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Title of article Quartz-sillimanite leucosomes in high-grade schists, Black Hills, South Dakota: A perspective on the mobility of Al in high-grade metamorphic rocks

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Table DR1

APPENDIX 1: COMPOSITIONS OF APATITES IN MIGMATITE SAMPLES

	118-1	121-1
no. of analyses:	4	3
CaO	53.35	54.04
FeO	0.56	0.31
MnO	1.15	0.87
P_2O_5	41.73	41.75
F	3.25	3.20
Cl	0.09	0.05
Total	100.12	100.21

TABLE DR2:

~~APPENDIX 2:~~ COMPOSITIONS OF BLACK HILLS BIOTITE

Sample:	81-1	95-1	112-1	118-1	121-1	124-1	137-1	140-1
Grade:*	chl	chl	sil	mig	mig	mig	st	st
SiO_2	34.14	34.14	34.18	34.19	34.80	33.77	33.97	35.37
TiO_2	1.55	1.60	1.91	2.19	2.64	2.94	1.59	1.52
Cr_2O_3	0.03	0.03	0.04	0.05	0.03	0.03	0.03	0.04
Al_2O_3	18.94	20.01	20.89	20.63	20.39	19.52	20.66	20.26
FeO	23.00	21.37	21.01	20.88	20.75	22.39	20.52	20.10
MnO	0.19	0.07	0.11	0.28	0.22	0.22	0.07	0.04
MgO	7.55	8.38	7.90	7.43	7.66	6.76	9.31	9.22
CaO	0.02	0.03	0.01	0.01	0.01	0.01	0.01	0.02
Na_2O	0.16	0.19	0.17	0.11	0.12	0.11	0.33	0.31
K_2O	8.75	8.66	8.84	9.58	9.56	9.57	8.47	8.61
F	0.37	0.26	0.30	0.40	0.29	0.57	0.32	0.43
Cl	0.01	0.00	0.01	0.11	0.02	0.01	0.02	0.01
Total	94.71	94.77	95.35	95.85	96.49	95.90	95.30	95.94
Si	2.672	2.640	2.621	2.626	2.643	2.621	2.600	2.677
Ti	0.091	0.093	0.110	0.126	0.151	0.172	0.091	0.086
Cr	0.002	0.002	0.003	0.003	0.002	0.002	0.002	0.002
Al	1.748	1.824	1.888	1.868	1.826	1.786	1.864	1.808
Fe	1.506	1.382	1.347	1.342	1.318	1.454	1.313	1.272
Mn	0.013	0.005	0.007	0.018	0.014	0.014	0.004	0.003
Mg	0.881	0.965	0.902	0.851	0.866	0.782	1.062	1.041
Ca	0.001	0.003	0.000	0.001	0.001	0.001	0.001	0.001
Na	0.024	0.029	0.025	0.016	0.018	0.017	0.049	0.046
K	0.873	0.855	0.864	0.938	0.926	0.948	0.827	0.832
Total	7.811	7.796	7.769	7.789	7.765	7.796	7.814	7.770

* Metamorphic grade: chl = chlorite + garnet, st = staurolite, sil = sillimanite, mig = migmatite

TABLE DR3:

~~APPENDIX 8~~: COMPOSITIONS OF BLACK HILLS MUSCOVITE

Sample:	81-1	95-1	112-1	118-1	121-1	124-1	137-1	140-1
Grade:*	chl	chl	sil	mig	mig	mig	st	st
SiO_2	44.92	44.65	44.87	44.94	44.87	44.31	44.36	46.11
TiO_2	0.24	0.21	0.48	0.66	0.76	0.52	0.30	0.33
Cr_2O_3	0.02	0.04	0.03	0.03	0.04	0.01	0.02	0.02
Al_2O_3	35.25	35.73	38.03	37.11	37.28	35.76	36.45	36.71
FeO	1.37	1.66	0.90	1.15	1.05	1.16	0.87	0.75
MnO	0.01	0.01	0.00	0.01	0.01	0.02	0.02	0.01
MgO	0.62	0.53	0.48	0.55	0.54	0.52	0.39	0.50
CaO	0.01	0.21	0.01	0.01	0.03	0.01	0.02	0.02
Na_2O	0.80	1.32	1.18	0.54	0.54	0.58	1.35	1.36
K_2O	9.59	8.87	9.16	10.05	10.14	10.35	8.46	8.62
F	0.06	0.06	0.10	0.13	0.10	0.14	0.04	0.09
Cl	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01
Total	92.89	93.28	95.24	95.17	95.35	93.38	92.28	94.55
Si	2.987	2.975	2.969	2.992	2.981	2.980	2.997	3.057
Ti	0.014	0.021	0.024	0.033	0.038	0.034	0.034	0.017
Cr	0.002	0.002	0.001	0.001	0.002	0.002	0.002	0.001
Al	2.953	2.966	2.967	2.913	2.920	2.932	2.906	2.870
Fe	0.059	0.048	0.050	0.064	0.058	0.062	0.064	0.041
Mn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Mg	0.047	0.048	0.047	0.054	0.053	0.053	0.056	0.049
Ca	0.001	0.001	0.001	0.000	0.002	0.000	0.000	0.002
Na	0.139	0.147	0.152	0.070	0.070	0.102	0.069	0.175
K	0.778	0.772	0.773	0.853	0.859	0.809	0.841	0.729
Total	6.980	6.980	6.985	6.980	6.985	6.974	6.970	6.942

