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STELLAR RESOURCES LIMITED

# Saint Dizier Metallurgical Testwork 2014 Progress Report

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**Minerals, Metals & Chemicals**

Level 12, 333 Collins Street

Melbourne VIC 3000

Australia

Telephone: +61 3 8676 3500

Facsimile: +61 3 8676 3505

[www.worleyparsons.com](http://www.worleyparsons.com)

ABN 61 001 279 812

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## SYNOPSIS

This report outlines the metallurgical testwork completed on samples collected from the Saint Dizier exploration lease, EL46/2003, over the calendar year 2014. A metallurgical testwork program was undertaken on samples collected from the lease for the purposes of preliminary scoping/concept level flowsheet development, and preliminary assessment of potentially achievable metallurgical performance.

At the time of writing the program was still in progress, with results, interpretation and reporting for the overall program yet to be finalised. As such this report only presents those results available at the time of writing.

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### PROJECT 201010-00575 - SAINT DIZIER METALLURGICAL TESTWORK

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REV	DESCRIPTION	ORIG	REVIEW	WORLEY-PARSONS APPROVAL	DATE	CLIENT APPROVAL	DATE
A	Issued for review	J Resta		N/A	15 Jan 15	N/A	



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## **1 INTRODUCTION**

This report outlines the metallurgical testwork completed on samples collected from the Saint Dizier exploration lease, EL46/2003, over the calendar year 2014. A metallurgical testwork program was undertaken on samples collected from the lease for the purposes of preliminary scoping/concept level flowsheet development, and preliminary assessment of potentially achievable metallurgical performance.

The current metallurgical testwork program represents the first program completed in recent times (only limited testwork has been completed on the Saint Dizier deposit since the 1960's).

Keys aims of the program were to;

- Understand likely achievable overall grade/recovery response and treatment issues
- Develop an appropriate flowsheet
- Understand how this potentially fits with the overall Heemskirk Tin project currently being considered by Stellar Resources

The testwork program was largely completed via ALS Metallurgy Burnie laboratory with metallurgical assistance and input to Stellar Resources provided by WorleyParsons.

At the time of writing the program was still in progress, with results, interpretation and reporting for the overall program yet to be finalised. As such this report only presents those results available at the time of writing.

It is expected all currently planned testwork will be completed during 1<sup>st</sup> quarter 2015, with finalised results, and analysis of results for the overall program expected to be reported in the 2015 annual progress update.



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## 2 OUTLINE OF PROGRAM

The testwork program was completed on a series of 4 composite samples generated from samples collected from the exploration lease.

The program consisted of;

- Sample characterisation (both bulk sample and drill hole composites)
- Comminution testing (bulk sample only)
- Magnetic Separation (both bulk sample and drill hole composites)
- Gravity Separation (both bulk sample and drill hole composites)
- Gravity concentrate dressing including sulfide flotation, magnetic separation and concentrate leaching (drill hole composites only)
- De-slime (drill hole composites only)
- Tin flotation (drill hole composites only)

Figure 2-1 shows the conceptual block flowsheet which was considered by the testwork program.

The conceptual block flowsheet consisted of primary grinding to a relatively coarse grind size (P80 ~250 to 350 µm) followed by wet magnetic separation to remove magnetite ahead of gravity separation.

Magnetic separation consisted of roughing followed by regrind and cleaning of the magnetic product. This was largely focused on minimising tin losses to the magnetite concentrate, while reducing the quantity of magnetite in the feed to the gravity circuit to more manageable levels.

The combine rough and cleaner non-mags products from the magnetic separation testwork formed the feed to the gravity separation testwork.

The gravity circuit considered, consisted of classification of the circuit feed into coarse and fine fractions to allow separation concentration of these, to produce a crude concentrate suitable for upgrade via the dressing circuits.

In addition to cassiterite, other high SG minerals present; pyrite, magnetite and siderite were also strongly concentrated in the gravity circuit, and were expected to be the major diluents of present in the crude concentrate produced. As such the dressing circuit is aimed at upgrading the concentrate to saleable Sn grades by removing these via sulfide flotation, magnetic separation and acid leaching.

