.494	67.385	121.393
12	18.218	47.385	0.072	0.001	5.396	69.287	123.240
13	18.171	41.387	0.092	0.000	5.184	66.289	122.239
14	17.329	38.329	0.083	0.000	5.285	68.835	120.032
15	17.235	37.284	0.082	0.000	5.388	67.440	120.984
16	17.874	35.285	0.076	0.001	5.494	68.350	121.384
17	18.275	33.390	0.084	0.001	5.924	66.285	122.292
18	18.975	31.847	0.084	0.002	5.489	69.298	121.298
19	19.198	31.894	0.079	0.002	5.198	65.282	123.398
20	18.372	30.826	0.064	0.002	4.928	68.847	124.329
21	17.937	29.833	0.084	0.000	4.728	69.284	122.198
22	17.249	29.389	0.068	0.000	4.829	70.028	125.384
23	18.275	28.389	0.074	0.000	5.289	69.298	126.389
24	18.847	30.384	0.084	0.000	5.524	68.372	123.198
25	17.948	31.874	0.074	0.000	5.298	66.284	124.295
26	17.238	29.385	0.072	0.002	5.049	64.982	122.918
27	17.472	29.187	0.069	0.000	4.903	62.396	120.350
28	18.147	31.384	0.072	0.000	4.987	63.281	123.193

Sample C3 @ pH 11.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	5.982	9.687	0.027	0.017	8.987	22.001	18.226
2	5.392	9.222	0.021	0.014	14.603	16.119	15.802
3	5.066	8.841	0.019	0.012	15.516	12.667	13.642
4	4.916	8.625	0.019	0.012	15.541	11.179	12.468
5	4.909	8.554	0.017	0.011	15.617	10.708	12.085
6	4.754	8.390	0.017	0.010	16.782	10.551	11.902
7	4.813	8.409	0.017	0.010	16.805	10.708	12.064
8	4.679	8.299	0.017	0.009	17.316	10.391	11.791
9	4.672	8.242	0.017	0.014	16.834	10.290	11.551
10	4.610	8.148	0.017	0.024	16.713	10.054	11.378
11	4.813	8.482	0.026	0.023	15.074	10.560	11.803
12	4.687	8.255	0.017	0.021	15.919	10.001	11.362
13	4.715	8.281	0.017	0.043	15.933	10.268	11.539
14	4.716	8.295	0.020	0.023	16.187	10.340	11.639
15	4.681	8.271	0.017	0.017	15.256	10.293	11.586
16	4.211	7.992	0.000	0.000	17.992	10.447	12.544
17	4.324	8.289	0.000	0.016	16.991	10.615	12.650
18	4.329	8.306	0.000	0.000	15.540	10.781	12.020
19	4.402	8.427	0.000	0.000	16.237	11.234	11.414
20	4.474	8.477	0.000	0.015	16.343	11.530	11.587
21	4.452	8.443	0.000	0.028	15.466	10.962	11.185
22	4.619	8.679	0.000	0.029	15.354	11.599	11.640
23	4.513	8.398	0.000	0.000	14.338	10.685	11.076
24	4.838	8.900	0.000	0.000	15.160	11.334	11.480
25	5.025	9.036	0.000	0.000	14.160	11.181	12.071
26	4.973	9.413	0.000	0.021	14.454	12.879	12.774
27	4.414	8.219	0.000	0.000	15.575	10.647	11.562
28	4.068	7.667	0.000	0.012	15.449	9.416	9.651

Sample C3 @ pH 12

Day	Si	Al	Fe	Mg	Ca	Na	K
1	6.585	12.288	0.043	0.001	12.499	19.423	28.366
2	5.978	11.327	0.034	0.001	14.289	12.716	21.285
3	5.307	10.800	0.033	0.001	14.739	9.382	17.314
4	5.295	11.557	0.032	0.001	15.684	9.047	16.873
5	5.102	12.464	0.030	0.001	15.664	9.442	17.591
6	4.870	12.702	0.031	0.001	15.230	9.669	17.979
7	4.926	13.739	0.030	0.001	15.594	10.563	19.476
8	4.745	15.466	0.030	0.001	14.983	12.482	22.265
9	4.408	15.677	0.032	0.011	14.254	15.170	26.219
10	4.514	18.191	0.029	0.012	14.147	18.061	30.414
11	4.730	20.757	0.030	0.027	14.887	20.312	34.696
12	4.407	20.323	0.027	0.023	14.526	20.205	34.162
13	4.485	20.784	0.025	0.018	14.669	20.825	34.892
14	4.541	21.203	0.024	0.012	14.385	20.982	35.388
15	4.581	21.340	0.023	0.021	14.309	21.018	35.664
16	4.294	21.895	0.000	0.000	14.614	21.443	36.802
17	4.096	21.776	0.000	0.000	14.917	19.442	35.254
18	4.210	21.584	0.000	0.042	13.881	21.161	35.652
19	4.182	21.962	0.000	0.000	13.303	19.433	35.239
20	4.361	22.935	0.000	0.005	13.244	22.059	37.121
21	4.401	22.453	0.000	0.000	13.859	19.833	36.000
22	5.082	23.961	0.000	0.000	11.889	22.094	36.965
23	4.931	21.887	0.000	0.000	11.392	20.028	35.195
24	4.885	20.878	0.000	0.000	12.814	19.468	33.836
25	4.914	21.125	0.000	0.000	12.352	18.660	33.520
26	4.976	20.778	0.000	0.000	11.657	16.999	32.383
27	5.591	21.958	0.000	0.000	11.250	19.272	35.127
28	6.263	22.071	0.000	0.000	11.466	20.425	35.671

Sample C3 @ pH 12.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	8.200	14.712	0.051	0.001	13.934	21.547	38.622
2	6.735	20.287	0.056	0.001	14.305	21.035	39.608
3	6.024	26.671	0.045	0.000	13.607	24.782	46.179
4	6.005	29.217	0.039	0.000	13.057	26.532	48.950
5	5.636	29.673	0.035	0.000	12.573	26.522	49.281
6	5.616	29.336	0.030	0.000	12.629	25.814	47.929
7	5.449	28.836	0.030	0.000	12.504	25.284	47.733
8	5.382	28.428	0.024	0.000	12.393	24.693	46.583
9	5.353	27.702	0.024	0.017	12.070	24.163	45.347
10	5.305	26.237	0.020	0.012	10.992	24.313	45.040
11	5.207	24.033	0.019	0.012	9.653	21.693	41.206
12	5.165	20.476	0.020	0.017	8.762	19.613	36.728
13	5.181	17.022	0.020	0.008	7.731	17.707	33.776
14	4.977	14.828	0.033	0.023	7.172	15.751	29.876
15	5.140	15.725	0.020	0.004	6.496	13.563	26.908
16	4.024	14.384	0.000	0.000	6.139	13.459	27.997
17	4.107	13.841	0.000	0.000	6.980	11.502	25.164
18	4.160	13.123	0.000	0.000	5.898	11.654	25.217
19	4.008	12.108	0.000	0.000	5.183	9.806	22.651
20	4.084	12.061	0.000	0.000	5.770	10.169	23.024
21	4.261	11.740	0.000	0.000	5.856	9.076	21.706
22	3.974	10.596	0.000	0.000	4.969	8.165	20.072
23	4.738	10.321	0.000	0.000	5.579	7.417	18.972
24	4.947	9.576	0.000	0.000	5.340	6.965	18.136
25	5.923	9.062	0.000	0.000	4.421	6.498	17.229
26	5.349	8.693	0.000	0.000	3.694	5.975	16.436
27	5.244	9.568	0.000	0.000	3.716	6.558	17.507
28	5.311	10.039	0.000	0.000	3.228	6.603	17.864



