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Title	The role of hydrothermal activity in the formation of karst-hosted manganese deposits of the Postmasburg Mn Field, Northern Cape Province, South Africa
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Methods

Polished briquettes and polished thin sections were prepared at the Department of Geology at Rhodes University. Bulk rock powders, for XRD, XRF and ICP-MS were produced from samples composed of matrix only. This was done by selecting approximately 50 g of homogenous matrix from quartered drill core samples. These were split into small pieces and crushed to a fine powder using a swing mill and a hardened steel set and rings at the Department of Geology, Rhodes University. Samples were milled for 5 min to ensure that no coarse fraction remained. Fresh quartzite was milled between samples and the crushing equipment was thoroughly cleaned.

A Bruker D8 Discover X-ray diffractometer, equipped with a Lynx Eye detector, was used to acquire bulk-rock powder XRD patterns. Approximately 1 g of powder was packed onto a plastic, indented plate. Cu-K_α radiation (= 1.5405 Å, nickel filter) was used and the X-ray diffraction data was treated using the Eva (evaluation curve fitting) software. Baseline correction was performed on each diffraction pattern.

Major oxide compositions were determined at the Department of Geology, Rhodes University. The XRF techniques of Norrish and Hutton (1969) were used to make these determinations. After determination of loss on ignition, 0.28 g of each ashed sample was fused with 0.02g $NaNO_3$ and 1.5 g lithium tetraborate flux to form glass disks. The K-alpha line for each major element was then used to analyse the disks. Background corrections were made based on "blank" materials. In the majority of the samples in this thesis, BaO occurs as one of the major oxides. BaO, Na_2O and trace elements were measured by analysis of pressed powder briquettes. These briquettes were made using approximately 5g of powdered sample. The sample was mixed with an organic binding agent (Mowiol®) and cased in boric acid. It was then pressed using a hydraulic press. The trace elements that were determined are Zn, Cu, Ni, Co, Cr, V, Ba, Sc, Th, Pb, Y, Nb, Zr, Rb and Sr. In most samples, the barium concentrations were much higher than the available standard material. In such cases, the samples were diluted between 10 and 20 times using PURATRONIC ® silicon (IV) oxide. The barium concentrations were then back-calculated according to the relevant dilution factor. The sodium concentrations were also measured on diluted samples and the difference in concentration between the original sodium values and the back-calculated values was used to normalize the back-calculated barium concentrations. Trace and major element concentrations were determined using a Philips PW1410 XRF spectrometer in the Department of Geology, Rhodes University. The instrument was calibrated using international and in-house rock standards.

Major element analyses were performed on various minerals using a Jeol JXA 8230 Superprobe with 4 WD spectrometers at the Department of Geology, Rhodes University. Polished thin sections and briquettes were first prepared for analysis by coating with carbon at a thickness of 20 nm. The analytical conditions for spot analyses as well as element maps were an acceleration potential of 15 kV, a beam current of 20 nA, a counting time of 10 s on peak and 5 s on background and ZAF matrix corrections.

Qualitative WDS scans were first used to identify major elements in unknown minerals. The majority of quantitative analyses were performed using a spot beam size of less than 1

μm. However, matrix analyses were performed using a beam radius of 10 μm or 20 μm so as to include all extremely fine-grained phases and attain an approximately homogenous, bulk analysis of the matrix. A 10 μm beam radius was used for albite and natrolite analyses.

Compositional maps of the sample used for dating were obtained using a JEOL JXA- 8200 electron probe micro-analyser (EPMA) at the Institute of Geosciences of the University of Potsdam. Sample preparation included the production of a polished thin section which was carbon coated in a Polaron CC 7650 carbon coater. The electron probe is equipped with five wavelength dispersive X- ray spectrometers (WDS) and analytical conditions were a 15 kV accelerating potential, a 35 nA beam current and a 30 ms dwell time for each 1.3 × 1.3 μm interval. In total, four 1024 × 850 pixel images were generated for the thin section area of interest, in which the major element concentrations are depicted by different colours and colour intensities after calibration against a set of synthetic oxides and natural silicates obtained from the Smithsonian Institute.

In situ ultraviolet laser ablation (UVLA) $^{40}Ar/^{39}Ar$ dating of an alkali feldspar porphyroblast was carried at the geochronology laboratory of the Universität Potsdam, Germany. A disc was drilled out from the polished surface of a sample using a hollow cored 7 mm diameter mini-drill. The disc was ground down, polished and wrapped in commercial-grade aluminium foil before being placed in a sample container.

The sample container is made of 5N (99.999% pure) aluminium, was irradiated for 4 hours at the CLICIT (Cadmium-Lined in-Core Irradiation Tube) facility of OSTR (Oregon State TRIGA Reactor), Oregon State University, USA (irradiation ID: PO-4). The neutron flux variation over the length of the sample container was monitored using the Fish Canyon Tuff Sanidine provided by the Geological Survey of Japan (FC3, 27.5 Ma, Uto et al., 1997; Ishizuka, 1998; Ishizuka et al., 2002). The interference correction factors and J value are listed with the analytical data in this appendix. The J value uncertainty is estimated at 0.4% based on earlier irradiations.

The in situ $^{40}Ar/^{39}Ar$ UVLA analyses were carried out using a 266 nm Nd-YAG ultraviolet pulsed laser for gas extraction. The gas fractions were extracted by ablating spots using a 250 or 300 μm beam diameter at 20 Hz. Generally, two passes were made through each of the analysed alkali feldspar to a final depth deduced to be up to 500 μm by previous drilling tests. Before being allowed to expand into the mass-spectrometer, the gas was purified for 10 min in an ultra-high vacuum line using two Zr-Al SAES getters (one at 400˚C and one at room temperature), and a cold trap to remove water that is kept at -90°C in cooled ethanol. The purified gas was analysed using a Micromass 5400 noble gas mass spectrometer with a high sensitivity and an ultra-low background. The mass spectrometer is fitted with an electron multiplier pulse counting system suitable for analysing small amounts of argon. Blanks were run at the start of each session and after every three unknowns. The ratios of net intensities of each Ar isotope against the intensities of the blank for each analysis were in the following ranges; ^{40}Ar: 250–23, ^{39}Ar: 680–25, ^{38}Ar: 24–2.4, ^{37}Ar: <3.7 and ^{36}Ar: 13–1.6.

The raw data were corrected for background contributions, mass discrimination (using the composition of atmospheric argon), and the decay of the neutron-induced nuclides produced during irradiation. Interference correction factors were obtained by analysing CaF_2 and

K_2SO_4 irradiated together with the samples and are listed with the analytical data in the appendices. $^{38}Ar_{Cl}/^{39}Ar_K$ ratios are not included as thermal neutron activation of ^{37}Cl was very low due to the Cd shielding. Data reduction and age calculation was carried out following Uto et al. (1997) that uses the decay constants recommended by Steiger and Jäger (1977). The adopted interference factors are: $(^{36}Ar/^{37}Ar)_{Ca} = (2.624 \pm 0.05) \times 10^{-4}$, $(^{39}Ar/^{37}Ar)_{Ca} = (6.938 \pm 0.041) \times 10^{-4}$, $(^{38}Ar/^{39}Ar)_K = (1.202 \pm 0.003) \times 10^{-2}$, and $(^{40}Ar/^{39}Ar)_K = (4.29 \pm 22.43) \times 10^{-4}$.

All the uncertainties on the ages for total-gas ages and iinclude the uncertainty in the irradiation parameter J (0.4%) and are reported on 1σ level. The uncertainty of the J value is estimated at 0.4% as the conservative random error at each location in sample containers, at which each J value was determined as the weighted mean of four single grain total fusion analyses of FC3, and derived from all J values (ca. 200 analyses) obtained from the first four irradiations at our $^{40}Ar/^{39}Ar$ geochronology laboratory.