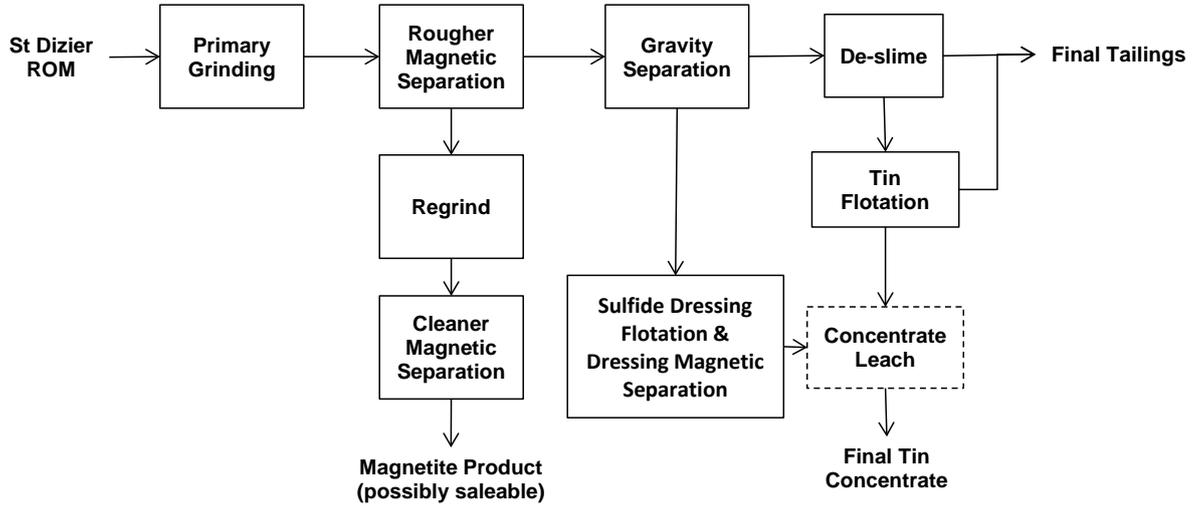
Fine material exiting the gravity circuit is deslimed, prior to sulfide scavenger flotation and tin flotation.



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Figure 2-1 – Conceptual Block Flowsheet





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### **3 SAMPLES USED IN TESTWORK PROGRAM**

The testwork program was completed on a series of 4 composite samples generated from samples collected from the exploration lease. These samples were;

- Saint Dizier Bulk Composite (Composite 1)

The Bulk Composite sample was produced from several tonnes of material excavated from a costean

- Composite 2

Composite 2 was produced from ½ core from the metallurgical drill hole ST06, intervals 20.3 – 50m, sample numbers 290657 - 290685

- Composite 3

Composite 3 was generated from ½ core from the metallurgical drill hole ST06, intervals 57 – 86m, sample numbers 290693 - 290721

- Composite 4

Composite 4 was generated from ½ core from the metallurgical drill hole ST06, intervals 106 – 114m, sample numbers 290737 – 290744

- Composite 2+3

A fifth composite was produced by combining composites 2 and 3 in equal weights

Figure 3-1 and Figure 3-2 show the locations of the bulk sample collection site and ST06 drill hole. Assays for the individual intervals forming Composites 2, 3 and 4 are contained in Appendix 1.



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Figure 3-1 - Drill hole and costean/bulk sample locations

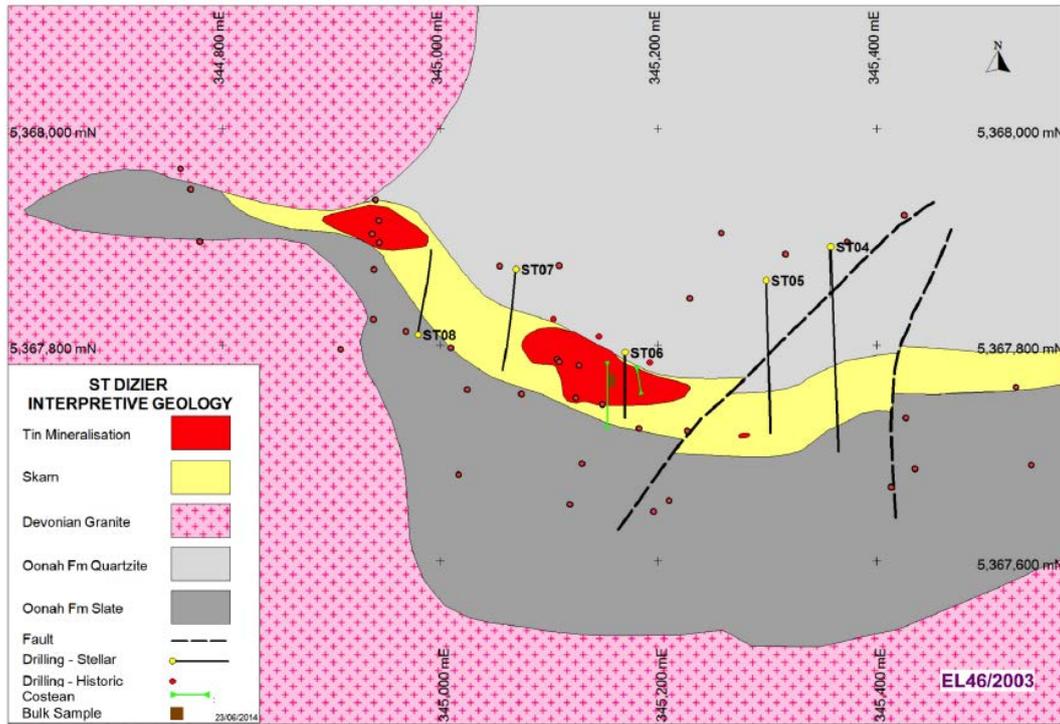
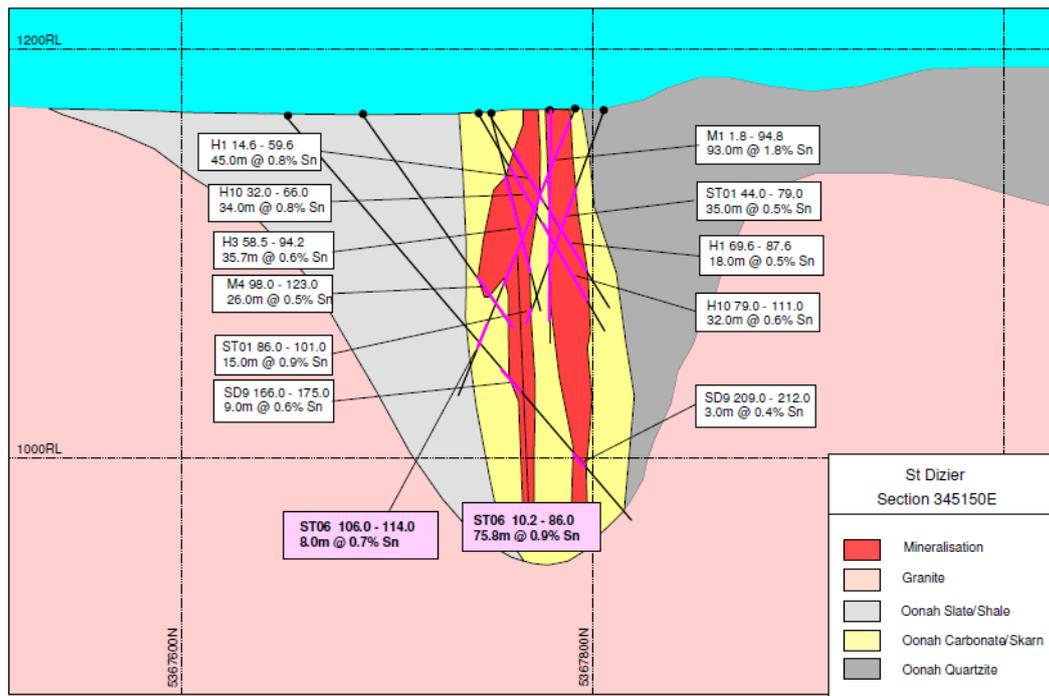