Sample C4 @ pH 11.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	4.540	8.437	0.010	0.009	6.783	7.484	11.378
2	3.300	8.679	0.018	0.007	8.287	9.290	14.187
3	3.000	9.187	0.009	0.005	13.385	12.897	18.329
4	2.000	9.676	0.006	0.008	9.387	10.872	13.328
5	1.686	9.176	0.005	0.010	10.873	8.328	10.237
6	1.465	8.587	0.005	0.008	10.346	6.276	10.975
7	1.537	8.373	0.004	0.005	9.876	6.735	10.278
8	1.195	7.972	0.004	0.006	9.484	5.935	11.327
9	1.577	7.577	0.006	0.004	8.946	5.573	11.365
10	1.786	7.673	0.006	0.004	9.287	5.751	11.764
11	1.451	7.474	0.004	0.003	9.587	5.428	11.935
12	1.143	7.483	0.004	0.002	9.763	5.425	11.635
13	1.311	7.387	0.002	0.002	9.836	5.592	11.584
14	1.252	7.172	0.002	0.000	9.786	5.687	11.487
15	1.500	6.827	0.003	0.000	9.936	5.863	11.473
16	1.411	6.972	0.002	0.000	9.644	5.565	11.179
17	1.400	7.037	0.000	0.000	9.487	5.714	11.037
18	1.048	7.387	0.000	0.002	9.836	5.472	11.287
19	1.122	7.187	0.000	0.000	9.904	5.824	10.937
20	1.116	7.173	0.000	0.000	10.237	6.062	10.874
21	1.295	7.094	0.000	0.000	10.214	6.387	10.917
22	1.294	6.927	0.003	0.000	10.017	6.188	10.763
23	1.498	6.879	0.004	0.005	9.973	6.038	10.763
24	1.576	6.924	0.008	0.003	9.933	5.836	10.640
25	1.734	7.183	0.001	0.002	9.656	5.576	10.373
26	1.832	7.136	0.005	0.003	9.564	5.739	9.973
27	1.677	7.283	0.000	0.002	9.687	5.753	10.287
28	1.286	7.035	0.000	0.002	9.725	5.676	9.837

Sample C4 @ pH 12

Day	Si	Al	Fe	Mg	Ca	Na	K
1	4.287	11.398	0.018	0.020	4.587	28.348	33.387
2	5.144	11.689	0.028	0.019	6.035	24.279	31.894
3	5.527	12.178	0.018	0.019	11.032	23.207	27.325
4	3.429	12.687	0.017	0.014	7.165	21.580	26.471
5	3.187	12.183	0.009	0.013	8.678	19.582	25.472
6	2.826	11.538	0.009	0.011	8.117	18.511	26.209
7	2.924	11.389	0.008	0.010	7.673	18.970	25.513
8	2.609	10.982	0.008	0.018	7.248	18.169	26.562
9	2.971	10.583	0.015	0.013	6.733	17.807	26.836
10	3.295	10.684	0.011	0.008	7.033	17.986	27.428
11	2.835	10.487	0.008	0.007	7.373	17.662	27.846
12	2.521	10.838	0.008	0.006	7.584	17.659	26.870
13	2.752	10.279	0.007	0.007	7.673	17.827	26.818
14	2.684	10.189	0.006	0.004	7.858	18.019	26.722
15	2.924	9.772	0.007	0.004	7.779	18.376	26.707
16	2.826	9.974	0.007	0.003	7.478	18.287	26.413
17	2.430	9.864	0.004	0.004	7.377	18.027	26.272
18	2.198	10.399	0.002	0.002	7.672	17.707	26.191
19	1.763	10.179	0.004	0.002	7.587	18.058	25.937
20	1.872	10.288	0.003	0.000	7.988	18.297	25.429
21	1.973	10.033	0.001	0.000	8.019	18.622	25.376
22	1.698	9.895	0.002	0.000	7.888	18.422	24.148
23	1.948	9.814	0.002	0.000	7.678	18.272	24.038
24	2.173	9.856	0.000	0.001	7.587	17.864	23.893
25	2.587	10.199	0.000	0.000	7.387	17.583	23.865
26	3.238	10.057	0.000	0.000	7.375	17.483	24.018
27	3.035	10.388	0.002	0.003	7.487	17.630	24.187
28	2.377	9.944	0.000	0.001	7.422	17.911	23.895

Sample C4 @ pH 12.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	5.961	23.744	0.021	0.022	11.237	38.594	44.767
2	7.817	24.035	0.031	0.021	8.289	33.406	51.018
3	6.766	24.524	0.021	0.020	9.125	32.334	45.449
4	6.295	25.033	0.021	0.016	8.149	30.708	41.819
5	7.287	24.529	0.013	0.014	7.174	26.607	35.610
6	5.326	20.884	0.013	0.013	6.781	25.536	36.348
7	4.162	18.625	0.012	0.011	5.497	25.994	32.801
8	3.847	17.311	0.011	0.020	5.072	24.395	33.850
9	4.209	15.911	0.018	0.014	4.556	25.387	34.124
10	3.295	16.011	0.014	0.011	4.857	25.972	31.667
11	3.508	15.875	0.013	0.010	5.197	25.349	32.086
12	3.194	16.225	0.013	0.009	5.408	25.766	30.059
13	3.401	15.666	0.012	0.009	4.897	25.198	30.008
14	3.333	14.328	0.011	0.007	5.081	24.973	31.894
15	3.573	15.328	0.012	0.007	5.003	24.779	33.390
16	3.475	14.872	0.008	0.004	4.702	24.480	32.385
17	2.580	14.580	0.005	0.005	4.600	24.974	31.239
18	2.348	14.948	0.003	0.003	4.896	24.875	30.239
19	1.913	15.183	0.006	0.003	5.439	25.082	31.239
20	2.022	15.348	0.005	0.002	5.660	25.149	31.973
21	1.736	15.598	0.003	0.001	5.691	25.249	31.483
22	1.461	15.295	0.003	0.000	5.560	25.185	32.275
23	1.710	14.893	0.003	0.000	5.350	25.498	32.726
24	1.936	14.787	0.001	0.002	5.396	25.398	32.188
25	2.350	14.398	0.000	0.001	5.197	25.150	31.824
26	3.912	14.149	0.000	0.001	5.184	25.638	31.975
27	3.708	13.983	0.001	0.000	5.296	25.828	30.483
28	3.050	13.825	0.002	0.000	5.231	25.583	30.982

