

Mineral Resources Tasmania

Mineralogical/Petrology Report

LJN2021-077

# MINERALOGICAL ANALYSES, MT HOUSETOP



An unpublished Mineral Resources  
Tasmania Report for:

**M. Latham**

**By:** R.S. Bottrill, L Unwin

**Date:** 17/8/2021

## SUMMARY

*The sample contains tabular blue-grey pseudomorphs of Nb-rich anatase and rutile, probably after titanite, in quartz.*

## INTRODUCTION

One mineral sample (comprising several related specimens) was received from Mathew Latham, for mineralogical analysis. Sample details are shown in Table 1. As it visually appeared to contain rare minerals not well described in Tasmania it was selected for a detailed mineralogical study.

**TABLE 1: SAMPLE DETAILS.**

Reg. No	Location	Description
C113539	Mt Housetop, Natone	Blue-grey mineral in quartz

## PROCESSES

The sample was first examined by pXRF (unrecorded), and high Ti and Nb were detected in bluish-grey crystals. Therefore, some small representative pieces of the sample were extracted; some of which were milled for X-ray diffraction analysis and other parts mounted on Al stubs for SEM/EDS analysis in the CSL.

## SAMPLE DESCRIPTIONS

The sample contains tabular, dull blue-grey crystals in quartz, up to about 10mm across (Figs. 1 - 2). Under higher magnification the samples appear to be granular pseudomorphs comprising very fine blue-grey crystals.



*Fig. 1: Sample C113539 , showing a blue-grey crystal of Ti-oxides (Ti) in white to smoky quartz. FOV: about 30 mm.*

## **SEM/EDAX ANALYSES**

The sample was analysed by SEM-EDS, in the CSL, University of Tasmania, with analytical conditions shown in Appendix 1. The results are given in Appendix 2 and summarised below.

The sample is an aggregate of bladed squarish crystals, probably anatase, with some smaller, more equant/complex crystals, probably rutile (Fig. 2). Both contain very high Ti (16 - 42 at. %) and elevated amounts of Nb (0.1 - 0.5 at. %) (Appendix 2). Associated minerals include silica (probably Quartz, EDS data unrecorded) and one spot was high in Fe, Al and Si, and may be a clay (nontronite?).

## **XRD ANALYSES**

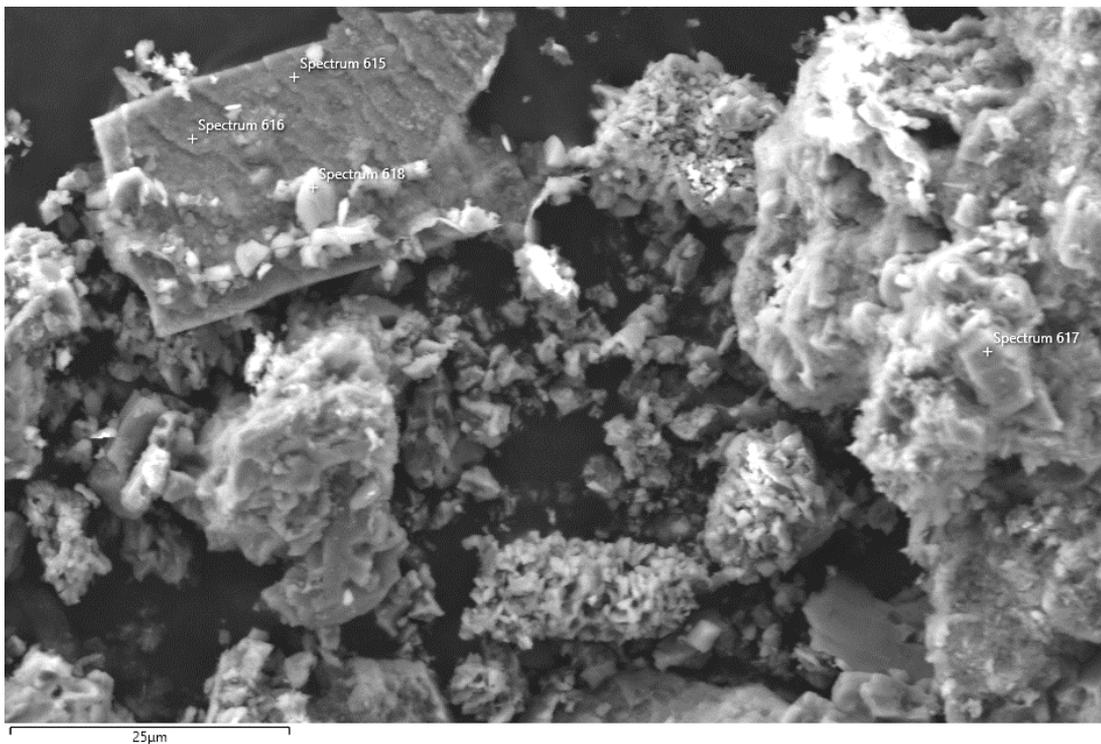
The samples were run on a Rigaku Miniflex 600 X-Ray Diffractometer system: a 600W generator 150mm goniometer with a Cu tube; 40kV/15mA, sample spinner and a Scintillation counter (SC) with Be window, 3° to 63° 2Theta scanning range and 3° – 63° 2Theta measuring range, a scanning speed of 0.02° /min, a graphite