Figure 3-2 Saint Dizier Section





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Mineralogy and characterisation testwork were carried out on the Bulk Composite and Composites 2, 3 and 4.

The majority of the initial testwork program, including comminution, magnetic separation and gravity separation testing, was carried out using the Bulk Composite. However, as the work progressed it became apparent the Bulk Composite was heavily weathered, with a number of issues which are thought to be not representative of the overall mineable mineral resource. In particular, soluble tin levels in the Bulk Composite were significantly higher than those in the drill samples from ST06. Consequently the later part of the program has focused on Composite 2+3 which is thought to be more typical of the mineable mineral resource.

Key differences between the Bulk Composite and intersections from ST06 are;

- Portion of soluble tin (as a % of total tin);  
Bulk sample; 22%, intersections - top; 8%, middle; 3%, bottom; 13.5%
- Liberation of the drill samples is poorer than the bulk sample
- Quantity of magnetite;  
Bulk sample; 31%, intersections - top; 22%, middle; 35%, bottom; 59%
- binary associations of cassiterite with magnetite;  
Bulk sample; 11%, intersections top; 1%, middle; 3%, bottom; 21%
- Drill intersections have significantly less cassiterite locked with magnetite and less soluble tin associated with the magnetic fraction;

Magnetic separation testwork on the Bulk Composite sample showed very high losses of Sn to the magnetite product compared to the drill hole composites (Comp 2, 3 and 4), with a combination of both high soluble tin deportment to the magnetic fraction and very fine intergrowths of cassiterite in magnetite being key contributors to this high loss in the Bulk Composite.

- Drill intersections have;
  - less tin in ultra-fine size fraction – likely lower slimes losses
  - higher sulfur ~5% c.f. 1.3%



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## **4 SAMPLE CHARACTERISATION**

Sample characterisation consisted of optical mineralogy and completion of a Davis tube magnetic separation routine on both the Bulk Composites and drill hole composites.

The Davis tube characterisation routine consisted of sizing each of the samples into +212, +106, +53, +20, +8 (+CS5) and -8 (-CS5)  $\mu\text{m}$  size fractions. Each of the size fractions, excluding the -8  $\mu\text{m}$  fraction, was then separated into magnetic and non-magnetic fractions by the Davis tube. The magnetic and non-magnetic fractions plus the -8  $\mu\text{m}$  fraction were then assayed for  $\text{Sn}_{\text{total}}$ ,  $\text{Sn}_{\text{soluble}}$ , Fe,  $\text{SiO}_2$  and S.

Additional mineralogy (both optical and SEM) was completed on a magnetic fraction produced from the Saint Dizier Bulk Composite to better understand the apparent tin association with the magnetic material.

### **4.1 Bulk Composite**

Full mineralogy reports for the Saint Dizier Bulk Composite are contained in Appendix 2, with full Davis tube characterisation results contained in Appendix 3.