Sample C5 @ pH 11.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	20.462	14.365	0.124	0.024	1.284	44.456	59.353
2	21.988	15.315	0.201	0.077	2.322	68.252	72.566
3	20.528	14.179	0.243	0.093	2.528	77.846	98.538
4	17.572	13.176	0.281	0.107	1.799	57.141	67.256
5	14.544	12.475	0.262	0.121	1.865	31.329	55.241
6	14.121	11.574	0.209	0.124	1.806	25.325	41.387
7	14.180	10.946	0.159	0.092	2.153	21.847	37.398
8	15.130	10.883	0.199	0.081	1.856	23.328	35.387
9	13.871	11.378	0.150	0.050	2.008	27.370	33.239
10	14.718	10.717	0.151	0.065	1.961	20.327	35.240
11	13.711	11.254	0.200	0.056	1.956	19.238	34.328
12	13.505	10.657	0.187	0.076	1.822	19.675	31.872
13	13.666	11.576	0.174	0.064	1.966	17.239	33.389
14	13.886	11.935	0.194	0.053	1.767	18.328	32.374
15	13.231	10.411	0.191	0.062	1.781	19.389	29.328
16	13.080	10.846	0.141	0.053	1.701	19.888	30.179
17	14.437	10.060	0.139	0.042	1.681	21.562	33.328
18	13.489	9.996	0.164	0.043	1.561	20.938	32.382
19	14.447	10.003	0.286	0.055	1.972	21.463	34.326
20	15.019	9.962	0.207	0.059	1.906	26.347	31.330
21	15.818	10.263	0.266	0.052	1.861	24.325	33.238
22	12.892	12.474	0.225	0.049	1.805	23.325	32.329
23	13.255	11.258	0.216	0.067	1.416	23.328	35.439
24	13.041	10.485	0.176	0.061	1.352	22.329	36.487
25	12.567	10.807	0.160	0.063	1.345	20.973	34.329
26	12.927	10.717	0.154	0.042	1.396	21.568	31.349
27	14.162	10.622	0.178	0.053	1.297	19.762	30.924
28	13.898	10.281	0.178	0.063	1.450	20.329	32.350

Sample C5 @ pH 12

Day	Si	Al	Fe	Mg	Ca	Na	K
1	31.439	27.785	0.133	0.030	1.471	108.707	123.802
2	35.907	33.375	0.210	0.084	2.510	80.483	86.821
3	32.504	28.513	0.252	0.100	2.716	65.759	72.162
4	29.549	25.514	0.272	0.113	1.920	58.510	66.932
5	26.520	23.424	0.252	0.127	1.986	53.045	62.489
6	26.098	22.405	0.218	0.130	1.927	44.541	58.593
7	26.157	22.313	0.169	0.099	2.165	43.902	53.838
8	23.889	23.533	0.185	0.058	1.868	42.938	55.278
9	23.883	24.328	0.159	0.057	1.984	43.308	53.589
10	23.738	24.137	0.161	0.072	1.937	42.308	55.637
11	23.723	23.937	0.209	0.063	1.903	39.740	50.802
12	23.517	24.514	0.184	0.082	1.769	38.796	48.271
13	23.678	24.460	0.168	0.074	1.913	40.610	49.223
14	23.898	24.031	0.204	0.063	1.714	42.896	47.168
15	23.242	23.831	0.201	0.062	1.728	41.426	46.171
16	23.091	23.542	0.151	0.060	1.648	38.800	47.162
17	23.003	23.480	0.148	0.049	1.657	39.525	49.112
18	23.500	23.122	0.173	0.050	1.574	39.802	50.537
19	22.473	23.423	0.259	0.061	1.985	39.540	51.537
20	22.427	23.382	0.216	0.060	1.919	34.637	50.588
21	22.143	23.683	0.178	0.063	1.982	33.437	51.588
22	21.768	23.693	0.234	0.060	1.926	34.650	50.526
23	22.132	23.820	0.225	0.074	1.537	34.701	50.526
24	21.918	23.904	0.185	0.068	1.473	33.591	51.697
25	21.443	24.227	0.169	0.061	1.466	33.125	50.644
26	21.803	24.137	0.184	0.049	1.583	32.706	51.589
27	23.038	23.818	0.188	0.053	1.484	35.492	49.290
28	22.774	23.612	0.195	0.057	1.637	33.902	48.348

Sample C5 @ pH 12.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	75.811	50.168	0.164	0.035	2.659	117.471	201.239
2	73.290	58.150	0.184	0.089	3.698	99.417	189.385
3	67.741	54.737	0.347	0.104	3.904	95.211	168.393
4	65.814	48.632	0.394	0.118	2.782	95.511	173.892
5	63.904	46.189	0.274	0.132	2.848	91.530	164.380
6	59.480	45.133	0.242	0.135	2.790	87.475	162.329
7	59.539	43.130	0.264	0.103	2.545	83.475	153.838
8	57.271	43.849	0.238	0.063	2.248	88.474	142.180
9	57.265	46.177	0.215	0.061	2.364	79.619	133.179
10	57.120	47.189	0.213	0.076	1.994	85.475	121.325
11	56.017	46.989	0.261	0.068	1.959	82.524	115.398
12	55.810	46.628	0.236	0.087	1.825	79.484	98.325
13	55.971	46.292	0.220	0.079	1.970	82.621	87.839
14	56.191	47.089	0.256	0.068	1.770	77.526	92.189
15	55.536	46.133	0.253	0.066	1.784	74.475	91.347
16	54.471	45.952	0.203	0.064	1.704	71.561	88.399
17	54.382	46.677	0.200	0.053	1.713	76.084	83.238
18	54.880	45.042	0.219	0.055	1.953	77.565	86.328
19	53.852	43.094	0.197	0.066	2.365	77.074	91.237
20	53.807	42.103	0.200	0.064	2.298	80.521	90.329
21	53.522	43.099	0.204	0.068	2.362	82.624	89.283
22	53.148	44.099	0.217	0.065	2.074	77.526	85.240
23	53.511	46.044	0.239	0.078	1.685	74.584	90.237
24	53.907	45.677	0.218	0.072	1.621	78.520	94.327
25	53.433	47.642	0.192	0.066	1.614	71.585	92.383
26	53.793	48.593	0.204	0.054	1.732	65.565	91.825
27	55.027	46.283	0.218	0.058	1.632	67.585	90.240
28	54.764	45.553	0.229	0.062	1.785	71.675	89.237

Sample F1 @ pH 11.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	6.273	10.410	0.083	0.026	2.385	8.925	8.240
2	6.095	10.154	0.079	0.020	2.712	6.930	7.463
3	5.953	9.941	0.075	0.016	2.939	5.927	6.891
4	5.994	10.150	0.068	0.017	2.950	5.573	6.662
5	6.064	10.132	0.072	0.016	3.013	5.445	6.565
6	6.163	10.380	0.073	0.014	2.716	5.479	6.595
7	6.322	10.682	0.072	0.014	2.521	5.848	6.876
8	6.560	11.129	0.073	0.014	2.351	6.196	7.175
9	6.376	10.826	0.075	0.045	2.567	6.792	7.006
10	6.530	11.029	0.075	0.031	2.376	6.362	7.127
11	6.656	11.270	0.074	0.025	2.359	6.277	7.274
12	6.454	10.969	0.084	0.029	2.517	5.972	7.004
13	6.675	11.293	0.088	0.040	2.484	6.261	7.322
14	6.606	11.179	0.071	0.028	2.315	6.060	7.221
15	6.433	10.920	0.073	0.028	2.323	5.885	7.021
16	5.721	10.631	0.000	0.001	1.804	5.906	6.242
17	5.946	11.168	0.000	0.011	2.037	5.925	6.240
18	6.177	11.259	0.000	0.034	2.071	5.619	6.484
19	5.979	11.218	0.000	0.000	2.451	5.884	6.268
20	5.903	10.996	0.000	0.015	2.579	5.962	6.351
21	5.653	10.486	0.000	0.000	2.399	5.558	5.894
22	5.771	10.643	0.000	0.136	2.349	5.911	6.131
23	5.480	10.965	0.004	0.067	2.364	5.133	5.623
24	5.148	10.288	0.000	0.019	2.123	5.564	5.200
25	5.157	10.323	0.000	0.013	2.031	4.942	5.059
26	5.141	10.180	0.000	0.006	2.024	4.764	5.018
27	5.769	10.424	0.000	0.018	1.595	5.626	5.509
28	5.936	10.782	0.000	0.016	1.724	5.617	5.752