* Metamorphic grade: chl = chlorite + garnet, st = staurolite, sil = sillimanite, mig = migmatite

TABLE DR 4:

~~APPENDIX 1~~. MAJOR ELEMENT COMPOSITION OF BLACK HILLS SCHISTS

Sample:	81-1	95-1	96-1	97-1	98-1	99-1	101-1	104-1
Grade:*	chl	chl	chl	chl	chl	chl	chl	chl
SiO_2	59.94	59.25	61.56	60.9	62.82	59.38	61.26	62.5
TiO_2	0.66	0.67	0.72	0.65	0.69	0.7	0.7	0.65
Al_2O_3	19.42	17.03	18.03	16.86	16.33	18.4	17.49	15.01
FeO	7.16	9.17	7.5	8.73	7.55	7.67	7.62	7.83
MnO	0.08	0.09	0.5	0.23	0.26	0.33	0.58	1.03
MgO	2.5	3.36	2.65	3.17	2.52	2.91	2.39	3.27
CaO	0.33	0.91	0.64	0.38	0.7	0.31	0.76	1.91
Na_2O	0.95	2.09	2.35	1.27	2.11	2.14	3.74	2.77
K_2O	5.61	4.48	4.18	5.03	4.41	4.32	3.02	3.07
P_2O_5	0.12	0.08	0.13	0.13	0.04	0.14	0.13	0.13
H_2O	2.33	1.54	0.38	1.63	1.43	2.43	1.51	0.74
Total	99.1	98.67	98.64	98.98	98.86	98.73	99.2	98.91

Sample:	82-1	82-2	90-1	94-1	108-1	109-1	109-2	110-1	111-1	111-2	137-1	138-1	139-1	140-1
Grade:*	st	st	st	st	st	st	st	st	st	st	st	st	st	st
SiO_2	61.07	73.39	64.89	72.7	63.76	73.17	62.82	60.46	59.33	69.93	61.88	59.56	61.3	57.02
TiO_2	0.62	0.45	0.77	0.5	0.65	0.48	0.74	0.66	0.79	0.65	0.64	0.66	0.67	0.76
Al_2O_3	15.92	12.48	16.84	13.29	16.64	12.67	16.67	17.16	19.74	14.06	18.07	18.72	18.15	22
FeO	9.39	3.09	6.61	3.6	7.16	3.08	6.25	9.46	8.04	4.99	6.97	7.27	7.21	6.99
MnO	2.09	0.31	0.08	0.06	0.67	0.11	0.06	0.42	0.1	0.04	0.17	0.07	0.15	0.17
MgO	2.68	1.31	2.25	1.57	2.82	1.72	2.84	2.77	2.94	1.92	2.74	2.39	2.83	2.5
CaO	1.01	2.24	0.22	1.63	0.49	2.33	0.66	0.49	0.41	1.29	0.51	0.26	0.46	0.69
Na_2O	1.44	4.01	0.4	3.67	1.34	3.17	1.84	1.53	1.17	4.19	1.31	0.5	1.13	1.76
K_2O	3.6	1.45	5.56	2.05	4.15	2.14	5.39	4.55	4.67	1.99	4.79	7.4	5.08	4.95
P_2O_5	0.16	0.28	0.17	0.14	0.12	0.16	0.18	0.12	0.15	0.03	0.11	0.14	0.11	0.11
H_2O	1.08	0.88	1.92	0.44	1.79	0.64	1.59	1.58	1.7	0.47	1.9	2.19	1.9	2.24
Total	99.06	99.89	99.71	99.65	99.59	99.67	99.04	99.2	99.04	99.56	99.09	99.16	98.99	99.19