The mineralogy is summarised in the extract and tables below. Notably magnetite makes up approximately 31% of the sample, with 24% of the observed cassiterite associated with magnetite.

The following minerals were identified, in approximate descending order:

- Gangue (*quartz, silicates, carbonate, tourmaline?, carbonaceous matter, fluorite, talc etc.*)
- Magnetite
- Goethite
- Pyrite (60% crystalline and 40% melnikovite)
- Arsenopyrite
- Cassiterite
- Chalcopyrite
- Pyrrhotite
- Hematite
- Sphalerite
- Covellite (rare)
- Chalcocite (very rare)
- Stannite (very rare)



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Table 1

**St Dizier Bulk Comp Composition Vol% (from total scan)**

Fraction	Wt%	Py	Po	As	Cs <sup>#</sup>	Cp	GoHe	Mt	Ga
+212µm	25.8	1.5	0.1	0.1	Tr	Tr	5.1	27.8	65.5
+106µm	22.3	1.7	0.1	Tr	Tr	Tr	6.3	31.9	60.1
+53µm	18.3	2.8	Tr	Tr	2.0	Tr	6.0	39.5	49.8
+25µm	13.9	1.0	Tr	Tr	Tr	Tr	4.8	24.7	69.6
+7µm	7.3	2.0	Tr	Tr	Tr	Tr	4.6	29.1	64.3
<b>TOTAL</b>	<b>87.6</b>	<b>1.8</b>	<b>0.1</b>	<b>Tr</b>	<b>0.4</b>	<b>Tr</b>	<b>5.5</b>	<b>30.9</b>	<b>61.4</b>

Py=pyrite, Po=pyrrhotite, As=arsenopyrite, Cs=cassiterite, Cp=chalcopyrite, GoHe=goethite+hematite, Mt=magnetite, Ga=gangue  
# count statistics very poor for the scarce cassiterite

**St Dizier Bulk Comp Cassiterite liberation distribution%**

Fraction	Sn Wt%	Free	Binary with						Ternary
			Py	Po	As	GoHe	Mt	Ga	
+212µm	20.0	0	0	0	0	0	10	42	48
+106µm	20.2	43	0	0	0	0	24	15	18
+53µm	16.9	65	1	0	0	0	1	23	11
+25µm	15.7	66	0	0	0	1	11	16	6
+7µm	12.0	82	0	0	0	3	5	8	1
<b>TOTAL</b>	<b>84.6</b>	<b>47</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>11</b>	<b>22</b>	<b>19</b>

**St Dizier Bulk Comp Cassiterite association%**

Fraction	Sn Wt%	%associated with					
		Py	Po	As	GoHe	Mt	Ga
+212µm	20.0	14	0	0	3	47	90
+106µm	20.2	9	0	0	0	33	33
+53µm	16.9	1	0	0	4	8	32
+25µm	15.7	0	0	0	2	17	22
+7µm	12.0	0	0	0	3	5	8
<b>TOTAL</b>	<b>84.6</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>24</b>	<b>41</b>

Davis tube characterization results are summarised in Table 2 and Figure 4-1. These indicate of the total present in the Bulk Composite (0.78% Sn<sub>total</sub>), 22% is soluble Sn (0.17% Sn<sub>soluble</sub>).

These show Sn losses to magnetic fraction level at ~0.4% Sn ~75 µm



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High mass rejection to magnetic fraction; 44% of mass

Fe grade is >64% in 53 µm fraction and below

Soluble Sn accounts for about half of Sn present in finer fractions

Of the insoluble Sn, 28.3% reported to the mags product, with 60.2% reporting to non-mags and 11.6% to the ultra-fines (-CS5) fraction.

The soluble Sn present preferentially reports to both the mags product and the ultra-fines (-CS5), with 32% of Sn present in the mag product being soluble Sn, while 45% of Sn in the ultra-fines being soluble Sn.

Of the non-mags product 8% of the total Sn is soluble, while only 45% of Sn in the ultra-fines (-CS5) is insoluble.