Sample F1 @ pH 12

Day	Si	Al	Fe	Mg	Ca	Na	K
1	12.190	17.130	0.155	0.001	2.972	13.806	23.056
2	13.478	19.073	0.182	0.001	2.590	14.691	25.429
3	13.565	19.271	0.207	0.001	2.135	13.750	24.524
4	13.995	19.035	0.208	0.001	2.269	13.193	23.198
5	13.105	17.574	0.209	0.001	2.214	11.985	21.309
6	12.575	16.660	0.211	0.001	2.372	11.121	20.006
7	12.010	15.855	0.207	0.001	2.439	10.491	19.007
8	11.473	15.495	0.211	0.000	2.457	10.008	18.546
9	11.362	15.017	0.208	0.022	2.704	10.195	18.294
10	11.448	14.992	0.198	0.016	2.720	10.102	18.094
11	11.500	14.901	0.193	0.017	2.822	10.203	18.129
12	11.036	14.552	0.202	0.028	2.912	10.038	17.844
13	11.483	14.947	0.193	0.032	3.082	10.433	18.342
14	11.341	14.875	0.191	0.016	2.899	10.401	18.183
15	11.596	15.077	0.190	0.008	2.862	10.637	18.561
16	10.414	14.551	0.059	0.000	2.022	10.826	18.661
17	10.646	14.810	0.061	0.000	2.122	10.882	18.779
18	10.776	15.053	0.052	0.000	1.881	10.265	18.276
19	10.964	14.714	0.055	0.000	1.860	10.619	18.059
20	11.441	15.543	0.052	0.000	2.055	11.284	18.898
21	11.244	15.281	0.051	0.000	2.074	11.177	18.781
22	11.621	15.761	0.046	0.000	2.263	11.957	19.546
23	11.553	15.517	0.049	0.000	2.118	11.460	18.893
24	11.354	15.338	0.051	0.000	2.173	10.776	19.085
25	11.729	15.806	0.051	0.044	2.600	11.185	18.800
26	11.902	16.220	0.074	0.055	2.676	10.802	19.218
27	12.471	16.501	0.046	0.000	2.507	11.619	19.481
28	12.167	16.935	0.044	0.000	2.436	11.995	19.407

Sample F1 @ pH 12.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	17.360	22.238	0.247	0.001	3.191	18.069	33.538
2	22.411	28.412	0.289	0.001	2.495	20.987	38.400
3	21.123	27.017	0.327	0.001	2.072	20.213	36.322
4	18.367	22.854	0.335	0.000	2.229	16.219	30.662
5	17.560	21.221	0.311	0.001	2.503	14.902	28.669
6	16.730	19.569	0.314	0.000	2.758	13.678	26.804
7	16.396	19.201	0.292	0.000	2.771	13.464	26.355
8	15.251	18.043	0.309	0.001	2.903	12.633	25.193
9	15.511	18.221	0.298	0.012	3.054	13.038	25.597
10	14.779	17.329	0.293	0.018	3.123	12.412	24.597
11	14.232	16.665	0.295	0.022	3.355	12.145	23.976
12	14.061	15.789	0.297	0.021	3.386	11.466	22.874
13	13.990	15.880	0.289	0.009	3.215	11.723	23.323
14	13.814	15.736	0.284	0.015	2.844	11.569	22.902
15	13.221	15.149	0.278	0.002	3.244	11.222	22.184
16	12.856	14.355	0.141	0.000	2.769	11.342	22.596
17	12.445	13.572	0.152	0.000	2.860	10.459	21.239
18	13.122	14.674	0.141	0.000	2.768	11.593	23.044
19	13.382	14.616	0.146	0.000	2.663	12.230	23.678
20	13.556	15.420	0.152	0.000	2.944	11.653	23.471
21	13.766	15.445	0.152	0.000	2.849	11.724	23.498
22	14.155	16.165	0.145	0.042	3.441	12.559	24.501
23	14.374	15.472	0.152	0.037	3.282	12.377	23.904
24	14.680	16.475	0.155	0.000	3.184	12.097	24.510
25	14.419	16.129	0.148	0.000	3.174	11.520	24.035
26	14.095	16.212	0.160	0.000	2.906	11.731	23.379
27	14.810	17.515	0.157	0.000	3.073	13.223	24.997
28	15.556	18.350	0.194	0.000	2.805	13.621	25.557

Sample F2 @ pH 11.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	7.115	9.835	0.076	0.028	4.390	7.474	6.925
2	7.632	11.389	0.067	0.019	5.187	6.249	7.836
3	7.217	10.390	0.058	0.018	5.585	8.328	8.573
4	6.881	9.388	0.058	0.016	4.989	5.329	7.479
5	6.855	9.282	0.068	0.014	5.018	4.378	5.328
6	6.927	9.387	0.053	0.015	4.973	3.780	4.298
7	7.026	9.589	0.059	0.012	4.707	3.979	4.456
8	7.077	9.794	0.062	0.010	4.686	4.155	4.606
9	6.840	10.328	0.063	0.008	4.587	4.592	4.516
10	7.051	10.194	0.065	0.004	4.688	4.430	4.726
11	7.051	9.892	0.067	0.007	4.821	4.286	4.653
12	6.742	9.653	0.073	0.005	4.933	3.968	4.434
13	7.227	9.387	0.069	0.002	4.754	4.309	4.538
14	7.140	9.573	0.067	0.003	4.604	4.103	4.673
15	7.043	9.682	0.064	0.001	4.588	4.294	4.528
16	6.637	9.482	0.052	0.004	3.933	4.047	4.299
17	6.811	9.274	0.047	0.003	4.109	4.122	4.328
18	7.043	9.185	0.018	0.002	3.964	3.829	4.298
19	6.892	9.148	0.038	0.002	4.119	3.972	4.424
20	6.841	9.287	0.029	0.001	3.998	4.093	4.253
21	6.751	9.083	0.017	0.001	3.781	3.865	4.015
22	6.851	9.185	0.015	0.000	3.807	3.985	4.180
23	6.642	8.933	0.010	0.000	3.781	3.565	3.857
24	6.752	8.725	0.007	0.000	3.667	3.756	3.604
25	6.386	9.387	0.005	0.002	3.565	3.466	3.559
26	6.291	9.288	0.002	0.004	3.499	3.376	3.863
27	6.118	9.071	0.002	0.000	3.641	3.629	3.764
28	6.216	8.872	0.002	0.000	3.960	3.874	3.963