Ar-Ar Data

Ar/Ar results from in situ ultraviolet laser ablation analysis of alkali feldspar from the Postmasburg Mn Field, South Africa.

$^{40}Ar^*$ = radiogenic argon; $^{39}Ar_K$ = K-derived ^{39}Ar; $^{37}Ar_{Ca}$ = Ca-derived ^{37}Ar.

Interference correction factors listed at end of table.

Spot nr.	$^{40}Ar/^{39}Ar$	$^{37}Ar/^{39}Ar$	$^{36}Ar/^{39}Ar$ (x10^{-3})	K/Ca	$^{40}Ar^*$ (%)	$^{39}Ar_K$ fraction (%)	$^{40}Ar^*/^{39}Ar_K$	Age (± 1 sigma) (Ma)
Sample 15-15O	Experiment number: U16001		Irradiation	PO-4	OSU, Oregon, USA			
J= 0.000998 ± \								
3	440.83 ± 3.48	0.05 ± 0.15	19.83 ± 3.85	12.1	98.7	3.1	434.99 ± 3.62	650.5 ± 5.0
5	462.45 ± 3.31	0.07 ± 0.04	7.18 ± 1.24	8.23	99.5	5.8	460.35 ± 3.31	682.0 ± 4.7
6	382.98 ± 5.69	0.62 ± 0.09	34.59 ± 5.03	0.9	97.3	2.3	372.97 ± 5.75	570.9 ± 7.8
7	462.92 ± 1.83	0.02 ± 0.05	11.24 ± 0.73	32.3	99.3	8.4	459.60 ± 1.83	681.1 ± 3.2
8	433.51 ± 4.74	0.09 ± 0.03	16.28 ± 1.26	6.5	98.9	8.2	428.73 ± 4.72	642.6 ± 6.3
9	451.66 ± 2.73	0.09 ± 0.02	13.67 ± 1.05	6.7	99.1	8.2	447.66 ± 2.73	666.3 ± 4.1
10	421.06 ± 2.18	0.04 ± 0.05	14.20 ± 1.23	13.4	99.0	9.8	416.88 ± 2.19	627.6 ± 3.5
11	461.44 ± 2.70	0.04 ± 0.17	120.33 ± 3.56	14.1	92.3	3.7	425.89 ± 2.72	639.0 ± 4.1
12	446.51 ± 2.29	0.01 ± 0.03	26.02 ± 1.17	41.4	98.3	10.8	438.83 ± 2.28	655.3 ± 3.6
13	447.43 ± 1.77	0.01 ± 0.04	74.18 ± 1.80	43.3	95.1	10.8	425.51 ± 1.78	638.5 ± 3.1
14	334.85 ± 3.42	0.01 ± 0.09	6.88 ± 1.68	86.8	99.4	5.6	332.82 ± 3.44	517.4 ± 5.0
15	345.61 ± 2.25	0.20 ± 0.15	14.90 ± 1.01	3.0	98.7	3.4	341.27 ± 2.25	528.8 ± 3.5
16	451.51 ± 7.89	1.03 ± 0.74	142.14 ± 11.92	0.6	90.7	0.7	409.88 ± 7.99	618.7 ± 10.4
17	356.68 ± 1.29	0.03 ± 0.07	6.24 ± 1.19	18.8	99.5	5.0	354.85 ± 1.33	546.9 ± 2.6
19	388.76 ± 1.84	0.07 ± 0.05	18.34 ± 1.38	8.4	98.6	5.3	383.36 ± 1.86	584.5 ± 3.1
20	419.13 ± 2.55	0.03 ± 0.05	7.29 ± 1.32	21.1	99.5	5.6	416.99 ± 2.57	627.7 ± 3.9
25	434.98 ± 12.60	0.52 ± 0.73	23.48 ± 6.45	1.1	98.4	0.7	428.24 ± 12.56	642.0 ± 16.0

26	386.39	±	12.33	0.69	±	1.35	68.85	±	11.87	0.8	94.7	0.4	366.28	±	12.22	562.1	±	16.2

Interference correction factors

$(^{39}Ar/^{37}Ar)_{Ca}$	1-sigma	$(^{40}Ar/^{39}Ar)_{K}$	1-sigma	$(^{36}Ar/^{37}Ar)_{Ca}$	1-sigma	$(^{38}Ar/^{39}Ar)_{K}$	1-sigma
0.00069	4.08689E-05	0.0004288	0.00224339	0.0002642	4.9E-06	0.012	3E-05

EPMA Data

Electron microprobe data for aegirine in drill core SLT-015.

Sample Number	Oxide (wt. %)									Cations calculated on the basis of 6O							
	SiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	K_2O	Na_2O	Total	Si	Al	Fe	Mn	Mg	Ca	K	Na
15-15N	52.46	1.00	30.05	1.31	0.04	0.09	0.02	14.08	99.03	2.02	0.05	0.87	0.04	0.00	0.00	0.00	1.05
15-15N	52.51	1.11	29.11	1.49	0.09	0.17	0.04	14.09	98.60	2.03	0.05	0.85	0.05	0.01	0.01	0.00	1.06
15-15N	52.01	0.27	31.65	0.92	0.03	0.04	0.00	14.14	99.05	2.02	0.01	0.92	0.03	0.00	0.00	0.00	1.06
15-15N	52.76	0.75	29.94	1.11	0.95	0.77	0.03	13.67	99.97	2.02	0.03	0.86	0.04	0.05	0.03	0.00	1.01
15-15N	52.30	0.58	25.96	3.05	1.59	1.80	0.03	12.97	98.28	2.03	0.03	0.76	0.10	0.09	0.07	0.00	0.98
15-15N	52.44	0.25	31.42	0.63	0.00	0.09	0.00	13.88	98.01	2.03	0.01	0.92	0.02	0.00	0.00	0.00	1.04
15-15N	52.61	0.87	28.98	1.32	0.98	0.66	0.04	13.30	98.75	2.03	0.04	0.84	0.04	0.06	0.03	0.00	0.99
15-15N	51.94	0.23	32.13	0.36	0.03	0.03	0.04	14.00	98.76	2.02	0.01	0.94	0.01	0.00	0.00	0.00	1.05
15-15N	51.61	0.24	31.74	0.69	0.02	0.05	0.02	13.81	98.18	2.02	0.01	0.93	0.02	0.00	0.00	0.00	1.05
15-15N	52.03	0.23	31.54	0.86	0.02	0.02	0.04	13.86	98.58	2.02	0.01	0.92	0.03	0.00	0.00	0.00	1.04
15-15N	51.69	0.19	31.67	0.83	0.00	0.02	0.03	13.86	98.29	2.02	0.01	0.93	0.03	0.00	0.00	0.00	1.05
15-15N	51.79	0.19	32.16	0.80	0.02	0.02	0.00	14.15	99.12	2.01	0.01	0.94	0.03	0.00	0.00	0.00	1.06
15-15N	52.29	1.47	28.48	1.58	0.09	0.03	0.00	14.26	98.20	2.03	0.07	0.83	0.05	0.01	0.00	0.00	1.07
15-15N	52.04	0.22	31.84	0.82	0.02	0.01	0.00	14.05	99.01	2.02	0.01	0.93	0.03	0.00	0.00	0.00	1.06
15-15O	52.34	0.27	31.62	0.63	0.04	0.12	0.17	14.42	99.66	2.02	0.01	0.92	0.02	0.00	0.01	0.01	1.08
15-15O	52.12	0.28	31.29	0.45	0.01	0.11	0.16	14.48	98.89	2.02	0.01	0.91	0.01	0.00	0.00	0.01	1.09
15-15O	52.75	0.71	29.94	0.88	0.87	0.84	0.03	13.61	99.63	2.02	0.03	0.86	0.03	0.05	0.03	0.00	1.01
15-15I	52.52	0.87	29.45	1.08	0.19	0.23	0.04	14.20	98.56	2.03	0.04	0.86	0.04	0.01	0.01	0.00	1.07
15-15I	52.40	0.33	31.23	1.02	0.05	0.16	0.02	14.64	99.84	2.02	0.01	0.90	0.03	0.00	0.01	0.00	1.09
Average	52.24	0.53	30.54	1.04	0.26	0.28	0.04	13.97	98.86	2.02	0.02	0.89	0.03	0.02	0.01	0.00	1.05
Std. Dev.	0.34	0.38	1.61	0.59	0.46	0.45	0.05	0.40	0.58								
Minimum	51.61	0.19	25.96	0.36	0.00	0.01	0.00	12.97	98.01								
Maximum	52.76	1.47	32.16	3.05	1.59	1.80	0.17	14.64	99.97								

Electron microprobe data for albite in drill core SLT-015.