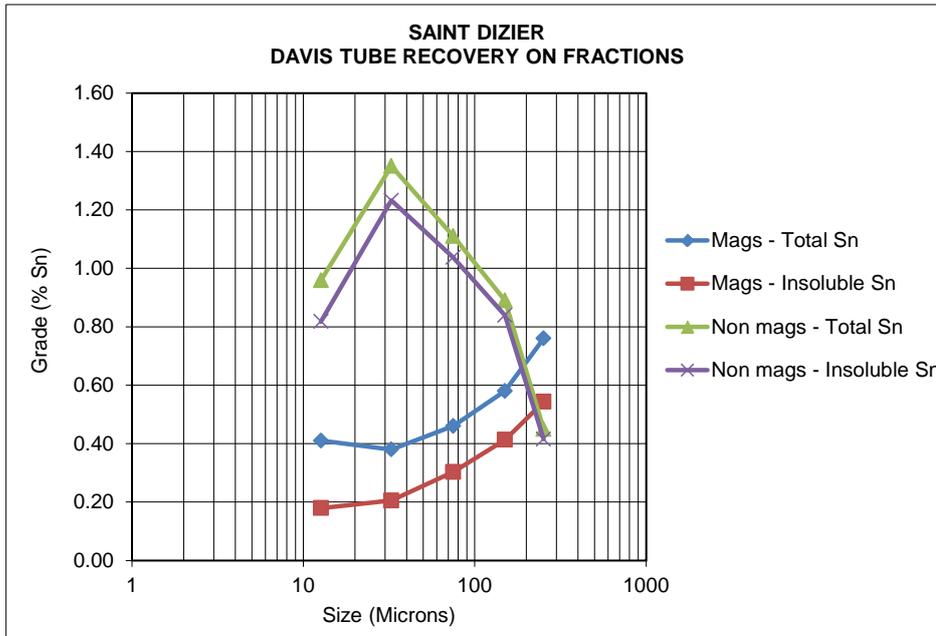
**Table 2 – Saint Dizier Bulk Composite: Summary of Davis Tube Results**

FRACTIONS	Picno	WT	Overall		Overall		Overall		Overall		Overall		% sol Sn	% of total Sn as Insol
			%Sn	dist	%Insol Sn	dist	%Fe	dist	%SiO2	dist	%S	dist		
mm	SG	%												
Mags+212		13.73	0.76	13.45	0.54	12.31	49.70	18.63	10.20	6.16	1.22	12.09	0.22	71%
Mags+106		12.58	0.58	9.40	0.41	8.58	61.70	21.19	3.95	2.19	0.56	5.09	0.17	71%
Mags+53		9.42	0.46	5.59	0.30	4.72	64.90	16.70	2.75	1.14	0.38	2.59	0.16	66%
Mags+20		5.61	0.38	2.75	0.21	1.90	66.60	10.20	2.08	0.51	0.24	0.97	0.18	54%
Mags+CS5		2.58	0.41	1.36	0.18	0.76	66.30	4.67	1.67	0.19	0.28	0.52	0.23	44%
Non Mags+212		12.05	0.45	6.99	0.42	8.26	12.05	3.97	45.60	24.17	1.85	16.10	0.04	92%
Non Mags+106		9.67	0.89	11.09	0.84	13.40	14.80	3.91	41.50	17.65	2.37	16.55	0.05	94%
Non Mags+53		8.91	1.11	12.75	1.04	15.27	14.90	3.63	38.40	15.05	2.17	13.97	0.07	93%
Non Mags+20		8.30	1.35	14.45	1.23	16.90	14.80	3.36	35.40	12.93	2.07	12.41	0.12	91%
Non Mags+CS5		4.69	0.96	5.79	0.82	6.33	17.10	2.19	32.30	6.66	2.58	8.73	0.14	85%
Total Mags		43.92	0.57	32.55	0.39	28.27	59.53	71.39	5.27	10.18	0.67	21.26	0.19	68%
Total Non Mags		43.62	0.91	51.07	0.83	60.16	14.31	17.04	39.85	76.45	2.15	67.76	0.07	92%
-CS5		12.46	1.02	16.38	0.56	11.57	34.00	11.57	24.40	13.37	1.22	10.98	0.46	55%
CALC FEED		100.00	0.78	100.00	0.61	100.00	36.62	100.00	22.74	100.00	1.38	100.00	0.17	78%



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**Figure 4-1**



**4.1.1 Additional mineralogy completed on a magnetic fraction**

Additional mineralogy (both optical and SEM) was completed on a magnetic fraction (-53 +20µm) produced from the Saint Dizier Bulk Composite to better understand the apparent tin association with the magnetic material.

The overall composition of the magnetic fraction based on the optical mineralogy is summarised in Table 3, with cassiterite liberation summarised in Table 4. However, a key observation of this work was there appeared to be insufficient cassiterite to account for the ~0.4% Sn grade of the fraction examined, with no sulfide tin being observed.

**Table 3**

***St Dizier Bulk Comp Composition Vol% (from total scan)***

Fraction	Py	Po	As	Cs <sup>#</sup>	Cp	GoHe	Mt	Ga
<b>+20µm</b>	0.9	0.1	Tr	0.1	Tr	6.8	78.9	13.3

*Py=pyrite, Po=pyrrhotite, As=arsenopyrite, Cs=cassiterite, Cp=chalcopyrite, GoHe=goethite+hematite, Mt=magnetite, Ga=gangue  
# count statistics very poor for the scarce cassiterite*



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Table 4

*St Dizier Magnetics Cassiterite liberation distribution%*

Fraction	Free	Binary with						Ternary
		Py	Po	As	GoHe	Mt	Ga	
+20µm	43	0	0	0	0	32	0	51

Subsequent SEM work (refer exact below and full report in Appendix 2) showed significant Sn to be present both as very fine intergrowths within magnetite and as schoenfliesite.

Based on this work it is strongly suspected schoenfliesite is likely responsible for the significant quantity of soluble Sn seen in the ultra-fine (-CS5) fraction (refer Table 2).