Sample F2 @ pH 12

Day	Si	Al	Fe	Mg	Ca	Na	K
1	13.443	13.949	0.143	0.002	3.875	10.235	9.374
2	16.148	16.378	0.159	0.001	3.974	14.897	16.329
3	16.552	16.329	0.176	0.001	4.113	12.325	15.325
4	15.550	14.284	0.186	0.001	4.163	10.235	13.007
5	13.551	11.239	0.183	0.001	4.937	9.330	11.981
6	12.750	10.383	0.174	0.002	5.763	10.049	11.837
7	10.750	10.948	0.163	0.001	6.482	9.635	10.690
8	10.750	10.898	0.173	0.002	6.372	9.479	10.348
9	10.552	11.237	0.166	0.000	5.488	8.779	10.187
10	11.298	11.483	0.154	0.000	4.763	7.676	9.325
11	11.560	11.285	0.138	0.000	4.664	6.827	9.874
12	11.431	12.897	0.118	0.002	4.482	6.480	9.365
13	11.573	12.129	0.088	0.003	4.188	6.724	9.187
14	11.415	11.833	0.098	0.002	4.879	6.935	8.876
15	11.282	11.691	0.118	0.002	4.978	7.024	8.932
16	10.817	11.387	0.108	0.002	4.632	7.149	9.023
17	11.008	11.484	0.082	0.001	4.438	7.388	9.149
18	11.096	11.173	0.075	0.000	4.382	6.872	8.774
19	10.947	11.287	0.058	0.000	4.669	6.163	8.932
20	10.853	10.866	0.041	0.000	4.863	6.387	9.387
21	10.750	10.929	0.041	0.000	4.589	6.287	9.588
22	10.950	11.300	0.038	0.000	4.653	5.937	9.247
23	10.750	11.000	0.040	0.002	4.394	5.683	9.428
24	10.551	11.011	0.042	0.004	4.598	5.387	9.149
25	10.301	11.304	0.043	0.004	4.741	5.583	9.032
26	10.138	11.460	0.057	0.003	4.828	5.788	8.994
27	10.207	11.722	0.046	0.002	4.424	5.678	8.833
28	10.512	11.838	0.034	0.002	4.282	5.824	9.017

Sample F2 @ pH 12.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	18.219	19.385	0.220	0.002	5.690	17.735	31.325
2	20.736	21.328	0.209	0.001	5.190	15.343	26.325
3	23.325	17.138	0.219	0.001	4.865	14.329	19.347
4	19.817	15.389	0.194	0.002	4.380	11.328	16.385
5	16.963	13.218	0.187	0.001	4.286	9.348	14.249
6	15.328	12.974	0.205	0.002	4.428	8.437	14.923
7	16.287	12.648	0.195	0.001	4.695	8.847	13.290
8	16.587	11.939	0.187	0.001	4.221	8.572	13.347
9	16.204	12.263	0.205	0.001	4.217	8.676	13.937
10	15.973	12.735	0.210	0.001	4.197	8.949	14.097
11	15.763	12.392	0.218	0.001	4.290	9.033	14.675
12	15.674	12.048	0.197	0.000	4.023	9.149	14.375
13	15.471	11.975	0.219	0.000	4.108	9.149	14.280
14	15.384	11.859	0.228	0.000	3.994	8.975	14.033
15	15.149	11.487	0.209	0.000	4.175	8.775	13.948
16	14.873	11.874	0.218	0.000	3.924	8.573	13.393
17	14.973	11.933	0.197	0.001	4.102	8.742	12.619
18	14.637	12.187	0.163	0.002	4.387	8.376	13.568
19	14.837	11.872	0.118	0.002	4.289	8.529	13.672
20	15.185	11.763	0.096	0.001	4.429	8.187	13.706
21	15.285	12.125	0.103	0.002	4.298	8.483	13.875
22	15.580	12.483	0.108	0.002	4.384	8.767	14.559
23	15.313	12.848	0.115	0.019	4.100	8.338	14.133
24	15.183	13.174	0.110	0.001	4.100	8.089	14.362
25	15.018	12.933	0.098	0.000	4.121	7.973	14.016
26	14.973	12.773	0.103	0.000	3.933	7.893	13.176
27	14.833	12.679	0.093	0.000	3.833	8.147	14.722
28	14.673	12.837	0.100	0.001	4.025	8.218	14.479

Sample F3 @ pH 11.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	4.869	8.186	0.060	0.026	6.105	2.448	2.325
2	5.375	8.979	0.053	0.024	7.387	2.760	2.646
3	5.236	8.932	0.053	0.021	7.507	2.408	2.361
4	5.058	8.606	0.054	0.020	6.832	2.210	2.170
5	4.940	8.392	0.055	0.019	6.661	2.131	2.071
6	4.969	8.244	0.055	0.017	6.844	2.081	2.001
7	4.986	8.432	0.051	0.016	6.893	2.109	2.036
8	4.998	8.464	0.052	0.015	7.021	2.114	2.036
9	4.735	8.180	0.053	0.041	6.829	2.216	2.027
10	4.905	8.160	0.062	0.044	6.999	2.256	2.038
11	4.909	8.204	0.054	0.059	7.284	2.296	2.032
12	4.452	7.547	0.063	0.028	6.375	1.964	1.865
13	4.877	8.205	0.052	0.053	7.124	2.276	2.042
14	4.883	8.201	0.052	0.026	6.894	2.146	2.002
15	5.002	8.386	0.054	0.026	6.853	2.295	2.036
16	4.900	7.838	0.000	0.044	5.733	2.188	2.054
17	5.222	7.954	0.000	0.000	5.890	2.320	2.087
18	5.273	7.492	0.000	0.005	5.858	2.039	2.173
19	5.321	7.556	0.000	0.000	5.761	2.125	2.156
20	5.404	7.806	0.000	0.000	5.417	2.223	2.154
21	5.431	7.837	0.000	0.002	5.163	2.306	2.136
22	5.586	8.000	0.000	0.023	5.265	2.060	2.229
23	5.228	8.184	0.000	0.021	5.435	1.997	2.090
24	5.126	8.062	0.000	0.072	4.834	1.948	2.008
25	5.239	8.217	0.000	0.063	5.099	1.990	2.059
26	5.693	8.123	0.000	0.018	4.974	1.988	2.155
27	5.822	8.298	0.000	0.033	5.687	2.119	2.303
28	5.530	7.983	0.000	0.000	6.197	2.261	2.112

Sample F3 @ pH 12

Day	Si	Al	Fe	Mg	Ca	Na	K
1	7.970	10.767	0.130	0.002	5.732	2.648	4.683
2	7.158	9.455	0.133	0.001	6.141	2.258	3.984
3	6.115	7.900	0.149	0.001	6.092	1.840	3.261
4	5.471	6.995	0.163	0.001	6.058	1.602	2.816
5	5.210	6.631	0.158	0.001	6.133	1.514	2.654
6	5.267	6.567	0.162	0.001	6.435	1.516	2.427
7	5.125	6.479	0.153	0.001	6.527	1.589	2.372
8	5.045	6.300	0.159	0.000	6.363	1.488	2.336
9	5.089	6.415	0.146	0.002	6.548	1.586	2.354
10	4.853	6.283	0.139	0.003	6.691	1.548	2.280
11	4.894	6.127	0.144	0.018	6.759	1.576	2.220
12	5.101	6.335	0.147	0.034	7.134	1.728	2.339
13	4.936	6.202	0.139	0.016	7.101	1.785	2.364
14	4.764	6.098	0.135	0.016	7.181	1.743	2.350
15	4.847	6.063	0.130	0.003	7.094	1.641	2.311
16	4.494	5.779	0.027	0.000	6.999	1.782	2.120
17	4.644	6.041	0.033	0.000	7.130	1.769	2.260
18	4.689	6.275	0.030	0.000	7.139	1.587	2.310
19	4.804	6.478	0.029	0.000	7.478	1.706	2.473
20	4.609	6.188	0.030	0.000	7.163	1.550	2.289
21	4.906	6.577	0.032	0.000	7.104	1.785	2.446
22	5.039	6.838	0.029	0.000	7.043	1.884	2.662
23	4.816	6.483	0.031	0.000	7.030	1.800	2.475
24	4.953	6.684	0.033	0.000	7.199	1.852	2.408
25	5.061	6.803	0.038	0.000	6.882	1.604	2.418
26	4.895	6.699	0.035	0.000	6.981	1.739	2.419
27	5.150	6.942	0.051	0.000	6.992	1.819	2.524
28	5.033	6.741	0.024	0.000	6.996	1.668	2.394