Sample Number	Oxide (wt. %)									Cations calculated on the basis of 8 O							
	SiO_2	Al_2O_3	FeO	MnO	K_2O	MgO	CaO	Na_2O	Total	Si	Al	Fe	Mn	K	Mg	Ca	Na
15-15E	69.76	19.26	0.00	0.00	0.00	0.00	0.01	12.01	101.03	3.01	0.98	0.00	0.00	0.00	0.00	0.00	1.01
15-15E	69.30	19.32	0.00	0.00	0.02	0.00	0.01	11.81	100.46	3.01	0.99	0.00	0.00	0.00	0.00	0.00	0.99
15-15E	68.96	19.45	0.00	0.03	0.01	0.00	0.01	11.90	100.35	3.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00
15-15E	69.62	19.39	0.00	0.01	0.03	0.01	0.01	11.70	100.77	3.01	0.99	0.00	0.00	0.00	0.00	0.00	0.98
15-15E	68.99	19.51	0.00	0.01	0.01	0.00	0.01	11.74	100.27	3.00	1.00	0.00	0.00	0.00	0.00	0.00	0.99
15-15E	69.21	19.37	0.00	0.02	0.02	0.00	0.02	11.88	100.51	3.01	0.99	0.00	0.00	0.00	0.00	0.00	1.00
15-15E	69.14	19.37	0.09	0.04	0.01	0.00	0.01	11.70	100.37	3.01	0.99	0.00	0.00	0.00	0.00	0.00	0.99
15-15E	69.09	19.55	0.00	0.01	0.01	0.00	0.03	11.69	100.38	3.00	1.00	0.00	0.00	0.00	0.00	0.00	0.99
15-15E	68.34	19.17	0.05	0.01	0.02	0.00	0.03	11.26	98.87	3.01	1.00	0.00	0.00	0.00	0.00	0.00	0.96
15-15E	68.38	19.39	0.00	0.03	0.02	0.00	0.02	11.42	99.25	3.00	1.00	0.00	0.00	0.00	0.00	0.00	0.97
15-15E	68.77	19.40	0.00	0.01	0.01	0.00	0.02	11.76	99.97	3.00	1.00	0.00	0.00	0.00	0.00	0.00	0.99
15-15E	69.19	19.15	0.00	0.01	0.00	0.00	0.04	11.85	100.23	3.01	0.98	0.00	0.00	0.00	0.00	0.00	1.00
15-15E	69.14	19.22	0.00	0.02	0.02	0.00	0.02	11.82	100.24	3.01	0.99	0.00	0.00	0.00	0.00	0.00	1.00
15-15E	68.19	19.16	0.00	0.07	0.02	0.00	0.02	11.56	99.01	3.00	1.00	0.00	0.00	0.00	0.00	0.00	0.99
15-15E	68.84	19.30	0.00	0.00	0.02	0.00	0.02	11.74	99.91	3.01	0.99	0.00	0.00	0.00	0.00	0.00	0.99
15-15E	68.44	19.09	0.07	0.03	0.01	0.00	0.01	11.61	99.26	3.01	0.99	0.00	0.00	0.00	0.00	0.00	0.99
15-15E	68.69	19.25	0.00	0.00	0.02	0.00	0.01	11.77	99.75	3.01	0.99	0.00	0.00	0.00	0.00	0.00	1.00
Average	68.94	19.31	0.01	0.02	0.01	0.00	0.02	11.72	100.04	3.01	0.99	0.00	0.00	0.00	0.00	0.00	0.99
Std. Dev.	0.44	0.13	0.03	0.02	0.01	0.00	0.01	0.18	0.62								
Minimum	68.19	19.09	0.00	0.00	0.00	0.00	0.01	11.26	98.87								
Maximum	69.76	19.55	0.09	0.07	0.03	0.01	0.04	12.01	101.03								

Electron microprobe data for barite in drill core SLT-015.

Sample Number	Oxide (wt. %)							Cations calculated on the basis of 4O					
	CaO	MgO	FeO	BaO	SO3	SrO	Total	Ca	Mg	Fe	Ba	S	Sr
15-11B	0.00	0.00	0.11	65.63	33.88	0.03	99.64	0.00	0.00	0.00	1.01	1.00	0.00
15-11B	0.03	0.02	0.00	65.84	33.98	0.01	99.88	0.00	0.00	0.00	1.01	1.00	0.00
15-11B	0.00	0.00	0.00	65.24	34.33	0.00	99.57	0.00	0.00	0.00	0.99	1.00	0.00
15-11B	0.07	0.02	0.00	65.72	33.80	0.01	99.61	0.00	0.00	0.00	1.01	1.00	0.00
15-11B	0.06	0.00	0.00	65.49	34.06	0.00	99.61	0.00	0.00	0.00	1.00	1.00	0.00
15-11B	0.03	0.00	0.02	65.03	34.18	0.01	99.27	0.00	0.00	0.00	0.99	1.00	0.00
15-11B	0.04	0.01	0.17	64.82	34.44	0.00	99.47	0.00	0.00	0.01	0.99	1.00	0.00
Average	0.03	0.01	0.04	65.39	34.10	0.01	99.58	0.00	0.00	0.00	1.00	1.00	0.00
Std. Dev.	0.03	0.01	0.07	0.38	0.23	0.01	0.18						
Minimum	0.00	0.00	0.00	64.82	33.80	0.00	99.27						
Maximum	0.07	0.02	0.17	65.84	34.44	0.03	99.88						

Electron microprobe data for braunite in drill core SLT-015.*MnO calculated according to braunite formula.