monochromator and a K $\beta$  Ni- filter. The analysis software used is the PDXL2 using the ICCD database.

Due to the relatively small amounts (~100 mg) of material available for analysis, the sample powder was spread over a special oriented, low background silicon plate with low response to X-rays.

Quantification is largely manual, using a series of prepared standards of the more common minerals to enable some semi-quantitative analysis. Our semi-quantitative results are calculated using single-peak calibration factors derived from scans of known mixtures of minerals.

The results are shown in Appendix 1, and indicates anatase, minor rutile and quartz.



*Fig. 2. C113539 Bladed anatase crystals, with some more equant/granular crystals, probably rutile. Backscattered electron image (BSE).*

## DISCUSSION

The sample is an aggregate of bladed squarish crystals, probably anatase, with some smaller, more equant/complex crystals, probably rutile. They are both unusually Nb-rich, and probably pseudomorph titanite, or less likely ilmenite.

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## **Disclaimers**

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## 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
- 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
Processing Option:	All Elements
Specimen Coating:	On
Beam Calibration Element Coating:	Off
Coating Element:	Carbon
Coating Thickness:	20 nm
Coating Density:	2.25 g/cm <sup>3</sup>
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

# Mineral Resources Tasmania

## Appendix 2: Laboratory Report –SEM Analyses

**Client:** M Latham

**Sample Location:** Mt Housetop

**Job Number:** LJN2021-077

**Analyses:** Mineral chemistry

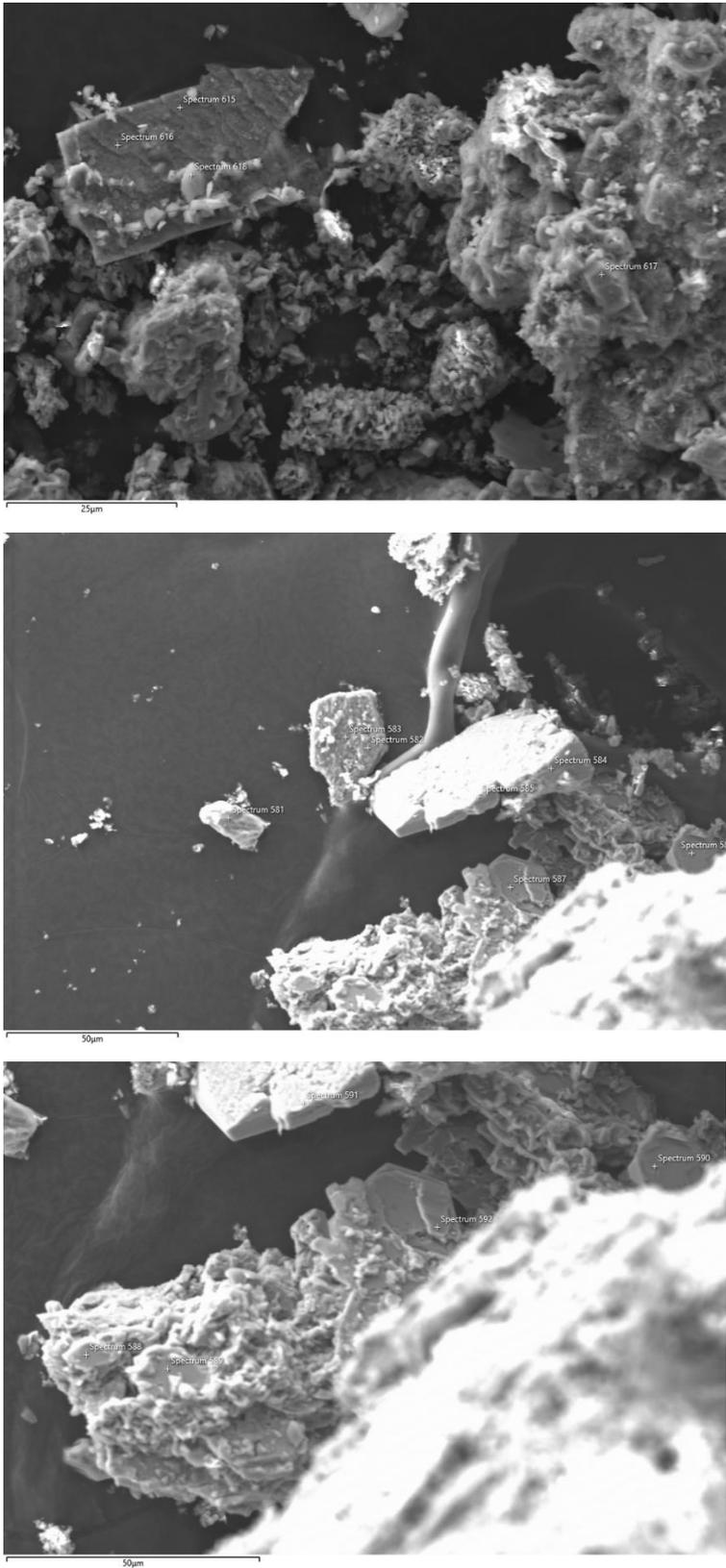
**Methods:** SEM-EDS

**Analyst:** R Bottrill

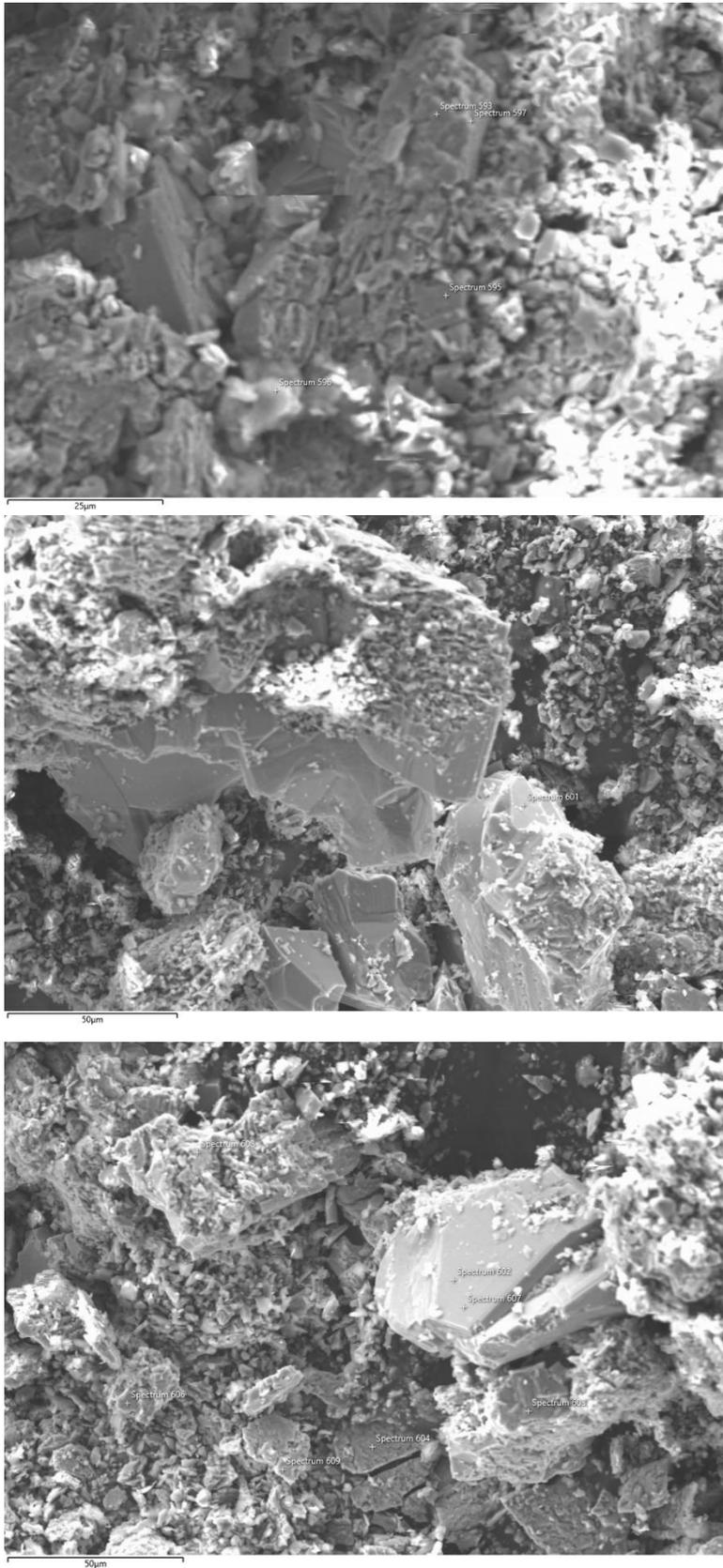
**Date:** 11/8/2021

**Table 1: C113539 EDS analyses (at. %).**

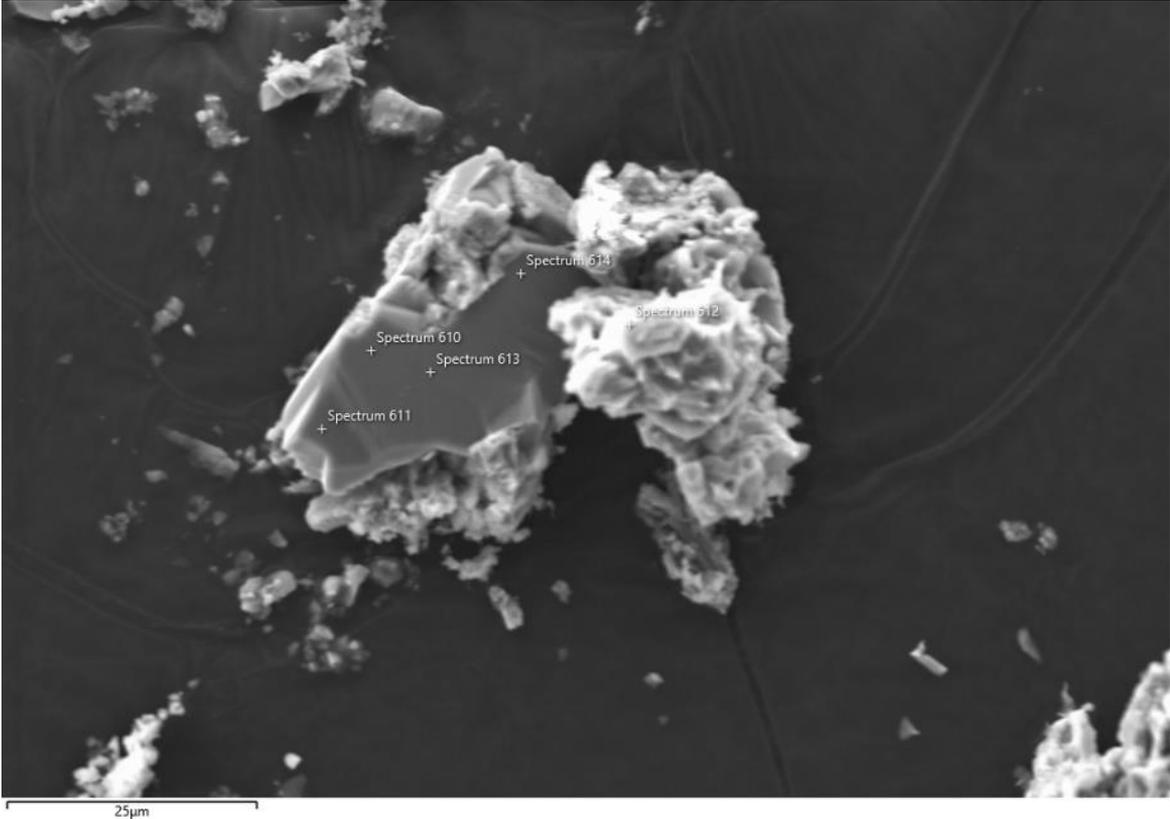
