AM-92-511

The free energy of formation of searlesite, $NaBSi_2O_5(OH)_2$, and its implications

Wen Yang, Philip E. Rosenberg

For deposit: Appendix 1

American Mineralogist, 77, 11-12, 1182-1190., pp. 38-44

Appendix : Analytical Results of Searlesite Experiments*
(Concentrations are in mg/l)

No.	Days	pH	SiO_2	Na	B
25 °C					
W51, 1g searlesite in 150 ml distilled water					
	9.	8.685	51.	16.0	8.6
	8.	8.585	69.	22.0	9.0
	40.	8.775	79.	23.0	9.7
	71.	8.868	96.	22.0	11.1
	90.	8.820	120.	24.0	13.5
	120.	8.747	157.	32.5	17.0
	184.	8.994	196.	52.0	27.5
	251.	9.241	200.	75.0	37.5
	365.	9.176	216.	108.0	54.5
	727.	8.941	196.	200.0	100.0
W52 1g searlesite in 150 ml distilled water					
	9.	8.700	64.	19.0	10.6
	18.	8.651	102.	23.0	11.8
	40.	8.903	145.	28.0	15.7
	71.	9.057	192.	34.0	19.5
	90.	8.942	208.	38.0	22.0
	120.	8.897	206.	46.0	24.5
	150.	9.224	214.	56.0	26.8
	184.	9.048	202.	59.0	31.5
	251.	9.227	212.	80.0	42.5
	365.	9.075	210.	105.0	54.0
	727.	8.941	198.	185.0	93.0
W57, 1g searlesite in 100 ml distilled water					
	10.	9.158	140.	26.5	16.5
	20.	9.074	150.	26.5	17.1
	41.	8.943	148.	28.0	17.5
	62.	8.799	156.	33.0	17.8
	90.	8.934	186.	50.0	19.5
	119.	9.104	210.	57.0	25.0
	186.	8.717	218.	100.0	37.5
	259.	8.990	220.	102.0	51.0
	369.	9.120	198.	126.0	61.0
	732.	9.267	182.	270.0	129.0

Appendix (Cont.)

No.	Days	pH	SiO_2	Na	B
W58, 1g searlesite in 100 ml distilled water					
	10.	9.064	142.	29.0	16.8
	20.	9.072	150.	29.0	17.1
	41.	8.963	148.	26.5	17.5
	62.	8.848	160.	33.0	17.0
	90.	8.996	192.	50.0	19.8
	119.	9.154	208.	56.0	24.3
	186.	8.765	226.	90.0	36.5
	259.	9.055	228.	102.0	50.0
	369.	9.155	212.	141.0	68.0
	732.	9.294	192.	275.0	122.0
W59, 1g searlesite in 100 ml carbonate buffer solution					
	10.	9.283	184.	1060.	20.0
	19.	9.267	182.	1150.	20.0
	30.	9.273	182.	1040.	20.5
	61.	9.208	194.	1150.	22.5
	92.	9.346	168.	1200.	21.3
	127.	9.286	190.	1130.	20.8
	186.	9.292	216.	1160.	21.5
	259.	9.521	220.	1160.	24.0
	369.	9.283	244.	1280.	32.0
	724.	9.602	196.	1320.	53.0
W60, 1g searlesite in 100 ml carbonate buffer solution					
	10.	9.296	157.	1168.	10.8
	19.	9.270	160.	1167.	10.2
	30.	9.286	162.	1200.	11.0
	61.	9.227	180.	1217.	12.5
	92.	9.354	180.	1150.	12.5
	127.	9.295	172.	1200.	13.5
	186.	9.290	204.	1160.	14.8
	254.	9.540	210.	1160.	18.0
	369.	9.284	236.	1261.	23.5
	724.	9.605	218.	1400.	61.5
W65, 1g searlesite in 100 ml distilled water					
	8.	9.073	182.	26.	17.0
	15.	9.073	220.	34.	22.0
	30.	9.262	232.	39.	26.3
	60.	9.019	252.	65.	34.8
	90.	9.436	220.	81.	45.5
	182.	9.300	238.	120.	62.5
	251.	9.280	242.	150.	72.0
	368.	9.127	237.	204.	90.0
	712.	9.418	196.	250.	115.0

Appendix (Cont.)