* Grade symbols: chl = chlorite + garnet; st = staurolite; sil = first sillimanite

TABLE DR4:

~~APPENDIX 4~~. MAJOR ELEMENT COMPOSITION OF BLACK HILLS SCHISTS (cont'd)

Sample:	84-1	84-2	86-1	86-2	112-1	142-1	145-1	156-2	157-1
Grade:*	sil	sil	sil	sil	sil	sil	sil	sil	sil
SiO_2	69.34	77.27	77	59.8	73.15	83.53	53.26	55.96	63.89
TiO_2	0.7	0.51	0.42	0.64	0.58	0.37	0.95	0.7	0.8
Al_2O_3	14.67	10.98	10.36	14.99	13.19	8.2	20.85	23.04	17.39
FeO	5.14	3.31	3.44	10.33	4.43	2.24	7.38	7.28	6.14
MnO	0.06	0.04	0.22	0.82	0.03	0.03	0.08	0.09	0.08
MgO	1.75	1.14	1.31	3.22	1.67	0.64	3.22	2.55	2.15
CaO	0.65	0.59	1.3	1.2	0.58	1	2.25	0.26	0.76
Na_2O	1.73	1.84	3.04	1.76	1.17	2.62	5.16	0.74	1.9
K_2O	3.57	2.37	1.46	4.6	2.97	1.06	3.96	5.93	4.31
P_2O_5	0.17	0.16	0.09	0.11	0.18	0.11	0.12	0.16	0.17
H_2O	1.4	1.24	0.88	1.24	1.43	0.36	1.51	2.14	1.44
Total	99.18	99.45	99.52	98.71	99.38	100.16	98.74	98.85	99.03

TABLE DR5:

~~APPENDIX 5~~ MAJOR ELEMENT COMPOSITION OF BLACK HILLS MIGMATITES

	Leucosomes															
Sample:	115-1	118-1	121-1	121-2	122-2	124-1	125-1A	127-1	129-1B	131-1B	132-1A	133-1A	118-2	129-2	133-2	133-3
SiO_2	72.46	74.91	78.43	78.87	84.48	76.70	73.78	79.03	79.45	76.40	74.21	80.74	78.74	71.12	77.16	77.53
TiO_2	0.06	0.01	0.07	0.04	0.18	0.06	0.09	0.02	0.05	0.05	0.03	0.06	0.06	0.03	0.04	0.02
Al_2O_3	14.85	14.55	18.54	16.50	8.54	15.93	15.35	18.59	16.52	13.82	14.43	15.76	18.35	16.84	15.61	19.40
FeO	0.68	0.39	0.78	0.56	1.36	1.57	0.64	0.39	0.54	0.55	0.49	0.82	0.80	0.47	0.85	0.48
MnO	0.01	0.10	0.01	0.01	0.02	0.15	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.01
MgO	0.22	0.07	0.28	0.16	0.44	0.23	0.21	0.04	0.16	0.15	0.12	0.20	0.22	0.20	0.25	0.11
CaO	0.40	4.85	0.55	0.50	0.73	0.32	0.68	0.26	0.17	1.00	0.50	0.31	0.42	0.67	0.36	0.23
Na_2O	1.62	0.06	0.06	1.22	2.35	2.24	3.09	0.42	0.67	3.64	2.37	0.45	0.00	4.83	1.02	0.73
K_2O	8.43	0.23	0.38	1.76	1.79	1.54	4.94	0.67	2.32	3.24	6.89	1.17	0.37	4.49	3.44	0.94
P_2O_5	0.41	3.84	0.43	0.20	0.08	0.12	0.25	0.16	0.04	0.09	0.11	0.21	0.37	0.25	0.32	0.07
H_2O	0.59	0.33	0.53	0.50	0.24	0.83	0.92	0.54	0.40	0.55	0.53	0.40	0.65	0.58	0.47	0.25
Total	99.74	99.32	100.08	100.30	100.20	99.69	99.95	100.12	100.32	99.48	99.68	100.12	99.99	99.49	99.54	99.76