Sample F3 @ pH 12.5

Day	Si	Al	Fe	Mg	Ca	Na	K
1	8.437	10.443	0.165	0.001	6.441	2.850	5.136
2	7.909	9.506	0.173	0.001	6.510	2.544	4.441
3	6.426	7.259	0.169	0.000	6.632	1.936	3.321
4	6.564	7.028	0.180	0.000	6.531	1.796	3.159
5	6.365	6.805	0.173	0.001	6.270	1.740	2.984
6	6.506	6.743	0.175	0.000	6.274	1.778	3.043
7	6.480	6.921	0.161	0.000	6.618	1.863	3.160
8	5.894	8.430	0.198	0.000	5.539	1.413	3.709
9	6.215	8.748	0.197	0.028	5.618	1.531	3.847
10	6.079	8.444	0.200	0.012	5.316	1.371	3.597
11	6.599	9.145	0.199	0.017	5.473	1.525	3.913
12	6.794	9.386	0.209	0.017	5.170	1.592	4.044
13	6.952	9.736	0.211	0.013	5.001	1.660	4.240
14	7.117	9.715	0.201	0.008	5.144	1.618	4.112
15	7.383	10.213	0.206	0.006	5.106	1.742	4.330
16	6.716	10.563	0.060	0.000	5.382	1.197	4.190
17	6.587	10.053	0.052	0.000	5.343	1.302	3.999
18	6.547	10.014	0.047	0.000	5.433	1.235	4.091
19	6.684	10.246	0.049	0.000	5.438	1.432	4.183
20	6.288	10.400	0.041	0.000	5.915	1.273	3.942
21	6.940	10.755	0.053	0.000	5.387	1.523	4.177
22	7.006	10.603	0.071	0.000	4.709	1.651	4.524
23	7.066	10.841	0.072	0.000	4.918	1.578	4.363
24	7.305	10.518	0.049	0.000	5.016	1.461	4.213
25	7.179	10.340	0.047	0.000	5.068	1.497	3.998
26	7.110	10.169	0.047	0.000	5.445	1.351	4.207
27	7.277	10.526	0.066	0.000	5.512	1.597	4.446
28	7.200	10.237	0.059	0.000	5.244	1.614	4.368

## APPENDIX B

### Example for calculation the dissolution rate of released element from SPFT test

Sample F1 @ pH 12.5, 1<sup>st</sup> day;

Concentration of SiO <sub>2</sub> (C <sub>i</sub> )	= 17.36 mg/l
	= 0.01736 g/l (from Appendix A)
Concentration of blank at pH 12.5 ( $\bar{C}_{i,b}$ )	= 0.79 mg/l
	= 0.00079 g/l (from Appendix A)
Flow rate (q)	= 20 ml/day = 0.02 l/day
Mass fraction of Si present in glass (f)	= 0.3973 (from the XRF result)
Surface area of sample F1 (S)	= 0.632 m <sup>2</sup> /g
Dissolution rate(g.m <sup>-2</sup> .d <sup>-1</sup> )	= (C <sub>i</sub> - $\bar{C}_{i,b}$ )q / (f <sub>i</sub> S)
	= $\frac{[(0.01736 - 0.00079) \times 0.02]}{(0.3973 \times 0.632)}$
	= 0.0013198 g.m <sup>-2</sup> .d <sup>-1</sup>

## APPENDIX C

MINEQL+ Ver 4.5  
 Data Extracted from : C4@11.5\_d1.MDO  
 SINGLE RUN SUMMARY

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This report compiles the output data (concentration, Log C, Log K) for all species within a single run.

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MINEQL+ Ver 4.5  
 Data Extracted from : C4@11.5\_d1.MDO  
 Run: 1

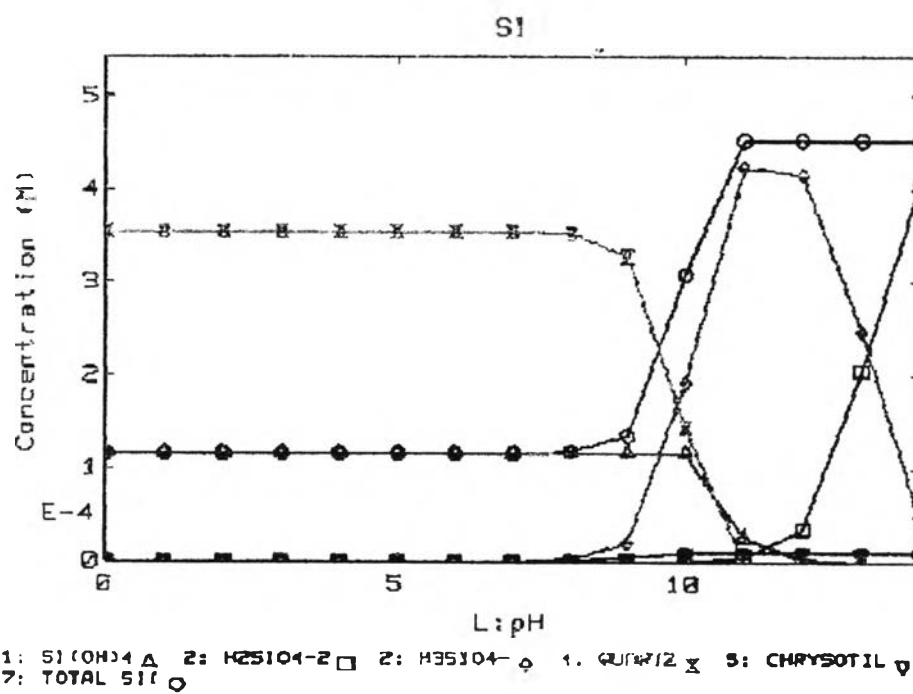
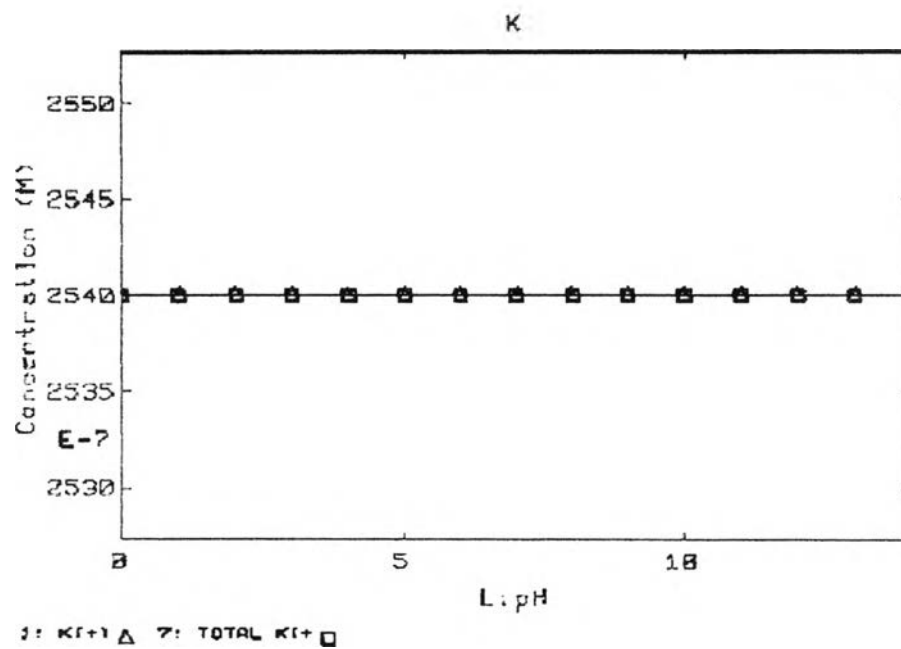
ID	Species	Conc.	Log C	Log K
Type I - COMPONENTS				
2	H2O	1.000E+00	0.000	0.000
3	H(+)	3.160E-12	-11.500	0.000
8	Al(3+)	1.190E-28	-27.925	0.000
16	Ca(2+)	2.080E-04	-3.682	0.000
19	Cl(-)	5.300E-03	-2.276	0.000
33	Fe(3+)	3.850E-43	-42.415	0.000
38	K(+)	2.500E-04	-3.602	0.000
40	Li(+)	1.450E-02	-1.839	0.000
41	Mg(2+)	3.930E-09	-8.405	0.000
45	Na(+)	2.340E-04	-3.630	0.000
64	Si(OH)4	8.400E-07	-6.076	0.000