No.	Days	pH	SiO_2	Na	B
W66, 1g searlesite in 100 ml distilled water					
	8.	9.048	182.	26.	18.0
	15.	9.032	216.	33.	21.8
	30.	9.265	230.	39.	25.3
	60.	9.010	250.	63.	33.0
	90.	9.436	226.	80.	52.0
	182.	9.345	240.	120.	63.5
	251.	9.300	242.	180.	73.0
	368.	9.135	236.	204.	92.0
	712.	9.434	202.	240.	116.0
W67, 2g searlesite in 100 ml distilled water					
	1.	8.935	204.	30.	21.2
	3.	9.250	234.	36.	27.5
	7.	9.094	238.	43.	29.0
	15.	8.963	246.	63.	32.8
	30.	9.080	259.	88.	48.3
	62.	9.410	244.	112.	60.5
	88.	9.344	238.	136.	70.0
	155.	9.355	232.	190.	95.5
	245.	9.412	178.	275.	137.5
W68, 1g searlesite in 100 ml distilled water					
	1.	8.894	144.	20.	13.3
	3.	9.030	170.	24.	15.8
	7.	9.015	204.	31.	19.8
	15.	8.843	230.	41.	24.0
	30.	9.026	263.	58.	31.5
	63.	9.402	236.	88.	46.0
	88.	9.200	244.	96.	46.0
	155.	9.468	234.	190.	96.5
	245.	9.358	212.	175.	86.0
W69, 1g searlesite in 100 ml borate buffer solution					
	1.	8.805	48.	410.	500.0
	3.	8.950	52.	420.	505.0
	7.	8.886	55.	415.	475.0
	15.	8.763	73.	475.	475.0
	30.	8.816	86.	442.	430.0
	63.	8.960	83.	470.	460.0
	88.	8.873	79.	520.	510.0
	245.	8.926	105.	550.	490.0

Appendix (Cont.)

No.	Days	pH	SiO_2	Na	B
W70**, 0.2 g searlesite in 100 ml borate buffer solution					
	1.	9.055	28.	40.	505.
	3.	9.13	208.	500.	505.
	7.	9.139	222.	480.	440.
	15.	9.007	220.	566.	440.
	30.	9.043	216.	608.	495.
	63.	9.166	196.	620.	505.
	88.	9.133	196.	630.	510.
	155.	9.070	194.	680.	510.
	245.	9.160	184.	650.	510.
	367.	9.044	179.	706.	509.
W71, 1 g searlesite in 100 ml borate buffer solution					
	1.	8.510	35.	960.	1060.
	3.	8.400	46.	950.	1080.
	9.	8.368	53.	1067.	1060.
	18.	8.431	50.	1083.	1150.
	31.	8.434	56.	1183.	1140.
	60.	8.570	56.	1140.	1100.
	119.	8.510	65.	1220.	1220.
	239.	8.550	64.	1200.	1200.
	368.	8.465	74.	1220.	1150.
W72**, 0.2 g searlesite in 100 ml borate buffer solution					
	1.	8.511	35.	1010.	1160.
	3.	8.422	39.	1010.	1100.
	9.	8.385	40.	1133.	1130.
	18.	8.450	38.	1133.	1150.
	31.	8.454	41.	1217.	1200.
	60.	8.570	42.	1140.	1100.
	119.	8.538	45.	1220.	1240.
	368.	8.486	48.	1200.	1184.
W79, 1 g searlesite in 100 ml 1 M NaCl solution					
	1.	8.074	100.	22667.	1.5
	4.	8.307	122.	22667.	2.0
	7.	9.197	130.	22667.	2.8
	17.	9.356	124.	22667.	3.4
	27.	8.175	112.	22667.	3.0
	62.	8.416	120.	23200.	4.2
	121.	8.228	128.	23200.	6.7
	189.	8.150	123.	23200.	8.7
	363.	8.098	118.	23200.	15.0
	660.	8.135	112.	24500.	19.8

Appendix (Cont.)

