Mineral Resources Tasmania

Laboratory Report
LJN2020-102

MINERALOGICAL ANALYSES, RHODONITE ETC

An unpublished Mineral Resources Tasmania Report for:

RSB

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Date: 17 October 2022

Mineral Resources Tasmania
Department of State Growth

Tasmanian Government

SUMMARY

Four pink minerals thought to be either rhodonite or bustamite, from Broken Hill, were analysed. The coarsely crystalline bustamite with sphalerite has a composition about: $(Ca_{0.8}Mn_{0.2})(Mn_{0.9}Fe_{0.1})Si_2O_6$. The fibrous/bladed bustamite has a composition about: $(Ca_{0.9}Mn_{0.1})(Mn_{0.9}Fe_{0.1})Si_2O_6$. The bladed rhodonite with ilvaite has a composition about: $Ca(Mn_{3.5}Fe_{0.5})Si_2O_6$. The ilvaite itself occurs with the rhodonite and has a composition about: $Ca(MnFe_2)Si_2O_{8(}OH)$, indicating it is manganilvaite.

.INTRODUCTION

Some rhodonite analysed from Tasmania were found to be not this mineral (Bottrill, et al., 2018a, b), and so some samples from Broken Hill were tested also. Details are given in Table 1.

Table 1: Sample details.

Field No	Location	Description	Process
R766	Broken Hill	Bustamite + Sphalerite	SEM
R770	Broken Hill	Bustamite, fibrous	SEM
R1868	Broken Hill	Rhodonite + ilvaite	SEM

PROCESS

The samples were examined under stereomicroscopy, broken up and sub-sampled selectively. The subsamples were mounted on 12mm diameter Al stubs and were C-coated and viewed and analysed by high magnification Scanning Electron Microscopy (SEM) in the CSL laboratories, University of Tasmania (appendix 1).

DESCRIPTIONS AND PHOTOS

Fig. 1. R766 coarse, rounded crystals of medium pink bustamite to about 25mm long, with sphalerite and calcite. FOV ~90mm.

Fig. 2. R770: coarse grained, bladed and fibrous bustamite, plus “sturtite”. FOV ~40mm.

Fig. 3. R1868: Pink, bladed rhodonite plus black ilvaite. FOV ~45mm.