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Extract for SEM-EDS Microanalysis report;

The author has assessed the analytical results and grouped them into mineral mixture groups. In many cases the phase grain size is smaller than the analytical beam width, so the analysis is of a mixture of two or more minerals. A full list of the analyses is provided at the end of the report but an essential summary follows:

Mineral Group	#	O	Mg	Al	Si	S	Ca	Ti	Mn	Fe	Br	Sn	W
cassiterite + minor magnetite	7	23.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	0.0	72.7	0.0
cassiterite + magnetite	4	36.7	0.7	0.0	0.7	0.0	0.0	0.0	0.0	27.9	0.0	34.0	0.0
magnetite + cassiterite	11	32.5	0.7	0.0	0.4	0.0	0.0	0.0	0.0	53.3	0.1	13.0	0.1
Fe oxide + minor cassiterite	7	30.5	0.8	0.0	0.7	0.0	0.0	0.0	0.7	65.0	0.0	1.4	0.9
Fe oxide + schoenfliesite	7	36.9	6.3	0.1	0.8	0.0	0.0	0.0	0.6	29.1	0.0	24.7	1.6
magnetite	12	27.5	0.2	0.0	0.2	0.0	0.0	0.0	0.0	72.2	0.0	0.0	0.0
Fe oxide + minor silicate	14	35.2	0.3	0.3	1.5	0.0	0.2	0.1	0.6	61.6	0.0	0.0	0.2
pyrrhotite	1	0.0	0.0	0.0	0.0	37.8	0.0	0.0	0.0	62.2	0.0	0.0	0.0
silicate	1	48.7	22.8	0.0	21.1	0.0	0.2	0.0	0.0	7.2	0.0	0.0	0.0

Most of the observed Sn occurs as very fine cassiterite inclusions in magnetite.

The mineral **schoenfliesite**  $MgSn(OH)_6$ , containing 48.4%Sn, was previously recognised at St Dizier during Renison drilling (*pers.comm. Ray Hazeldene, Stellar*). It is a secondary phase typically found in oxidised Sn-bearing minerals. The author is unfamiliar with this mineral, but upon re-examination, it may be possible to identify it optically. *Schoenfliesite* is documented to be usually fibrous with an SG of 3.48.

In the sample examined, *schoenfliesite* is fine-grained and mixed with *hematite* and *goethite*. Recovery would be extremely difficult.

## 4.2 Drill Hole Composites

Full mineralogy reports for Composites 2, 3 and 4 are contained in Appendix 9, with full Davis tube characterisation results contained in Appendix 10.

The mineralogy for Composites 2, 3 and 4 is summarised in the extract and tables below. Notably, although magnetite is present in similar levels to the Bulk Composite, significantly less cassiterite is associated with magnetite in Composites 2 and 3:

- binary associations of cassiterite with magnetite;

Bulk composite = 11%, Comp 2 = 1%, Comp 3 = 3%, Comp 4 = 21%

However, generally liberation of the drill samples is poorer than the bulk sample.



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The following minerals were identified, in approximate descending order:

- Gangué (*quartz, silicates, carbonate, fluorite, talc, carbonaceous matter, etc.*)
- Magnetite
- Pyrite (*crystalline and melnikovite varieties*)
- Pyrrhotite
- Arsenopyrite
- Cassiterite
- Chalcopyrite
- Sphalerite
- Bismuthinite (*rare*)
- Native bismuth (*rare*)
- Molybdenite (*very rare*)



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Table 5

**St Dizier *Comp 2* Composition Vol% (from total scan)**

Fraction	Wt%	Py	Po	As	Cs <sup>#</sup>	Cp	GoHe	Mt	Ga
<b>+212µm</b>	18.4	4.2	1.0	0	0.1	Tr	0	12.2	82.5
<b>+106µm</b>	19.2	12.6	0.8	0.1	0.1	0.9	0	25.6	60.0
<b>+53µm</b>	18.7	9.0	1.9	0	0.2	0	0	13.8	75.2
<b>+20µm</b>	17.5	6.8	2.8	0.9	0.1	1.0	0	34.4	54.1
<b>+7µm</b>	10.0	12.3	5.9	1.0	Tr	0	0	26.7	54.2
<b>TOTAL</b>	<b>83.8</b>	<b>8.7</b>	<b>2.1</b>	<b>0.3</b>	<b>0.1</b>	<b>0.4</b>	<b>0</b>	<b>22.0</b>	<b>66.4</b>

Py=pyrite, Po=pyrrhotite, As=arsenopyrite, Cs=cassiterite, Cp=chalcopyrite, GoHe=goethite+hematite, Mt=magnetite, Ga=gangue  
# count statistics very poor for the scarce cassiterite