Sample Number	Oxide (wt. %)									Cations calculated on the basis of 12O							
	SiO_2	Al_2O_3	Fe_2O_3	Mn_2O_3	MgO	CaO	SrO	MnO*	Total	Si	Al	Fe	Mn^{3+}	Mn^{2+}	Mg	Ca	Sr
15-06	10.01	0.38	1.99	75.81	0.09	1.50	0.00	9.80	99.57	1.01	0.04	0.15	5.79	0.83	0.01	0.16	0.00
15-06	9.78	1.16	5.66	70.45	0.02	0.85	0.00	10.50	98.42	0.99	0.14	0.43	5.44	0.90	0.00	0.09	0.00
15-06	9.67	0.17	0.64	77.39	0.05	0.72	0.00	10.40	99.05	0.98	0.02	0.05	5.97	0.89	0.01	0.08	0.00
15-06	9.85	0.46	0.37	76.35	0.06	1.08	0.02	10.00	98.19	1.00	0.05	0.03	5.92	0.86	0.01	0.12	0.00
15-06	10.14	0.49	0.71	77.66	0.02	1.66	0.00	9.80	100.48	1.01	0.06	0.05	5.88	0.83	0.00	0.18	0.00
15-06	9.76	0.19	0.16	78.29	0.08	0.85	0.00	10.30	99.62	0.98	0.02	0.01	6.00	0.88	0.01	0.09	0.00
15-06	9.75	1.70	0.28	75.39	0.00	1.61	0.01	9.40	98.14	0.99	0.20	0.02	5.81	0.81	0.00	0.17	0.00
15-06	9.35	0.71	0.52	79.10	0.01	0.46	0.00	10.50	100.64	0.93	0.08	0.04	6.01	0.89	0.00	0.05	0.00
15-06	9.53	0.54	0.18	77.73	0.00	1.71	0.00	9.10	98.80	0.96	0.06	0.01	5.99	0.78	0.00	0.19	0.00
15-06	9.77	0.72	4.20	73.85	0.06	1.42	0.00	9.60	99.63	0.98	0.08	0.32	5.64	0.82	0.01	0.15	0.00
15-15A	9.92	1.08	3.19	73.67	0.15	1.79	0.00	9.20	99.01	1.00	0.13	0.24	5.64	0.78	0.02	0.19	0.00
15-15A	9.86	1.15	3.93	72.83	0.12	1.79	0.00	9.20	98.87	0.99	0.14	0.30	5.58	0.78	0.02	0.19	0.00
15-15A	10.01	1.27	3.92	72.19	0.17	1.82	0.03	9.20	98.61	1.01	0.15	0.30	5.54	0.78	0.02	0.20	0.00
15-15A	7.72	1.18	2.99	77.80	0.09	1.16	0.00	7.50	98.43	0.79	0.14	0.23	6.05	0.65	0.01	0.13	0.00
15-15A	10.15	1.16	4.80	71.17	0.12	1.83	0.05	9.40	98.68	1.02	0.14	0.36	5.46	0.80	0.02	0.20	0.00
15-15A	9.28	1.03	2.76	75.78	0.10	1.44	0.07	8.90	99.35	0.93	0.12	0.21	5.80	0.76	0.01	0.16	0.00
15-15A	8.24	0.60	3.09	77.64	0.06	1.58	0.00	7.60	98.81	0.84	0.07	0.24	6.02	0.66	0.01	0.17	0.00
15-15A	8.32	0.65	2.92	79.42	0.09	1.49	0.00	7.80	100.69	0.83	0.08	0.22	6.04	0.66	0.01	0.16	0.00
15-15A	8.97	0.80	4.63	75.19	0.08	1.82	0.03	8.10	99.62	0.90	0.10	0.35	5.75	0.69	0.01	0.20	0.00
15-15E	10.50	0.35	4.70	71.48	0.12	1.92	0.06	9.70	98.84	1.06	0.04	0.36	5.49	0.83	0.02	0.21	0.00
15-15E	10.65	0.34	4.63	70.54	0.09	1.94	0.02	9.90	98.11	1.08	0.04	0.35	5.45	0.85	0.01	0.21	0.00
15-15E	10.66	0.42	4.62	71.83	0.08	2.04	0.00	9.90	99.54	1.07	0.05	0.35	5.47	0.84	0.01	0.22	0.00
15-15E	10.68	0.42	4.67	71.42	0.12	1.99	0.03	9.90	99.23	1.07	0.05	0.35	5.45	0.84	0.02	0.21	0.00
15-15E	9.87	0.43	3.94	73.58	0.10	1.66	0.00	9.40	98.97	1.00	0.05	0.30	5.66	0.80	0.02	0.18	0.00
15-15E	9.82	0.46	4.88	73.68	0.11	1.70	0.00	9.30	99.94	0.98	0.05	0.37	5.61	0.79	0.02	0.18	0.00
Average	9.69	0.71	2.97	74.81	0.08	1.51	0.01	9.38	99.17	0.98	0.08	0.23	5.74	0.80	0.01	0.16	0.00
Std. Dev.	0.74	0.40	1.82	2.85	0.04	0.43	0.02	0.85	0.74								
Minimum	7.72	0.17	0.16	70.45	0.00	0.46	0.00	7.50	98.11								
Maximum	10.68	1.70	5.66	79.42	0.17	2.04	0.07	10.50	100.69								

Electron microprobe data for hematite in drill core SLT-015.

Sample Number	Oxide (wt. %)							Cations calculated on the basis of 3O					
	TiO_2	Al_2O_3	SiO_2	Fe_2O_3	Mn_2O_3	Cr_2O_3	Total	Ti	Al	Si	Fe	Mn	Cr
15-23B	0.00	0.06	n.d	95.16	2.92	0.00	98.14	0.00	0.00	0.00	1.94	0.06	0.00
15-23B	0.00	0.05	n.d	95.28	2.86	0.04	98.23	0.00	0.00	0.00	1.94	0.06	0.00
15-23B	0.10	0.02	n.d	97.27	2.73	0.00	100.12	0.00	0.00	0.00	1.94	0.06	0.00
15-23B	0.10	0.07	n.d	93.65	6.25	0.02	100.08	0.00	0.00	0.00	1.87	0.13	0.00
15-15E	0.21	0.16	n.d	96.48	3.65	0.00	100.50	0.00	0.01	0.00	1.92	0.07	0.00
15-15E	0.21	0.16	n.d	96.48	3.65	0.00	100.50	0.00	0.01	0.00	1.92	0.07	0.00
15-15A	n.d	0.58	0.74	92.63	5.96	n.d	99.90	0.00	0.02	0.02	1.84	0.12	0.00
15-15A	n.d	0.57	0.59	91.66	5.57	n.d	98.39	0.00	0.02	0.02	1.85	0.11	0.00
15-15A	n.d	0.58	0.65	93.73	5.54	n.d	100.50	0.00	0.02	0.02	1.85	0.11	0.00
15-15A	n.d	0.53	0.52	94.19	5.40	n.d	100.64	0.00	0.02	0.01	1.86	0.11	0.00
15-15A	n.d	0.53	0.61	92.07	5.26	n.d	98.47	0.00	0.02	0.02	1.85	0.11	0.00
15-23A	n.d	0.15	0.43	90.35	6.86	n.d	98.35	0.00	0.00	0.01	1.84	0.14	0.00
15-14A	0.12	1.72	0.48	96.69	0.99	0.03	100.02	0.00	0.05	0.01	1.91	0.02	0.00
15-14A	0.10	1.54	0.58	96.69	0.12	0.00	99.03	0.00	0.05	0.02	1.93	0.00	0.00
Average	0.10	0.48	0.57	94.45	4.13	0.01	99.49	0.00	0.01	0.01	1.89	0.08	0.00
Std. Dev.	0.08	0.54	0.10	2.19	2.03	0.02	0.99						
Minimum	0.00	0.02	0.43	90.35	0.12	0.00	98.14						
Maximum	0.21	1.72	0.74	97.27	6.86	0.04	100.64						

Electron microprobe data for microcline in drill core SLT-015.