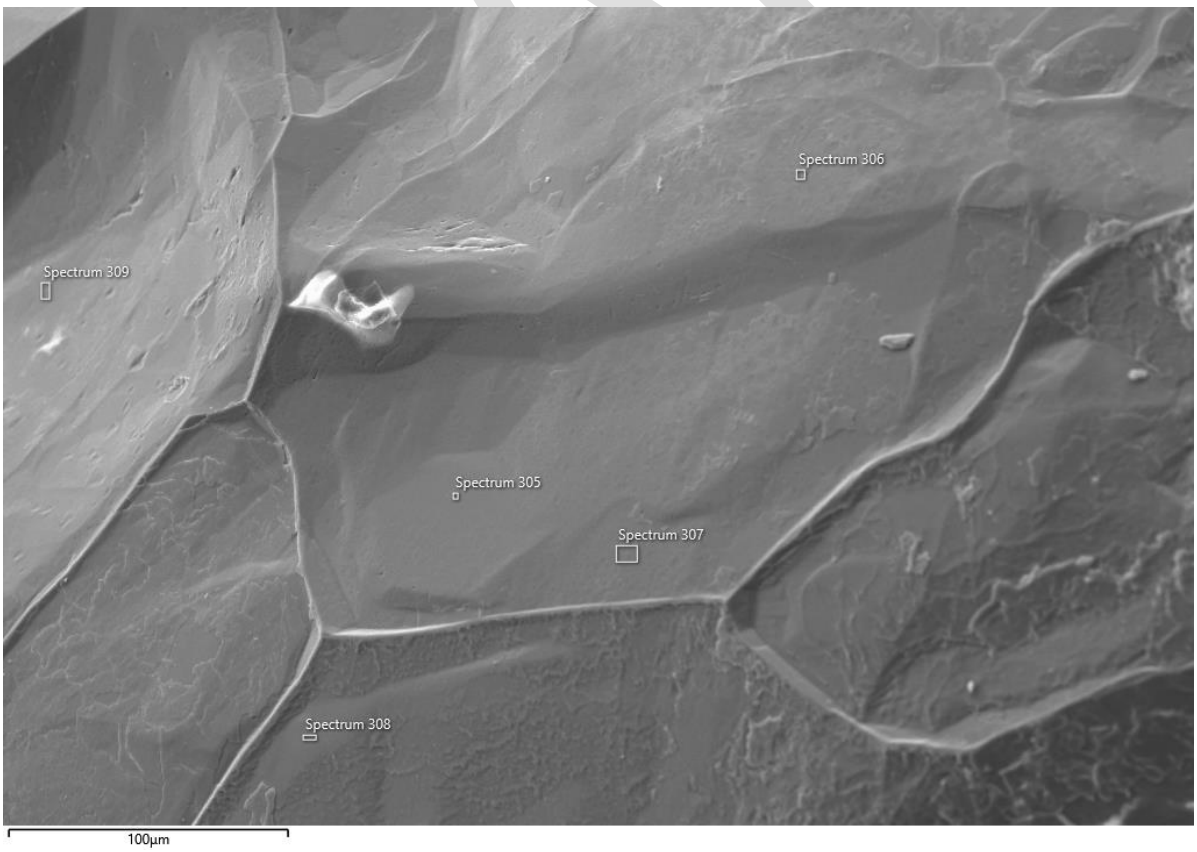

Fig. 4 R766: showing contact growth features from the granoblastic texture, on bustamite.

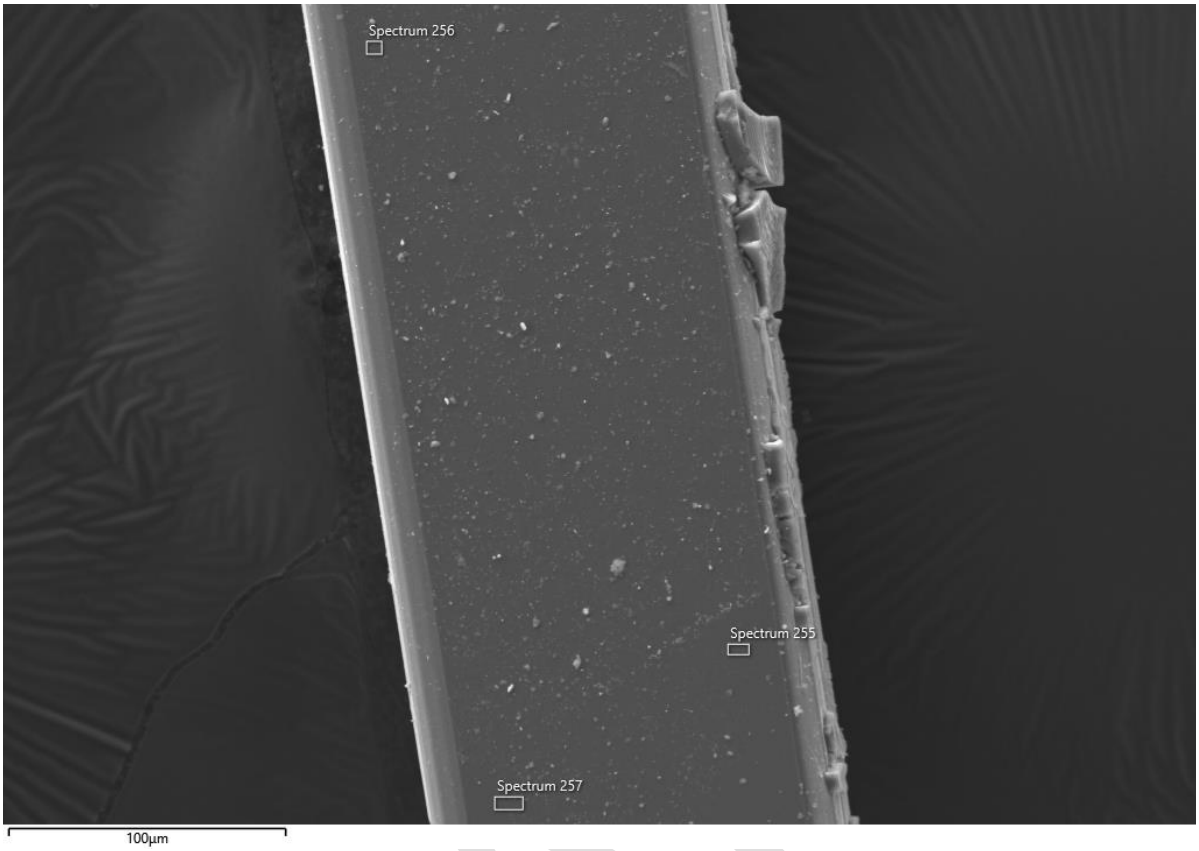

Fig. 5. R770: Blade of bustamite.