**St Dizier *Comp 3* Composition Vol% (from total scan)**

Fraction	Wt%	Py	Po	As	Cs <sup>#</sup>	Cp	GoHe	Mt	Ga
<b>+212µm</b>	19.2	3.5	3.1	0	0.2	Tr	0	21.8	71.5
<b>+106µm</b>	20.9	4.5	6.2	1.0	0.2	0	0	44.1	44.1
<b>+53µm</b>	19.6	1.9	7.1	1.0	0.6	Tr	Tr	34.4	55.1
<b>+20µm</b>	17.7	3.8	14.2	0	1.0	0	0.1	40.3	40.7
<b>+7µm</b>	8.9	2.7	8.1	0	1.0	0	0	32.1	56.3
<b>TOTAL</b>	<b>86.3</b>	<b>3.4</b>	<b>7.6</b>	<b>0.5</b>	<b>0.5</b>	<b>Tr</b>	<b>Tr</b>	<b>34.9</b>	<b>53.3</b>

**St Dizier *Comp 4* Composition Vol% (from total scan)**

Fraction	Wt%	Py	Po	As	Cs <sup>#</sup>	Cp	GoHe	Mt	Ga
<b>+212µm</b>	23.6	0.1	0.2	0.3	Tr	0	0	54.0	45.5
<b>+106µm</b>	24.0	0	0	1.4	0.2	0	0	68.7	29.8
<b>+53µm</b>	18.4	0.2	Tr	2.0	Tr	0	0	58.8	39.1
<b>+20µm</b>	15.7	0	1.0	3.0	Tr	0	0	54.4	41.7
<b>+7µm</b>	7.7	0	0.2	1.0	Tr	0	0	54.3	44.5
<b>TOTAL</b>	<b>89.4</b>	<b>0.1</b>	<b>0.2</b>	<b>1.5</b>	<b>0.1</b>	<b>0</b>	<b>0</b>	<b>59.0</b>	<b>39.2</b>



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Table 6

*St Dizier Comp 2 Cassiterite liberation distribution%*

Fraction	Sn Wt%	Free	Binary with					Ternary
			Py	Po	As	Mt	Ga	
+212µm	15.8	0	0	0	0	0	26	74
+106µm	19.1	0	0	0	0	0	41	59
+53µm	17.9	21	1	0	0	5	51	22
+20µm	18.4	37	6	0	0	0	44	13
+7µm	17.4	84	2	0	1	1	9	3
<b>TOTAL</b>	<b>88.6</b>	<b>28</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>35</b>	<b>34</b>

*St Dizier Comp 3 Cassiterite liberation distribution%*

Fraction	Sn Wt%	Free	Binary with					Ternary
			Py	Po	As	Mt	Ga	
+212µm	15.6	0	0	0	0	0	18	82
+106µm	22.6	16	3	7	0	0	38	36
+53µm	21.6	31	0	7	0	4	45	14
+20µm	21.0	60	0	5	0	7	21	7
+7µm	14.2	85	0	1	0	4	8	1
<b>TOTAL</b>	<b>95.0</b>	<b>37</b>	<b>1</b>	<b>5</b>	<b>0</b>	<b>3</b>	<b>28</b>	<b>27</b>

*St Dizier Comp 4 Cassiterite liberation distribution%*

Fraction	Sn Wt%	Free	Binary with					Ternary
			Py	Po	As	Mt	Ga	
+212µm	14.1	0	0	0	0	38	48	13
+106µm	23.6	38	0	0	0	15	24	23
+53µm	19.5	39	0	0	0	37	15	10
+20µm	17.1	61	0	0	0	7	31	1
+7µm	12.0	85	0	0	0	4	8	2
<b>TOTAL</b>	<b>86.3</b>	<b>43</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>21</b>	<b>25</b>	<b>11</b>

Davis tube characterisation results for Composites 2, 3 and 4 are summarised in Table 7, Table 8 and Table 9. These indicate significant less of the total Sn present is present as soluble Sn compared to the Bulk Composite; Comp 2 = 6.6% of total Sn is soluble, Comp 3 = 2.0% and Comp 4 = 7.4% compared with 22% for the Bulk Composite.



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Although total Sn losses to the magnetic fractions were high at 38.8%, 32.6% and 39.6% for Composites 2, 3 and 4 respectively, result indicate these can be significantly reduced by very fine regrind (to around 20 µm) and cleaning of the magnetic product.

Sn distribution to the ultra-fines is also more encouraging compared to the Bulk Composite at 13.5%, 5.9% and 12.2% for Composites 2, 3 and 4 respectively.