Sample number	Oxide (wt. %)										Cations calculated according to 8O								
	SiO_2	Al_2O_3	Fe_2O_3	Mn_2O_3	CaO	BaO	SrO	K_2O	Na_2O	Total	Si	Al	Fe	Mn	Ca	Ba	Sr	K	Na
15-15O	64.54	18.34	0.00	0.00	0.00	0.00	0.42	16.76	0.08	100.13	2.99	1.00	0.00	0.00	0.00	0.00	0.01	0.99	0.01
15-15O	64.41	18.66	0.00	0.01	0.01	n.d	n.d	15.98	0.16	99.23	2.99	1.02	0.00	0.00	0.00	0.00	0.00	0.95	0.01
15-15O	63.24	18.94	0.04	n.d	0.00	0.00	0.00	16.77	0.04	99.03	2.96	1.05	0.00	0.00	0.00	0.00	0.00	1.00	0.00
15-15O	63.26	18.75	0.02	n.d	0.00	0.00	0.00	17.36	0.04	99.43	2.96	1.04	0.00	0.00	0.00	0.00	0.00	1.04	0.00
15-15O	63.69	18.91	0.06	n.d	0.00	0.00	0.00	16.30	0.03	98.97	2.97	1.04	0.00	0.00	0.00	0.00	0.00	0.97	0.00
15-15O	63.80	18.85	0.04	n.d	0.00	0.00	0.00	16.46	0.04	99.19	2.98	1.04	0.00	0.00	0.00	0.00	0.00	0.98	0.00
15-15O	63.97	18.91	0.03	n.d	0.00	0.00	0.00	16.75	0.04	99.69	2.97	1.04	0.00	0.00	0.00	0.00	0.00	0.99	0.00
15-23B	64.49	19.39	0.00	0.24	0.02	0.03	0.55	16.41	0.08	101.20	2.96	1.05	0.00	0.01	0.00	0.00	0.01	0.96	0.01
15-23B	64.47	19.38	0.00	0.02	0.00	0.03	1.35	15.70	0.09	101.04	2.96	1.05	0.00	0.00	0.00	0.00	0.04	0.92	0.01
15-23B	64.40	19.36	0.00	0.02	0.00	0.00	0.53	14.45	0.09	98.83	2.98	1.06	0.00	0.00	0.00	0.00	0.01	0.85	0.01
15-23A	64.81	18.28	0.00	n.d	0.00	n.d	n.d	15.79	0.09	98.97	3.01	1.00	0.00	0.00	0.00	0.00	0.00	0.94	0.01
Average	64.10	18.89	0.02	0.06	0.00	0.01	0.32	16.25	0.07	99.61	2.98	1.03	0.00	0.00	0.00	0.00	0.01	0.96	0.01
Std. Dev.	0.54	0.38	0.02	0.10	0.01	0.01	0.46	0.77	0.04	0.83									
Minimum	63.24	18.28	0.00	0.00	0.00	0.00	0.00	14.45	0.03	98.83									
Maximum	64.81	19.39	0.06	0.24	0.02	0.03	1.35	17.36	0.16	101.20									

Electron microprobe data for natrolite in drill core SLT-015.

Sample Number	Oxide (wt. %)									Cations calculated on the basis of 10O							
	SiO_2	Al_2O_3	FeO	MnO	MgO	CaO	K_2O	Na_2O	Total	Si	Al	Fe	Mn	Mg	Ca	K	Na
15-15E	47.85	26.12	0.15	0.24	0.00	0.02	0.02	16.22	90.61	3.03	1.95	0.01	0.01	0.00	0.00	0.00	1.99
15-15E	47.41	26.12	0.00	0.58	0.00	0.05	0.03	16.14	90.32	3.02	1.96	0.00	0.03	0.00	0.00	0.00	1.99
15-15E	46.58	26.16	0.01	0.00	0.00	0.01	0.03	16.27	89.07	3.00	1.99	0.00	0.00	0.00	0.00	0.00	2.03
15-15E	46.23	26.09	0.00	0.01	0.00	0.02	0.02	15.78	88.15	3.00	2.00	0.00	0.00	0.00	0.00	0.00	1.99
15-15E	46.30	26.02	0.00	0.00	0.00	0.01	0.01	16.03	88.36	3.00	1.99	0.00	0.00	0.00	0.00	0.00	2.02
15-15E	47.11	26.45	0.03	0.04	0.00	0.01	0.03	16.26	89.93	3.00	1.99	0.00	0.00	0.00	0.00	0.00	2.01
15-15E	47.40	26.20	0.00	0.04	0.00	0.00	0.02	16.27	89.93	3.02	1.97	0.00	0.00	0.00	0.00	0.00	2.01
15-15E	47.61	26.39	0.00	0.02	0.01	0.01	0.07	15.87	89.98	3.03	1.98	0.00	0.00	0.00	0.00	0.01	1.96
15-15E	46.92	26.07	0.03	0.02	0.00	0.02	0.04	16.07	89.16	3.02	1.97	0.00	0.00	0.00	0.00	0.00	2.00
15-15E	46.77	26.11	0.05	0.06	0.00	0.02	0.02	15.64	88.68	3.02	1.99	0.00	0.00	0.00	0.00	0.00	1.96
15-15E	46.94	26.42	0.06	0.01	0.01	0.03	0.05	16.01	89.53	3.00	1.99	0.00	0.00	0.00	0.00	0.00	1.99
Average	47.01	26.20	0.03	0.09	0.00	0.02	0.03	16.05	89.43	3.01	1.98	0.00	0.00	0.00	0.00	0.00	1.99
Std. Dev.	0.52	0.15	0.04	0.18	0.00	0.01	0.02	0.21	0.81								
Minimum	46.23	26.02	0.00	0.00	0.00	0.00	0.01	15.64	88.15								
Maximum	47.85	26.45	0.15	0.58	0.01	0.05	0.07	16.27	90.61								

Electron microprobe data for noélbensonite in drill core SLT-015.

Sample Number	Oxide (wt. %)								Cations calculated on the basis of 8O					
	SiO_2	Al_2O_3	Mn_2O_3	BaO	CaO	SrO	H_2O	Total	Si	Al	Mn	Ba	Ca	Sr
15-15O	27.63	0.23	36.28	24.09	1.89	1.79	8.22	100.12	2.02	0.02	2.02	0.69	0.15	0.08
15-15O	27.43	0.19	35.29	25.25	1.12	2.61	8.10	99.99	2.03	0.02	1.99	0.73	0.09	0.11
15-15O	27.19	0.22	35.39	27.39	1.00	1.56	8.09	100.85	2.02	0.02	2.00	0.80	0.08	0.07
15-15O	27.32	0.23	35.22	26.56	0.81	2.23	8.08	100.46	2.03	0.02	1.99	0.77	0.06	0.10
15-15O	27.62	0.20	34.20	26.42	2.01	1.44	8.09	99.97	2.05	0.02	1.93	0.77	0.16	0.06
15-15O	28.32	0.22	34.76	25.36	2.25	1.79	8.25	100.94	2.06	0.02	1.92	0.72	0.17	0.08
15-15O	28.20	0.16	35.15	25.44	1.63	1.53	8.20	100.30	2.06	0.01	1.96	0.73	0.13	0.06
15-15O	27.37	0.21	35.71	24.90	1.22	1.70	8.09	99.20	2.03	0.02	2.01	0.72	0.10	0.07
15-23A	26.06	0.28	34.78	29.88	0.38	1.36	7.89	100.62	1.98	0.03	2.01	0.89	0.03	0.06
15-23A	27.63	0.20	37.35	23.62	0.66	2.80	8.23	100.49	2.01	0.02	2.07	0.67	0.05	0.12
15-23B	27.55	0.22	34.42	26.83	0.85	2.63	8.07	100.57	2.05	0.02	1.95	0.78	0.07	0.11
15-23B	28.02	0.22	34.01	26.62	0.71	2.84	8.10	100.51	2.07	0.02	1.92	0.77	0.06	0.12
Average	27.53	0.22	35.21	26.03	1.21	2.02	8.12	100.33	2.03	0.02	1.98	0.75	0.10	0.09
Std. Dev.	0.58	0.03	0.93	1.66	0.60	0.56	0.10	0.47						
Minimum	26.06	0.16	34.01	23.62	0.38	1.36	7.89	99.20						
Maximum	28.32	0.28	37.35	29.88	2.25	2.84	8.25	100.94						

Electron microprobe data for paragonite in drill core SLT-015.