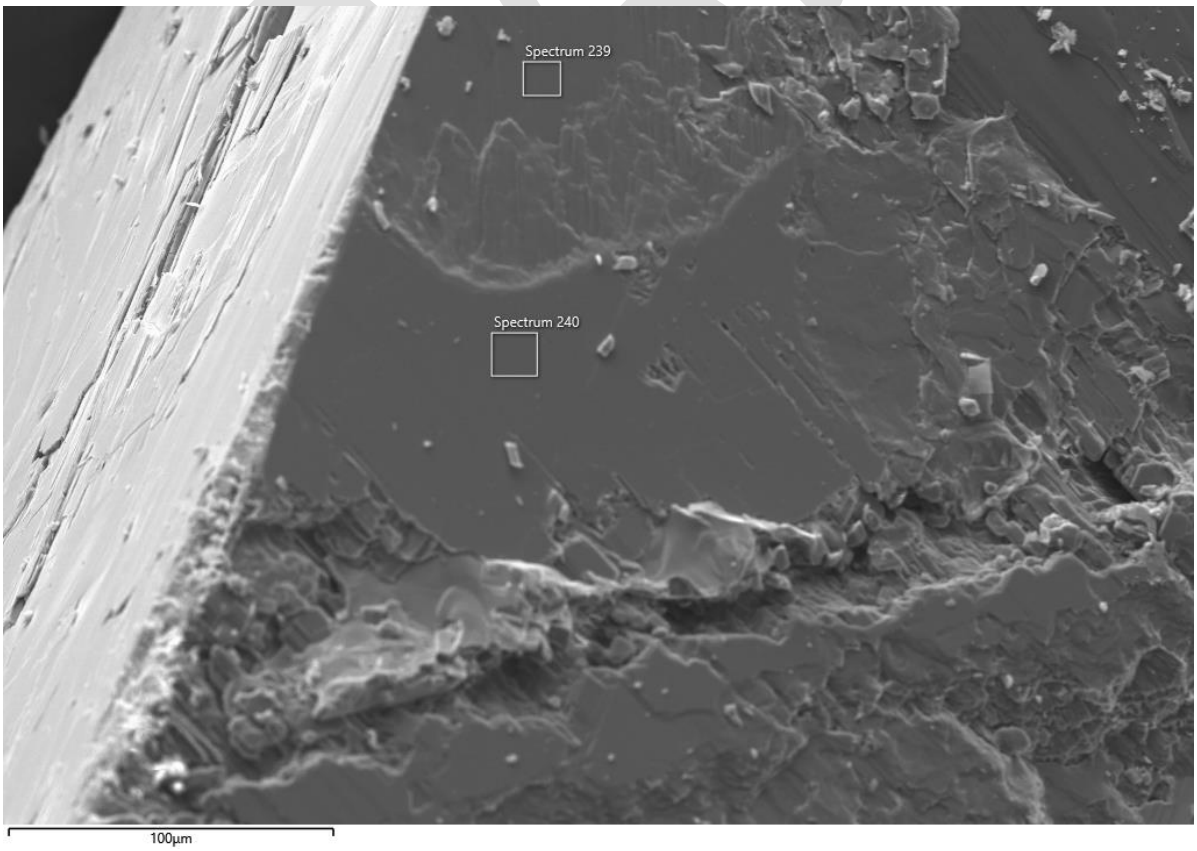

Fig. 6 R1868: Rhodonite

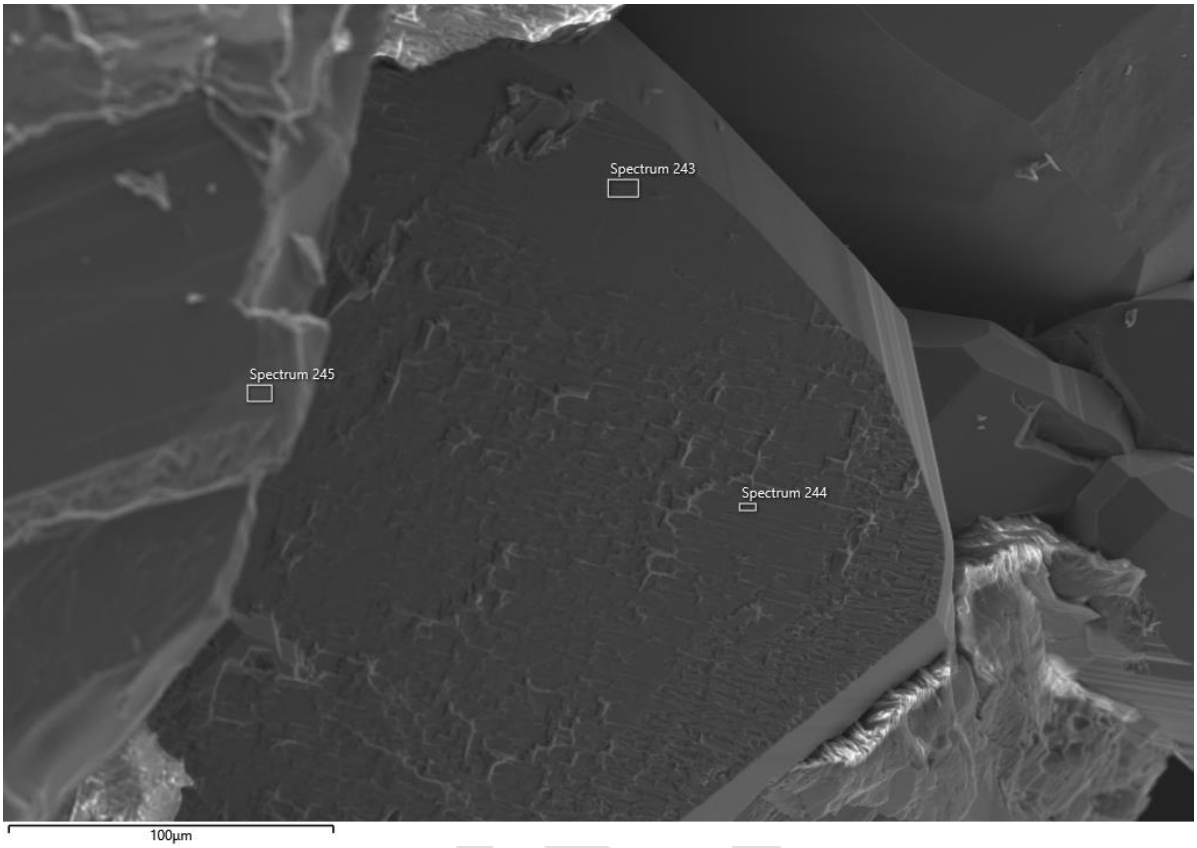

Fig. 7 R1868: Rhodonite

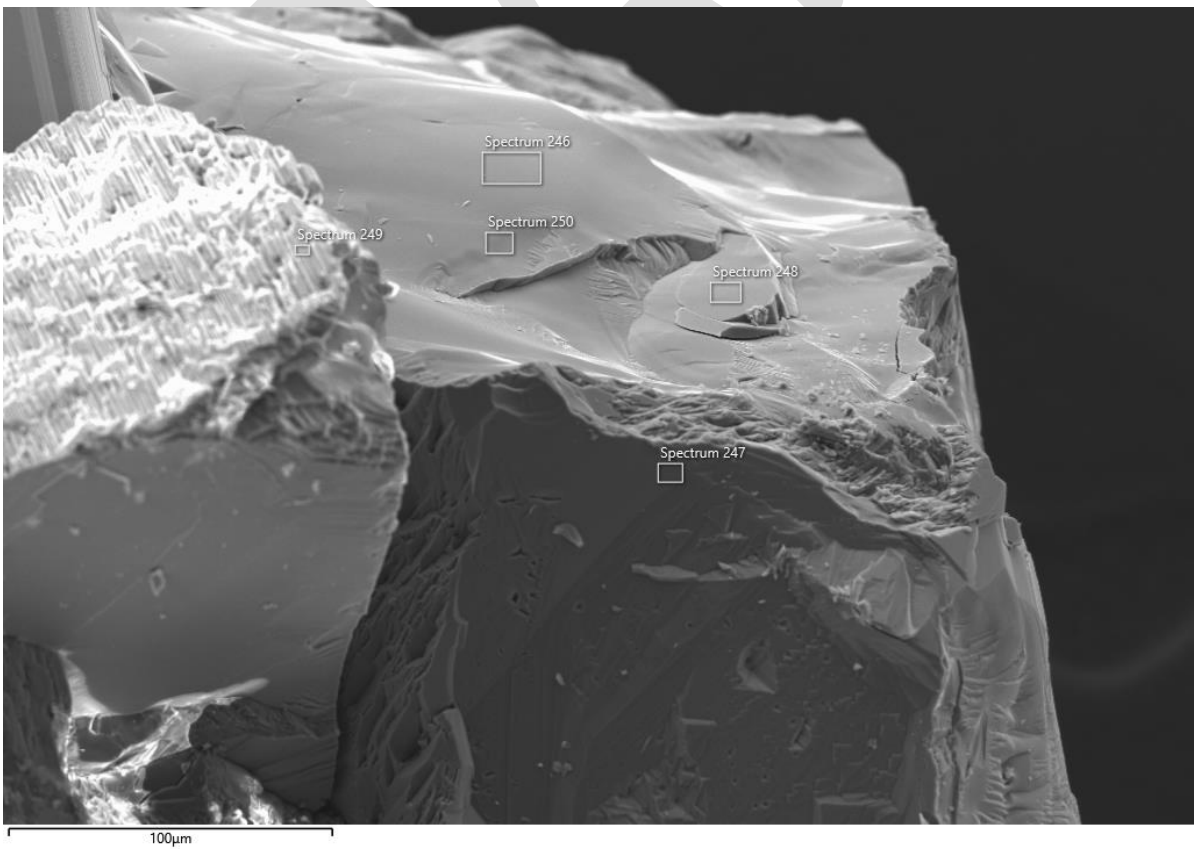

Fig. 8 R1868: Ilvaite

SEM ANALYSES

The samples were micro-analysed by SEM-EDS to determine the mineral composition, and results given in Appendix 1. The analytical conditions are shown in Appendix 2.

R766

The coarse bustamite has a composition about: $(Ca_{0.8}Mn_{0.2})(Mn_{0.9}Fe_{0.1})Si_2O_6$.

R770:

The fibrous bustamite has a composition about: $(Ca_{0.9}Mn_{0.1})(Mn_{0.9}Fe_{0.1})Si_2O_6$.

R1868:

The bladed rhodonite has a composition about: $Ca(Mn_{3.5}Fe_{0.5})Si_2O_6$.
The ilvaite has a composition about: $Ca(MnFe_2)Si_2O_{8(}OH)$, indicating it is manganilvaite.

References

Bottrill, RS, Goemann K. , and Woolley R.N. 2018. Mineralogical Analyses, Rosebery. Mineralogical/Petrology Report. LJN2018-134

Bottrill, RS, Goemann K. , and Unwin, L. 2018. Mineralogical Analyses, Andersons Ck. Mineralogical/Petrology Report. LJN2018-084a

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LABORATORY DETAILS

Mineral Resources Tasmania (MRT) operates a laboratory facility at its offices at Rosny Park and Mornington, Tasmania. In the interests of full disclosure, these laboratories do not have NATA accreditation. However, all tests are performed according to relevant Australian Standards cited in the report and subject to internal peer review processes. The analytical facilities at MRT are periodically compared against other similar laboratories in other jurisdictions with favourable results.

DISCLAIMERS

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These analyses collected in the MRT laboratories, along with some other data on the samples submitted, may enter the MRT databases but every attempt will be made to ensure the data remains closed file and not be available externally, except at your request.