Label	O	Al	Si	K	Ca	Ti	Fe	Nb	Total
582	67.5	0.1	0.32			31.2	0.5	0.3	100
583	68.3	0.1	0.59			30.2	0.5	0.3	100
584	56.8	0.1	0.38			42	0.5	0.3	100
585	73.1	0.1	0.27			25.9	0.4	0.3	100
587	72.2		0.13			26.1	1.5	0.1	100
588	75.5		0.18			23.4	0.5	0.3	100
589	76.5		0.18			22.1	1	0.2	100
591	78.2	0.1	0.25			20.8	0.4	0.2	100
592	74.9	0.1	0.15			23.7	1	0.2	100
593	69.4		0.26			29.9	0.3	0.2	100
595	57.0	0.1	0.55			41.6	0.4	0.3	100
597	77.2	0.1	2.14			20.3	0.2	0.1	100
601	80.7	0.2	0.76			17.9	0.3	0.1	100
602	77.3	0.1	0.23			22.3		0.2	100
603	68.0		0.49		0.1	31.1	0.2	0.2	100
604	71.2	1.1	1.32	0.2		25.8	0.2	0.2	100
607	77.7		0.23			21.9		0.2	100
608	77.4	0.1	0.75			21.3	0.3	0.2	100
609	75.9		0.18			23.6	0.1	0.2	100
610	67.2					32.2	0.3	0.3	100
611	65.2		0.29		0.1	34		0.4	100
612	82.9		0.46			16.2	0.2	0.2	100
613	67.1	0.1	0.14			32	0.4	0.3	100
614	62.3		0.23			37	0.2	0.3	100
615	75.0	0.7	0.74	0.1		23	0.3	0.3	100
616	74.5	0.2	0.39			24.5	0.2	0.2	100
617	59.5		0.23			39.6	0.2	0.5	100