Sample number	Oxide (wt. %)										Cations calculated on the basis of 11O									
	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	K_2O	Na_2O	Cr_2O_3	Total	Si	Ti	Al	Fe	Mn	Mg	Ca	K	Na	Cr
15-09	49.11	0.00	37.30	0.41	0.04	0.03	0.02	0.51	5.35	0.00	92.77	3.18	0.00	2.84	0.02	0.00	0.00	0.00	0.04	0.67	0.00
15-09	48.82	0.00	37.46	0.37	0.04	0.01	0.05	0.38	5.21	0.00	92.33	3.17	0.00	2.86	0.02	0.00	0.00	0.00	0.03	0.66	0.00
15-09	49.11	0.00	37.55	0.44	0.06	0.04	0.03	0.42	5.53	0.02	93.19	3.16	0.00	2.85	0.02	0.00	0.00	0.00	0.03	0.69	0.00
15-09	47.97	0.01	37.84	1.36	0.10	0.03	0.04	0.51	5.24	0.03	93.12	3.11	0.00	2.89	0.07	0.01	0.00	0.00	0.04	0.66	0.00
15-09	48.95	0.00	37.63	0.53	0.06	0.05	0.01	0.39	5.07	0.03	92.72	3.16	0.00	2.87	0.03	0.00	0.00	0.00	0.03	0.64	0.00
15-09	48.63	0.00	37.45	0.25	0.07	0.02	0.02	0.43	5.46	0.04	92.36	3.16	0.00	2.87	0.01	0.00	0.00	0.00	0.04	0.69	0.00
Average	48.76	0.00	37.54	0.56	0.06	0.03	0.03	0.44	5.31	0.02	92.75	3.16	0.00	2.86	0.03	0.00	0.00	0.00	0.04	0.67	0.00
Std. Dev.	0.43	0.00	0.18	0.40	0.02	0.01	0.01	0.06	0.17	0.02	0.36										
Minimum	47.97	0.00	37.30	0.25	0.04	0.01	0.01	0.38	5.07	0.00	92.33										
Maximum	49.11	0.01	37.84	1.36	0.10	0.05	0.05	0.51	5.53	0.04	93.19										

Electron microprobe data for partridgeite in drill core SLT-015.

Sample Number	Oxide (wt. %)							Cations calculated on the basis of 3O					
	SiO_2	Al_2O_3	Fe_2O_3	Mn_2O_3	CaO	MgO	Total	Si	Al	Fe	Mn	Ca	Mg
15-15E	2.27	0.86	2.64	95.18	0.31	0.07	101.32	0.06	0.03	0.05	1.84	0.01	0.00
15-15E	2.28	0.62	3.34	96.11	0.28	0.05	102.68	0.06	0.02	0.06	1.84	0.01	0.00
15-15E	3.22	0.69	2.90	94.89	0.47	0.06	102.24	0.08	0.02	0.05	1.81	0.01	0.00
15-15E	1.47	0.64	3.07	97.00	0.19	0.03	102.40	0.04	0.02	0.06	1.87	0.01	0.00
15-15E	2.16	0.67	2.46	95.01	0.29	0.04	100.62	0.06	0.02	0.05	1.85	0.01	0.00
15-15E	2.11	0.47	3.67	95.24	0.31	0.04	101.85	0.05	0.01	0.07	1.84	0.01	0.00
Average	2.25	0.66	3.01	95.57	0.31	0.05	101.85	0.06	0.02	0.06	1.84	0.01	0.00
Std. Dev.	0.56	0.13	0.45	0.82	0.09	0.01	0.77						
Minimum	1.47	0.47	2.46	94.89	0.19	0.03	100.62						
Maximum	3.22	0.86	3.67	97.00	0.47	0.07	102.68						

Electron microprobe data for piemontite in drill core SLT-015.

Sample Number	Oxide (wt. %)												Cations calculated on the basis of 12.5O									
	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	Mn_2O_3	CaO	MgO	K_2O	Na_2O	Cr_2O_3	H_2O	Total	Si	Ti	Al	Fe	Mn	Ca	Mg	K	Na	Cr
15-11Cii	38.88	0.08	22.38	1.07	14.67	21.41	0.02	0.08	0.29	0.00	1.90	100.77	3.06	0.00	2.08	0.06	0.88	1.81	0.00	0.01	0.04	0.00
15-11Cii	38.33	0.06	22.16	1.23	14.88	21.31	0.01	0.04	0.27	0.00	1.89	100.17	3.04	0.00	2.07	0.07	0.90	1.81	0.00	0.00	0.04	0.00
15-11Cii	38.50	0.06	21.56	1.20	15.51	21.83	0.04	0.04	0.12	0.00	1.89	100.75	3.05	0.00	2.01	0.07	0.93	1.85	0.00	0.00	0.02	0.00
Average	38.57	0.06	22.03	1.17	15.02	21.52	0.02	0.05	0.23	0.00	1.89	100.56	3.05	0.00	2.05	0.07	0.90	1.82	0.00	0.01	0.03	0.00
Std. Dev	0.28	0.01	0.42	0.08	0.44	0.27	0.02	0.02	0.09	0.00	0.01	0.34										
Minimum	38.33	0.06	21.56	1.07	14.67	21.31	0.01	0.04	0.12	0.00	1.89	100.17										
Maximum	38.88	0.08	22.38	1.23	15.51	21.83	0.04	0.08	0.29	0.00	1.90	100.77										

Electron microprobe data for sérandite-pectolite group minerals in drill core SLT-015.