Appendix 1: Laboratory Report –SEM analytical conditions

Hitachi SU-70 analytical field emission SEM

- Installed February 2011
- Schottky thermal field emission source
- ultra-high resolution (1.0 nm @ 15kV, 1.6 nm @ 1kV for SE imaging)
- high vacuum operation only (i.e. no variable pressure in chamber)
- Hitachi in-chamber and in-lens scintillation detectors, Super ExB filter, beam deceleration
- Hitachi in-chamber 5-segment solid state BSE detector, retractable
- in-column Faraday cup with picoammeter for beam current measurement
- anticontamination cold plate, liquid nitrogen cooled
- 5 axis motorised fully eucentric stage, XYZ range 110x110x40mm
- Oxford AZtec EDS/EBSD system with
    - X-Max 80 SDD EDS, MnKa 125 eV resolution, elements B-U, large area hyperspectral mapping, standardless and standards-based quantification, feature analysis
    - HKL NordlysNano EBSD camera & forescatter detector system, HKL & Channel 5 software packages, Synergy EDS/EBSD integration, HKL, ICSD & American Mineralogist phase databases
- NEW June 2017: Gatan ChromaCL2 colour cathodoluminescence imaging system with integrated BSE detector, Digital Micrograph 3 software, automated mosaic acquisition, simultaneous acquisition of SE, iBSE and colour CL images.

Label:	am 179
Element List Type:	Current Spectrum
Processing Option:	All Elements
Specimen Coating:	On
Beam Calibration Element Coating:	Off
Coating Element:	Carbon
Coating Thickness:	20 nm
Coating Density:	2.25 g/cm³
Automatic Line Selection:	Disabled
Normalization:	Enabled
Thresholding:	Sigma level = 1
Detector Window Correction:	Enabled
Deconvolution Elements:	None
Selected Standards:	Minerals_15kV_2017-10-20 [User]
Pulse Pile Up Correction:	Succeeded
Detector file:	X-Max 3
Efficiency:	File based

Appendix 2: Laboratory Report –SEM Analyses

Client: R Bottrill
Sample Location: Broken Hill
Job Number: LJN2020-102
Analyses: Mineral chemistry
Methods: SEM-EDS
Analyst: R Bottrill & J Renaud
Lab Manager: R Bottrill
Date: 30/9/20

EDS Analyses
(relative atomic proportions)

Table 1: R0766, Atomic ratios, sum to 4 cations.

Spectrum	Mg	Al	Si	Ca	Mn	Fe	Mineral
Spectrum 305	0.0	0.1	2.1	0.7	1.0	0.1	bustamite
Spectrum 306	0.0	0.1	2.1	0.7	1.0	0.1	bustamite
Spectrum 307	0.0	0.0	2.1	0.7	1.0	0.1	bustamite
Spectrum 308	0.0	0.0	2.0	0.8	1.0	0.1	bustamite
Spectrum 309	0.0	0.0	2.0	0.7	1.0	0.1	bustamite
Spectrum 310	0.0	0.0	2.0	0.8	1.0	0.2	bustamite
Spectrum 311	0.0	0.0	2.0	0.8	1.0	0.2	bustamite

Table 2: R0770, Atomic ratios, sum to 4 cations.

Spectrum	Si	Ca	Mn	Fe	Mineral
Spectrum 251	2.0	0.9	0.9	0.3	bustamite
Spectrum 252	2.0	0.9	0.9	0.2	bustamite
Spectrum 253	2.0	0.9	0.9	0.3	bustamite
Spectrum 254	2.0	0.9	0.9	0.3	bustamite
Spectrum 255	2.0	0.9	0.9	0.3	bustamite
Spectrum 256	2.0	0.9	0.9	0.3	bustamite
Spectrum 257	2.0	0.9	0.9	0.3	bustamite

Table 3: R1868, atomic rations, sum to 10 cations.

Spectrum Label	Si	Ca	Mn	Fe	Mineral
Spectrum 237	0.0	1.0	0.0	0.0	fluorite
Spectrum 238	4.6	0.2	4.3	0.9	Rhodonite
Spectrum 239	5.2	1.0	3.3	0.4	Rhodonite
Spectrum 240	5.2	1.0	3.4	0.4	Rhodonite
Spectrum 241	5.3	1.0	3.3	0.4	Rhodonite
Spectrum 242	5.3	1.0	3.3	0.4	Rhodonite
Spectrum 249	5.4	1.0	3.4	0.2	Rhodonite

Table 3: R1868, atomic rations, sum to 6 cations.

Spectrum Label	Si	Ca	Mn	Fe	Mineral
Spectrum 246	2.3	0.9	0.7	2.0	Ilvaite
Spectrum 248	2.3	0.9	0.7	2.1	Ilvaite
Spectrum 250	2.2	1.0	0.8	2.0	Ilvaite