## Type II - COMPLEXES

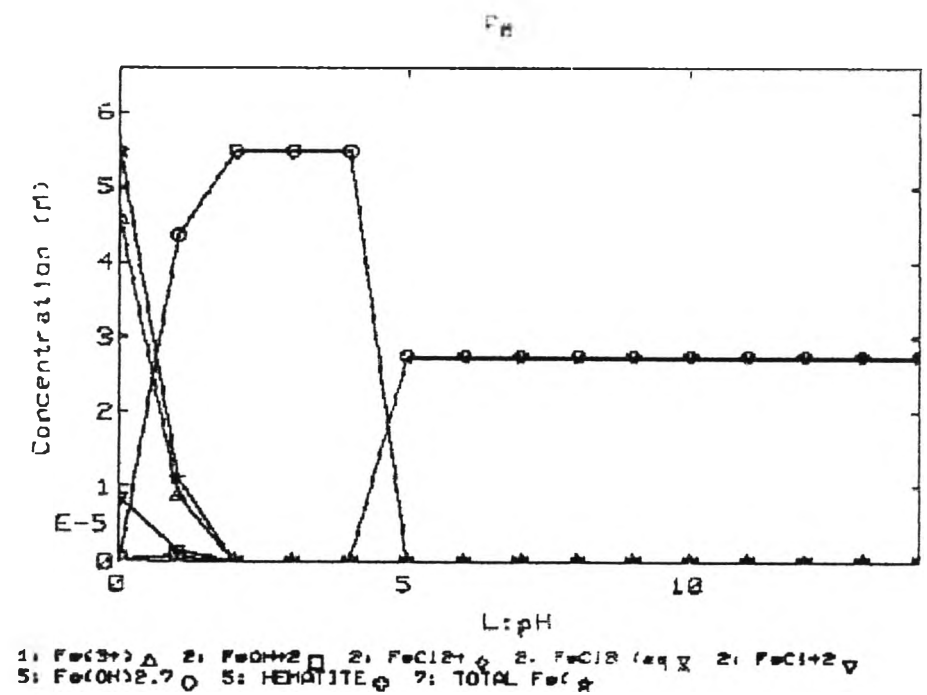
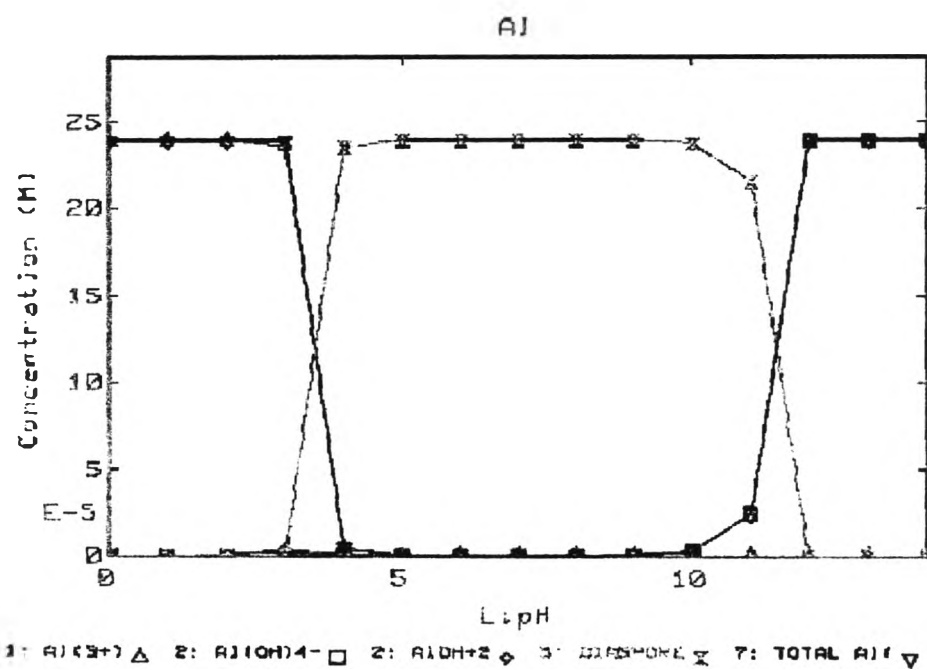
3800	OH-	(-1)	4.620E-03	-2.336	-13.840
4300	Al(OH)2+	(+1)	9.580E-16	-15.019	-10.090
4400	Al(OH)3 (aq)		6.080E-11	-10.216	-16.790
4500	Al(OH)4-	(-1)	7.720E-05	-4.112	-22.190
4600	AlOH+2	(+2)	5.200E-22	-21.284	-4.860
7300	CaOH+	(+1)	2.030E-05	-4.693	-12.510
14300	FeOH+2	(+2)	1.040E-33	-32.981	-2.070
14400	Fe(OH)2+	(+1)	9.800E-25	-24.009	-4.590
14500	Fe2(OH)2+4	(+4)	3.040E-65	-64.517	-2.690
14600	Fe(OH)3 (aq)		6.680E-21	-20.175	-12.260
14700	Fe(OH)4-	(-1)	9.930E-19	-18.003	-21.590
14800	Fe3(OH)4+5	(+5)	1.000E-75	-75.000	-6.100
17800	LiOH		1.060E-04	-3.976	-13.640
17900	MgOH+	(+1)	7.830E-09	-8.106	-11.200
43500	H2SiO4-2	(-2)	1.150E-06	-5.939	-22.860
43600	H3SiO4-	(-1)	4.390E-05	-4.358	-9.780
89700	FeCl2+	(+1)	1.460E-45	-44.836	2.130
89800	FeCl3 (aq)		7.730E-49	-48.112	1.130
89900	FeCl+2	(+2)	7.170E-44	-43.144	1.550