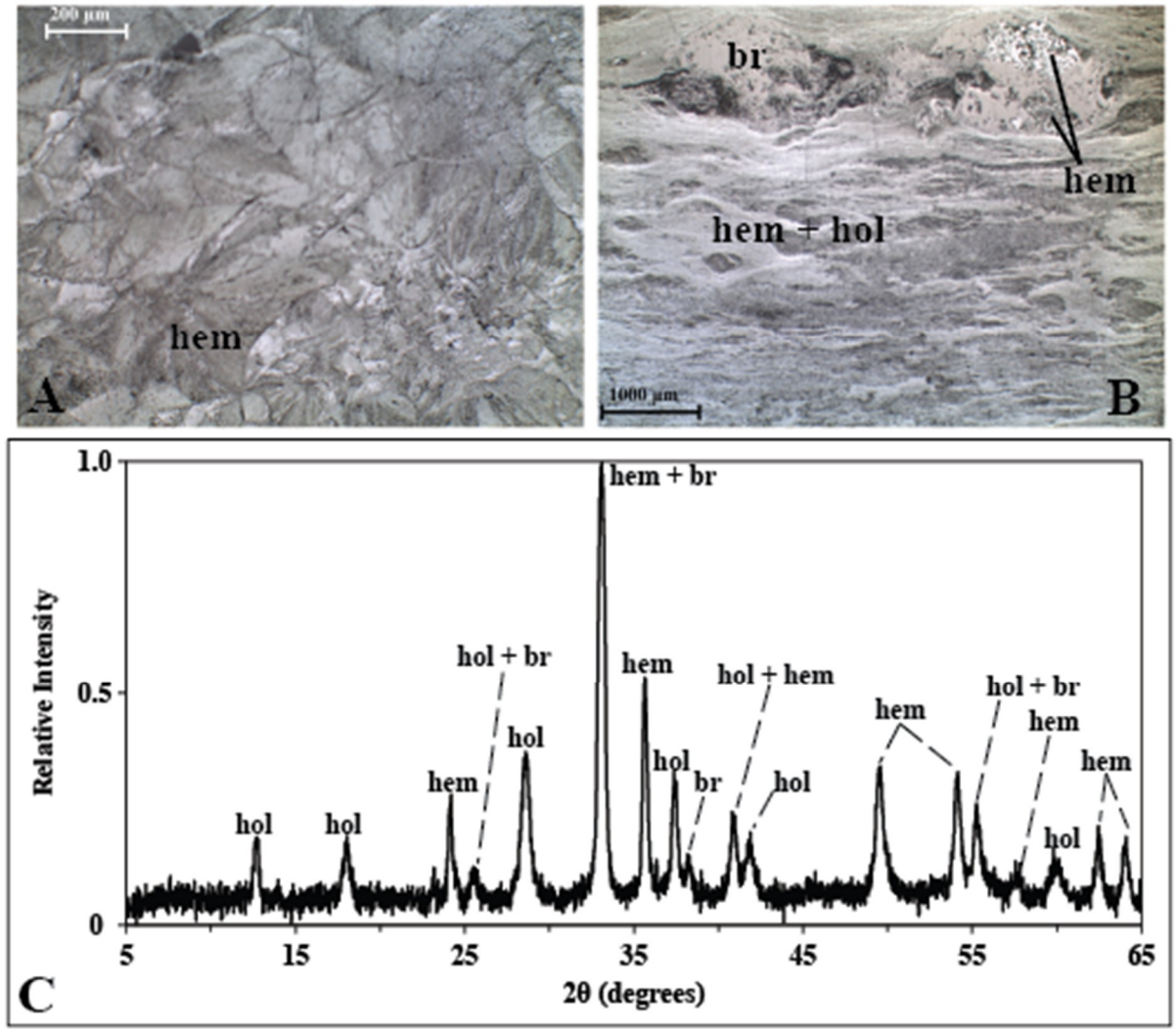
Sample number	Oxide (wt. %)										Cations calculated on the basis of 8.5 O								Per formula unit	
	SiO_2	Al_2O_3	FeO	MnO	MgO	K_2O	CaO	Na_2O	H_2O	Total	Si	Al	Fe	Mn	Mg	K	Ca	Na	Ca	Mn
15-15O	50.24	0.03	n.d	35.21	0.03	0.01	2.67	8.87	2.50	99.55	3.01	0.00	0.00	1.79	0.00	0.00	0.17	1.03	0.07	0.93
15-15O	49.99	0.00	n.d	37.60	0.00	0.00	1.18	9.03	2.50	100.30	3.00	0.00	0.00	1.91	0.00	0.00	0.08	1.05	0.03	0.97
15-15O	49.71	0.02	n.d	35.81	0.00	0.01	2.23	9.19	2.49	99.46	2.99	0.00	0.00	1.83	0.00	0.00	0.14	1.07	0.06	0.94
15-15I	51.20	0.01	0.25	22.05	0.03	0.00	14.84	9.39	2.58	100.34	2.97	0.00	0.01	1.08	0.00	0.00	0.92	1.06	0.40	0.60
15-15I	50.46	0.00	0.12	31.39	0.03	0.03	6.03	8.63	2.51	99.19	3.01	0.00	0.01	1.59	0.00	0.00	0.39	1.00	0.16	0.84
15-15I	50.58	0.03	0.10	29.55	0.00	0.03	7.65	8.55	2.52	99.01	3.01	0.00	0.01	1.49	0.00	0.00	0.49	0.99	0.21	0.79
15-15I	51.04	0.02	0.14	25.27	0.03	0.01	11.72	9.02	2.56	99.81	2.99	0.00	0.01	1.25	0.00	0.00	0.74	1.02	0.32	0.68
15-15I	50.78	0.00	0.07	36.88	0.00	0.03	1.88	8.62	2.53	100.79	3.01	0.00	0.00	1.85	0.00	0.00	0.12	0.99	0.05	0.95
15-15I	51.56	0.02	0.09	21.74	0.03	0.01	15.18	9.15	2.59	100.36	2.99	0.00	0.00	1.07	0.00	0.00	0.94	1.03	0.41	0.59
15-23B	50.72	0.01	0.07	26.59	0.00	0.02	10.38	8.80	2.53	99.12	3.00	0.00	0.00	1.33	0.00	0.00	0.66	1.01	0.28	0.72
15-23B	49.94	0.03	0.09	36.08	0.00	0.01	1.88	9.10	2.49	99.62	3.00	0.00	0.00	1.84	0.00	0.00	0.12	1.06	0.05	0.95
15-23B	50.29	0.00	0.00	35.55	0.00	0.03	2.09	9.03	2.50	99.49	3.02	0.00	0.00	1.81	0.00	0.00	0.13	1.05	0.06	0.94
15-23B	49.92	0.02	0.05	36.63	0.00	0.02	1.42	8.73	2.49	99.28	3.01	0.00	0.00	1.87	0.00	0.00	0.09	1.02	0.04	0.96
15-23B	49.55	0.00	0.00	36.42	0.01	0.02	2.02	9.05	2.48	99.54	2.99	0.00	0.00	1.86	0.00	0.00	0.13	1.06	0.05	0.95
15-23B	49.57	0.00	0.03	35.94	0.00	0.02	2.09	8.77	2.48	98.90	3.00	0.00	0.00	1.84	0.00	0.00	0.14	1.03	0.05	0.95
15-23B	50.72	0.01	0.07	26.59	0.00	0.02	10.38	8.80	2.54	99.13	3.00	0.00	0.00	1.33	0.00	0.00	0.66	1.01	0.28	0.72
15-23B	49.94	0.03	0.09	36.08	0.00	0.01	1.88	9.10	2.50	99.63	3.00	0.00	0.00	1.84	0.00	0.00	0.12	1.06	0.05	0.95
15-23B	50.29	0.00	0.00	35.55	0.00	0.03	2.09	9.03	2.50	99.49	3.02	0.00	0.00	1.81	0.00	0.00	0.13	1.05	0.06	0.94
15-23B	49.92	0.02	0.05	36.63	0.00	0.02	1.42	8.73	2.49	99.28	3.01	0.00	0.00	1.87	0.00	0.00	0.09	1.02	0.04	0.96
15-23B	49.55	0.00	0.00	36.42	0.01	0.02	2.02	9.05	2.49	99.55	2.99	0.00	0.00	1.86	0.00	0.00	0.13	1.06	0.05	0.95
15-23B	49.57	0.00	0.03	35.94	0.00	0.02	2.09	8.77	2.48	98.90	3.00	0.00	0.00	1.84	0.00	0.00	0.14	1.03	0.05	0.95
15-11B	53.67	0.00	0.08	1.31	0.00	0.02	31.94	9.21	2.68	98.91	3.01	0.00	0.00	0.06	0.00	0.00	1.92	1.00	0.96	0.04
15-23A	50.23	0.02	0.03	35.51	0.02	0.00	2.25	9.15	2.50	99.71	3.01	0.00	0.00	1.80	0.00	0.00	0.14	1.06	0.06	0.94
15-23A	50.00	0.00	0.01	35.57	0.00	0.00	2.25	9.04	2.49	99.36	3.01	0.00	0.00	1.81	0.00	0.00	0.15	1.05	0.06	0.94
15-11Cii	53.33	0.07	0.05	11.61	0.03	0.05	24.09	9.47	2.68	101.39	2.99	0.00	0.00	0.55	0.00	0.00	1.45	1.03	0.67	0.33
15-11Cii	53.64	0.02	0.00	1.08	0.02	0.01	32.30	9.39	2.68	99.14	3.00	0.00	0.00	0.05	0.00	0.00	1.94	1.02	0.97	0.03
15-11Cii	53.25	0.00	0.01	13.28	0.02	0.01	21.68	9.15	2.65	100.05	3.02	0.00	0.00	0.64	0.00	0.00	1.32	1.01	0.62	0.38
15-11Cii	54.24	0.01	0.00	2.81	0.03	0.04	31.28	9.36	2.71	100.46	3.00	0.00	0.00	0.13	0.00	0.00	1.86	1.00	0.92	0.08
15-11Cii	54.18	0.01	0.02	4.50	0.02	0.00	30.07	8.96	2.70	100.47	3.01	0.00	0.00	0.21	0.00	0.00	1.79	0.96	0.87	0.13
Average	50.97	0.01	0.06	27.44	0.01	0.02	9.62	9.00	2.55	99.66	3.00	0.00	0.00	1.39	0.00	0.00	0.59	1.03		