**Fig. 1: Electron micrographs with sample points: C113539**



**Fig. 2: Electron micrographs with sample points: C113539**



**Fig. 3: Electron micrographs with sample points: C113539**

## Appendix 1: Laboratory Report: XRD Analyses

**XRD RESULTS-G409731-LJN2021-077-LATHAM-20/8/2021**

### General Information

Measurement date:	19/8/2021	Interpretative date:	20/8/2021
Job Number/Client:	LJN2021-077 Latham	XRD	Rigaku Miniflex 600
Registration Number:	G409731	Analyst:	LUnwin
Quantitative Method:	Mineralogy	Process Medium:	Wholerock
Sample Holder:	Low Reflectance	Speed (deg/min):	0.5
Comment:	Shifted -0.05, Quartz added for Calibration		

### Analysis Results

Phase name	Formula
Anatase	TiO <sub>2</sub>
Rutile	TiO <sub>2</sub>

#### Notes

Quartz was added so not measured. The relative amounts of anatase and rutile were not analysed, but likely anatase is >> rutile.

Peak overlap may interfere with identifications and quantitative calculations.

Amorphous minerals and minerals present in trace amounts may not be detected.

### Peak List

No.	2-theta(deg)	d(ang.)	Phase name	Rel. int. I(a.u.)
1	20.838(4)	4.2594(8)	Quartz(1,0,0)	19.63
2	25.263(4)	3.5224(6)	Anatase(1,0,1)	8.33
3	26.623(3)	3.3456(3)	Quartz(0,1,1)	100.00
4	27.399(18)	3.253(2)	Rutile(1,1,0)	0.75
5	36.04(2)	2.4903(15)	Rutile(1,0,1)	0.56
6	36.504(4)	2.4595(3)	Quartz(1,1,0)	7.57
7	36.864(13)	2.4363(9)	Anatase(1,0,3)	0.42
8	37.726(4)	2.3826(2)	Anatase(0,0,4)	1.25
9	38.496(6)	2.3366(3)	Anatase(1,1,2)	0.47
10	39.423(3)	2.28383(1)	Quartz(1,0,2)	6.27
11	40.246(6)	2.2390(3)	Quartz(1,1,1)	2.88
12	42.417(5)	2.1293(2)	Quartz(2,0,0)	4.81
13	45.742(7)	1.9819(3)	Quartz(2,0,1)	3.06
14	47.951(9)	1.8957(3)	Anatase(2,0,0)	2.58
15	50.106(5)	1.81907(1)	Quartz(1,1,2)	12.05
16	53.81(4)	1.7023(11)	Anatase(1,0,5)	2.33
17	54.868(5)	1.67191(1)	Quartz(0,2,2),Anatase(2,1,1)	5.36
18	55.277(5)	1.66052(1)	Quartz(0,1,3)	1.01
19	59.914(3)	1.54261(8)	Quartz(1,2,1)	8.83

## Phase Data Pattern