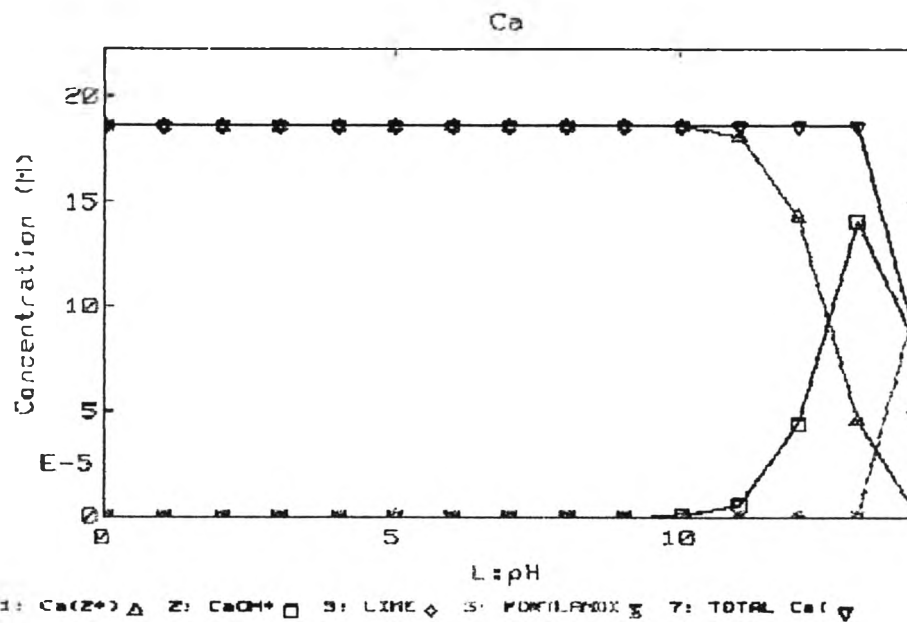
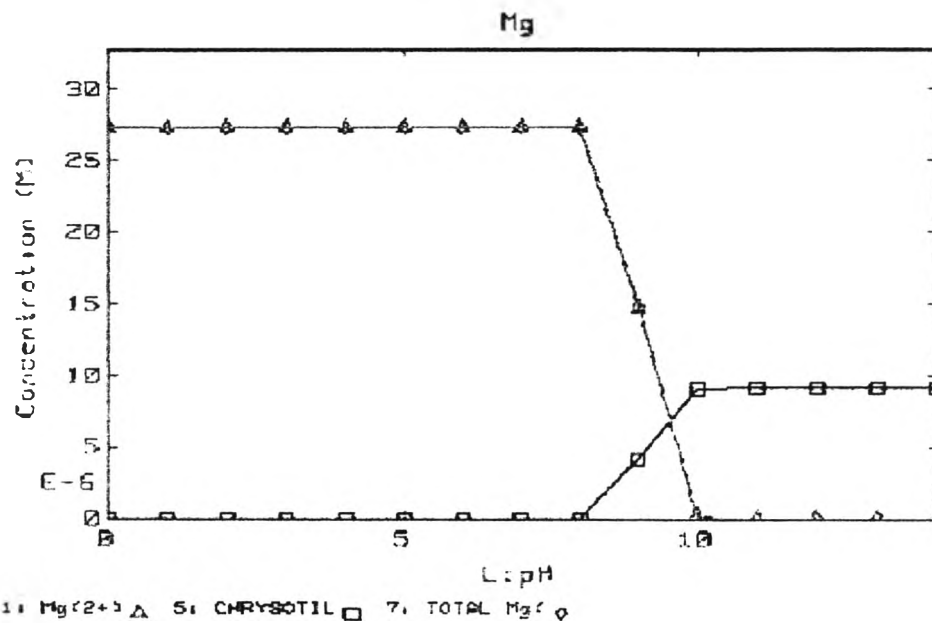
MINEQL+ Ver 4.5  
 Data Extracted from : C4@11.5\_d1.MDO  
 Run: 1

ID	Species	Conc.	Log C	Log K
Type III - FIXED ENTITIES				
3801	H2O (Solution)			0.000
175310	pH (+1)			11.500
Type IV - PRECIPITATED SOLIDS				
181900	DIASPORE	1.790E-04	0.000	-6.580
197300	CHRYSTILE	3.060E-08	0.000	-31.630
Type V - DISSOLVED SOLIDS				
182000	Al2O3		-5.754	-18.900
182100	BOEHMITE		-1.663	-8.240
182200	Al(OH)3 (am)		-3.904	-10.480
182300	GIBBSITE		-1.440	-8.020
183900	SPINEL		-7.981	-35.730
184600	HALLOYSITE		-8.051	-9.050
184700	KAOLINITE		-6.008	-7.010
186700	LIME		-12.820	-32.140
186800	PORTLANDITE		-3.114	-22.430
189400	Fe(OH)2.7Cl.3		-9.008	3.040
194200	LEPIDOCROCITE		-9.286	-1.370
194300	GOETHITE		-8.231	-0.320
194400	HEMATITE		-14.039	1.790
194500	FERRIHYDRITE		-10.894	-2.980
194600	MAGHEMITE		-22.216	-6.390
194800	MAGNESIOFERRITE		-17.289	-16.050
196600	PERICLASE		-6.552	-21.150
196700	BRUCITE		-1.920	-16.510
196702	Mg(OH)2 (active)		-4.199	-18.790
196900	SEPIOLITE		-4.467	-15.430
197100	SEPIOLITE (A)		-7.817	-18.780
208400	CRISTOBALITE		-2.783	3.290
208500	SiO2 (am,ppt)		-3.379	2.700
208600	CHALCEDONY		-2.582	3.490
208700	SiO2 (am,gel)		-3.406	2.670
208800	QUARTZ		-2.140	3.940
221800	HALITE		-7.519	-1.610
Other Species				
900003	Activity of H+	3.160E-12	-11.500	0.000









## APPENDIX D

### Calculation of NBO/T

$$\text{NBO/T} = Y_{\text{NB}}/x_{\text{T}}$$

Where NBO = non-bridging oxygen

T = tetrahedrally-coordinated atom

$x$  = mole fraction

$$Y_{\text{NB}} = \Sigma 2 [x(\text{CaO}) + x(\text{MgO}) + x(\text{FeO}) + x(\text{MnO}) + x(\text{Na}_2\text{O}) + x(\text{K}_2\text{O})] \\ + [6(1-f)x(\text{Fe}_2\text{O}_3)] - 2[x(\text{Al}_2\text{O}_3)] - 2f[x(\text{Fe}_2\text{O}_3)]$$

$$x_{\text{T}} = \Sigma x(\text{SiO}_2) + 2x(\text{Al}_2\text{O}_3) + 2fx(\text{Fe}_2\text{O}_3) + x(\text{TiO}_2) + 2x(\text{P}_2\text{O}_5)$$

$$f = \text{Fe}^{3+}(\text{IV}) / (\text{Fe}^{3+}(\text{IV}) + \text{Fe}^{3+}(\text{VI}))$$

Calculation for sample F1;

Mole fraction:  $\text{SiO}_2 = 0.6622$ ,  $\text{Al}_2\text{O}_3 = 0.2188$ ,  $\text{Fe}_2\text{O}_3 = 0.0513$ ,  $\text{MgO} = 0.0403$ ,  
 $\text{CaO} = 0.1327$ ,  $\text{Na}_2\text{O} = 0.1727$ ,  $\text{K}_2\text{O} = 0.1017$

$$\text{Fe}^{3+}(\text{VI}) \lll \text{Fe}^{3+}(\text{IV}), \text{ so } f \approx 1$$

$$Y_{\text{NB}} = 2(0.1327 + 0.0403 + 0.1727 + 0.1017) - 2(0.2188 + 0.0513)$$

$$= 0.3546$$

$$x_{\text{T}} = 0.6622 + 2(0.2188) + 2(0.0513) = 1.2024$$

$$\text{NBO/T} = Y_{\text{NB}}/x_{\text{T}}$$

$$= 0.3546/1.2024 = 0.2949$$

## BIOGRAPHY

Miss Supaluck Swatekititham was born on July 5, 1981 in Bangkok, Thailand. She has received her Bachelor Degree of Science in Environmental Technology at Sirindhorn International Institute of Technology, Thammasat University. She has started her master's degree at the International Postgraduate Programs in Environmental Management, Chulalongkorn University, in May 2003. She has finished her Master's of Science Degree in Environmental Management in Nov 2005.