Minimum	49.55	0.00	0.00	1.08	0.00	0.00	1.18	8.55	2.48	98.90
Maximum	54.24	0.07	0.25	37.60	0.03	0.05	32.30	9.47	2.71	101.39

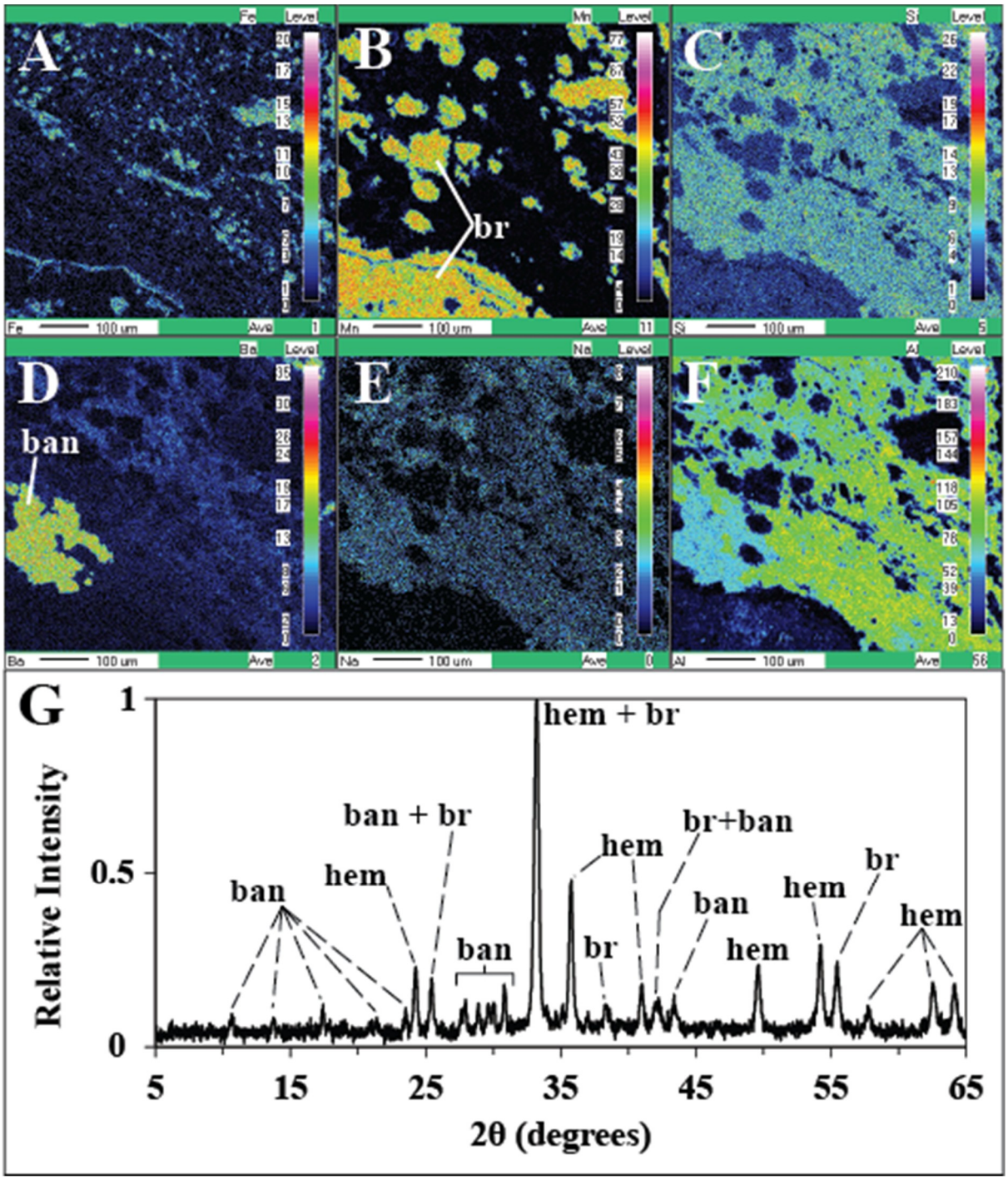
Electron microprobe data for witherite in drill core SLT-015.

Sample Number	Oxide (wt. %)								Cations calculated based on 1 CO_3					
	MgO	FeO	MnO	BaO	CaO	SrO	CO2	Total	Mg	Fe	Mn	Ba	Ca	Sr
15-23A	0.04	0.02	0.00	75.25	0.00	0.80	23.00	99.11	0.00	0.00	0.00	0.98	0.00	0.02
15-23A	0.00	0.00	0.01	75.97	0.01	0.74	22.30	99.03	0.00	0.00	0.00	0.99	0.00	0.01
15-23A	0.00	0.00	0.00	76.77	0.00	0.41	22.20	99.38	0.00	0.00	0.00	0.99	0.00	0.01
15-23A	0.00	0.02	0.03	76.37	0.00	0.57	22.22	99.21	0.00	0.00	0.00	0.99	0.00	0.01
15-23A	0.00	0.00	0.03	75.22	0.01	0.63	23.30	99.18	0.00	0.00	0.00	0.99	0.00	0.01
15-23A	0.05	0.00	0.04	76.17	0.01	0.51	22.80	99.58	0.00	0.00	0.00	0.99	0.00	0.01
15-23A	0.00	0.05	0.00	75.05	0.00	1.05	23.00	99.16	0.00	0.00	0.00	0.98	0.00	0.02
15-23A	0.00	0.00	0.00	75.00	0.02	0.89	23.10	99.01	0.00	0.00	0.00	0.98	0.00	0.02
15-23A	0.00	0.00	0.00	75.62	0.02	0.81	22.70	99.15	0.00	0.00	0.00	0.98	0.00	0.02
15-23A	0.00	0.03	0.00	77.54	0.00	0.93	22.00	100.51	0.00	0.00	0.00	0.98	0.00	0.02
Average	0.01	0.01	0.01	75.90	0.01	0.73	22.66	99.33	0.00	0.00	0.00	0.98	0.00	0.01
Std. Dev.	0.02	0.02	0.02	0.83	0.01	0.20	0.45	0.45						
Minimum	0.00	0.00	0.00	75.00	0.00	0.41	22.00	99.01						
Maximum	0.05	0.05	0.04	77.54	0.02	1.05	23.30	100.51						

Figures



Reflected light photomicrographs and XRD spectrum showing matrix composition in the massive ferromanganiferous ore unit. A. Massive crystalline hematite (hem) (sample 15-15A). B. Laminated cryptoplaty hematite and hollandite (hol) in sample 15-13. Laterally discontinuous laminae wrap around braunite(br)-rich (with microplaty hematite) clasts. C. Whole rock powder XRD spectrum of matrix showing presence of hollandite, braunite and hematite (sample 15-13).



Element distribution and mineralogy in SLT-017 ferromanganese ore (Sample 17-18 unless otherwise stated; scales are in counts per second). A. Iron distribution. B. Manganese distribution outlining braunite (br) occurrences. C. Silicon distribution. D. Barium distribution outlining banalsite (ban) occurrence. E. Sodium distribution. F. Aluminum distribution. G. Whole rock powder XRD spectrum of sample 17-16 showing the presence of hematite (hem), braunite and banalsite.

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