No.	Days	pH	SiO_2	Na	B
W80**, 0.1 g searlesite in 100 ml 1 M NaCl solution					
	1.	8.982	216.	23333.	88.
	4.	9.023	201.	23333.	81.
	7.	9.015	204.	23333.	85.
	17.	8.951	204.	23333.	82.
	27.	9.105	176.	23333.	85.
	189.	9.022	170.	23200.	87.
	363.	8.906	164.	23200.	88.
	660.	8.735	150.	24500.	98.
50 °C					
W53, 1 g searlesite in 150 ml distilled water					
	9.	8.764	121.	24.	13.3
	18.	8.657	138.	26.	14.4
	40.	8.907	176.	34.	17.8
	71.	9.112	340.	63.	38.0
	90.	9.106	342.	81.	53.0
	120.	9.178	340.	125.	68.5
	150.	9.456	345.	149.	80.0
	184.	9.516	345.	200.	83.0
	251.	9.500	370.	240.	110.0
	365.	9.284	316.	244.	122.0
W54, 1 g searlesite in 150 ml distilled water					
	9.	8.751	74.	21.	11.9
	18.	8.676	90.	22.	12.8
	40.	8.877	148.	28.	15.5
	71.	9.102	330.	63.	40.0
	90.	9.110	346.	78.	53.8
	120.	9.193	330.	133.	73.0
	150.	9.457	350.	159.	83.0
	184.	9.568	375.	200.	92.0
	251.	9.460	360.	235.	110.0
W55, 1 g searlesite in 100 ml distilled water					
	10.	9.046	90.	19.	12.1
	20.	8.948	138.	27.	16.5
	41.	8.955	290.	49.	31.3
	62.	9.005	298.	93.	45.0
	90.	9.249	334.	140.	66.5
	119.	9.402	355.	160.	82.0
	186.	9.320	320.	195.	105.0
	259.	9.320	345.	250.	134.0
	369.	9.321	290.	298.	149.0

Appendix (Cont.)

No.	Days	pH	SiO_2	Na	B
W56, 1 g searlesite in 100 ml distilled water					
	10.	9.035	92.	19.	12.2
	20.	8.955	140.	27.	16.5
	41.	8.994	304.	49.	30.0
	62.	9.038	336.	95.	47.5
	90.	9.190	340.	155.	67.0
	119.	9.423	360.	160.	90.0
	186.	9.314	355.	190.	112.0
	259.	9.349	345.	250.	132.0
	369.	9.338	314.	300.	156.0
W111, 2 g searlesite in 80 ml distilled water					
	7.	8.996	400.	99.	26.1
	14.	9.039	482.	130.	59.0
	30.	9.318	400.	155.	77.2
	60.	9.555	433.	240.	110.0
	122.	9.484	453.	317.	159.0
	216.	9.500	435.	340.	195.0
	357.	9.623	438.	480.	223.0
W112, 2 g searlesite in 80 ml 1 M NaCl solution					
	7.	8.566	210.	23000.	14.6
	14.	8.597	219.	23000.	18.0
	30.	8.839	233.	23000.	21.4
	60.	8.600	267.	23000.	22.2
	122.	8.706	226.	23000.	28.8
	260.	8.493	200.	23000.	25.0
	357.	8.465	205.	23000.	28.5
75 °C					
W109, 2 g searlesite in 80 ml distilled water					
	3.	9.407	595.	165.	87.2
	7.	9.578	696.	280.	133.2
	14.	9.514	710.	328.	187.0
	30.	9.660	666.	455.	233.2
	60.	9.646	768.	700.	323.2
	125.	9.681	530.	926.	417.2
W110, 2 g searlesite in 80 ml 1 M NaCl solution					
	3.	8.552	324.	23000.	19.5
	7.	8.699	347.	23000.	21.4
	15.	8.570	327.	23000.	23.9
	30.	8.599	328.	23000.	29.4
	60.	8.616	335.	23000.	46.4
	125.	8.700	204.	23000.	59.1

Appendix (Cont.)

No.	Days	pH	SiO_2	Na	B
W116†	1.	9.551	330.	150.	60.
W118	3.	9.537	470.	220.	100.
W117	7.	9.658	635.	300.	155.
W113	15.	9.730	725.	500.	235.
W114	29.	9.801	805.	560.	280.
W119	61.	9.800	810.	690.	330.
W115	129.	9.861	890.	730.	370.
100 °C					
W638	0.5	9.211	365.	100.	60.
W646	0.8	9.100	465.	140.	80.
W637	1.	9.218	525.	185.	95.
W636	3.	9.557	500.	295.	180.
W635	7.	9.571	665.	440.	313.
W645	16.	9.965	1230.	700.	395.
W634	59.	9.669	1030.	1067.	580.
W641	92.	9.720	1180.	1140.	560.
W91§	31.	8.856	600.	24000.	125.
W92§	31.	8.868	650.	20000.	130.
W93**	31.	9.734	570.	22000.	700.
W94**	31.	9.312	450.	23000.	1290.
W95**	31.	9.661	620.	23000.	2420.

* Experiments with more than 1 analysis were carried out in plastic bottles; experiments with a single analysis were carried out with Teflon-lined aluminum vessels. The concentrations of the chemical species are given in ppm.

** Starting solutions supersaturated with respect to searlesite.

† Unless otherwise indicated, each experiment carried out in Teflon-lined vessels contained 1 g searlesite and 12 ml liquid.

§ 0.5 g searlesite in 15 ml 1 M NaCl solution