	Melanosomes								
Sample:	115-1	118-1	121-1	126-5	127-1	128-1	129-1A	131-1B	132-1A
SiO_2	61.86	59.24	73.11	62.90	46.86	64.65	55.56	61.75	69.62
TiO_2	0.69	1.35	0.92	0.75	2.20	0.85	1.09	0.93	0.84
Al_2O_3	20.67	13.92	11.97	20.97	16.83	19.41	20.65	20.21	15.23
FeO	7.65	12.53	6.56	7.36	16.82	6.81	9.62	8.30	6.85
MnO	0.11	0.15	0.06	0.06	0.17	0.07	0.11	0.08	0.07
MgO	2.55	4.23	2.34	2.62	5.39	2.26	3.59	2.90	2.46
CaO	0.18	0.36	0.26	0.09	0.06	0.15	0.33	0.11	0.23
Na_2O	0.23	0.12	0.08	0.41	0.16	0.17	0.87	0.32	0.19
K_2O	4.10	5.67	3.29	3.71	7.64	3.77	5.19	4.00	3.25
P_2O_5	0.14	0.27	0.19	0.09	0.09	0.10	0.10	0.06	0.19
H_2O	1.25	0.88	0.81	0.40	1.17	0.97	1.52	0.12	0.77
Total	99.44	98.72	99.58	99.35	97.40	99.22	98.63	98.78	99.69

TABLE DR5:

~~APPENDIX 5~~: MAJOR ELEMENT COMPOSITION OF BLACK HILLS MIGMATITES, cont

	Mesosomes									
Sample:	116-2	118-1	120-1	121-1	121-2	121-3	122-2	122-3	124-1	124-2
SiO_2	70.77	70.11	82.52	67.93	70.32	83.54	76.21	77.60	75.57	67.71
TiO_2	0.61	0.87	0.36	0.79	0.78	0.30	0.54	0.55	0.57	0.73
Al_2O_3	14.30	12.89	8.50	14.72	12.59	8.54	11.78	11.41	11.86	15.55
FeO	5.80	7.67	2.57	6.02	5.98	2.29	3.91	3.81	3.86	5.81
MnO	0.07	0.10	0.04	0.06	0.07	0.03	0.04	0.04	0.05	0.06
MgO	2.12	2.52	0.76	2.16	2.13	0.78	1.27	1.23	1.24	2.13
CaO	0.26	0.37	0.42	0.46	0.94	0.37	0.67	0.57	0.41	0.64
Na_2O	0.39	0.11	1.25	1.53	2.57	1.16	1.96	1.39	1.93	1.85
K_2O	3.97	3.56	2.41	4.52	3.00	2.33	2.68	2.42	2.64	3.79
P_2O_5	0.15	0.32	0.12	0.14	0.12	0.08	0.10	0.14	0.19	0.15
H_2O	1.22	0.68	0.53	0.99	0.58	0.53	0.62	0.53	0.87	1.05
Total	99.63	99.21	99.47	99.32	99.08	99.95	99.77	99.68	99.19	99.47

	Mesosomes									
Sample:	125-1A	125-1B	126-4	127-1	128-1	128-2	131-1A	132-1B	132-1C	133-1B
SiO_2	69.49	66.11	68.03	85.91	62.56	73.72	66.67	70.18	80.60	66.14
TiO_2	0.74	0.82	0.85	0.24	0.65	0.72	0.64	0.76	0.39	0.66
Al_2O_3	15.44	16.41	15.32	6.78	18.97	12.64	16.65	14.71	9.49	15.61
FeO	6.13	6.66	6.19	1.89	5.25	5.80	5.83	5.64	2.78	5.65
MnO	0.06	0.07	0.06	0.02	0.06	0.06	0.06	0.05	0.03	0.06
MgO	2.19	2.44	2.27	0.57	1.85	2.02	2.06	1.95	0.98	1.69
CaO	0.24	0.25	0.77	0.40	0.58	0.11	0.77	0.48	1.13	0.90
Na_2O	0.25	0.73	2.17	1.39	2.15	0.06	1.95	1.30	2.60	3.42
K_2O	3.71	4.43	2.94	2.28	6.21	3.14	3.85	3.51	1.40	4.79
P_2O_5	0.20	0.16	0.06	0.09	0.11	0.07	0.10	0.05	0.11	0.13
H_2O	0.99	1.05	0.65	0.31	1.13	0.74	0.74	0.90	0.47	0.79
Total	99.44	99.11	99.30	99.86	99.53	99.06	99.32	99.53	99.99	99.85