**Table 7 – Saint Dizier Composite 2: Summary of Davis Tube Results**

FRACTIONS um	Picno SG	WT %	Overall											
			%Tot Sn	dist	%Sol Sn	dist	%Cs Sn	dist	%Fe	dist	%SiO2	dist	%S	dist
Mags+212		11.77	1.03	15.87	0.11	25.16	0.92	15.18	33.50	14.84	20.60	9.65	4.10	7.47
Mags+106		9.26	0.95	11.51	0.06	10.61	0.89	11.58	42.70	14.89	13.35	4.92	8.45	12.11
Mags+53		7.17	0.72	6.75	0.05	6.84	0.67	6.75	52.10	14.05	9.00	2.57	6.51	7.22
Mags+20		5.77	0.49	3.70	0.05	4.96	0.45	3.61	58.60	12.73	5.09	1.17	5.13	4.58
Mags+CS5		2.18	0.34	0.97	0.04	1.54	0.30	0.93	63.50	5.21	3.03	0.26	4.44	1.50
Non Mags+212		9.58	0.39	4.89	0.03	5.48	0.36	4.84	9.44	3.40	38.70	14.75	3.94	5.84
Non Mags+106		9.66	0.71	8.97	0.03	5.35	0.68	9.24	14.60	5.31	32.20	12.37	7.89	11.79
Non Mags+53		10.38	0.91	12.37	0.03	6.14	0.88	12.82	16.00	6.25	30.50	12.60	9.17	14.74
Non Mags+20		11.06	1.10	15.92	0.04	8.65	1.06	16.45	16.50	6.87	29.10	12.80	9.73	16.65
Non Mags+CS5		4.79	0.89	5.58	0.04	3.87	0.85	5.71	30.94	5.58	20.86	3.98	8.15	6.04
Total Mags		36.16	0.82	38.81	0.07	49.11	0.75	38.05	45.36	61.73	12.91	18.57	5.88	32.88
Total Non Mags		45.46	0.80	47.72	0.03	29.50	0.77	49.07	16.02	27.41	31.23	56.50	7.83	55.06
-CS5		18.38	0.56	13.47	0.06	21.40	0.50	12.89	15.70	10.86	34.10	24.94	4.24	12.06
CALC FEED		100.00	0.76	100.00	0.05	100.00	0.71	100.00	26.57	100.00	25.13	100.00	6.46	100.00

**Table 8 – Saint Dizier Composite 3: Summary of Davis Tube Results**

FRACTIONS um	Picno SG	WT %	Overall											
			%Tot Sn	dist	%Sol Sn	dist	%Cs Sn	dist	%Fe	dist	%SiO2	dist	%S	dist
Mags+212		12.20	0.99	12.11	0.02	14.50	0.97	12.07	40.10	15.06	19.55	9.44	5.05	12.33
Mags+106		11.70	0.89	10.45	0.03	15.81	0.87	10.35	54.70	19.71	9.33	4.32	6.27	14.69
Mags+53		10.73	0.60	6.46	0.03	14.50	0.58	6.31	60.90	20.13	4.96	2.11	6.95	14.94
Mags+20		8.62	0.35	3.03	0.02	11.18	0.33	2.87	65.20	17.31	2.84	0.97	7.79	13.45
Mags+CS5		2.37	0.22	0.52	0.02	2.95	0.20	0.48	65.30	4.77	1.70	0.16	8.21	3.90
Non Mags+212		9.69	0.70	6.81	0.01	5.76	0.69	6.83	7.32	2.18	43.50	16.69	2.14	4.15
Non Mags+106		8.52	1.59	13.59	0.01	5.06	1.58	13.75	9.39	2.46	41.60	14.03	3.11	5.30
Non Mags+53		8.36	1.97	16.51	0.01	5.42	1.96	16.72	9.68	2.49	40.00	13.23	4.42	7.40
Non Mags+20		8.66	2.23	19.37	0.01	6.08	2.22	19.62	11.65	3.11	38.70	13.26	4.79	8.30
Non Mags+CS5		4.05	1.29	5.24	0.02	4.04	1.27	5.27	38.37	4.78	20.80	3.33	6.29	5.09
Total Mags		45.63	0.71	32.57	0.02	58.94	0.69	32.08	54.79	76.98	9.41	17.00	6.49	59.32
Total Non Mags		39.27	1.56	61.52	0.01	26.37	1.55	62.18	12.42	15.02	38.95	60.53	3.85	30.25
-CS5		15.10	0.39	5.91	0.02	14.69	0.37	5.74	17.20	8.00	37.60	22.47	3.45	10.43
CALC FEED		100.00	1.00	100.00	0.02	100.00	0.98	100.00	32.48	100.00	25.27	100.00	4.99	100.00

**Table 9 – Saint Dizier Composite 4: Summary of Davis Tube Results**

FRACTIONS um	Picno SG	WT %	Overall											
			%Tot Sn	dist	%Sol Sn	dist	%Cs Sn	dist	%Fe	dist	%SiO2	dist	%S	dist
Mags+212		20.31	0.53	13.35	0.04	15.83	0.49	13.17	51.80	27.71	11.10	13.28	0.63	15.85
Mags+106		19.78	0.61	14.96	0.05	15.76	0.57	14.90	57.80	30.10	6.54	7.62	0.51	12.49
Mags+53		13.92	0.55	9.50	0.04	10.60	0.51	9.41	62.20	22.80	5.22	4.28	0.23	3.97
Mags+20		2.64	0.33	1.08	0.04	1.87	0.29	1.02	65.40	4.54	3.17	0.49	0.36	1.18
Mags+CS5		3.93	0.15	0.73	0.03	2.37	0.12	0.61	67.40	6.97	1.73	0.40	0.34	1.65
Non Mags+212		6.98	0.38	3.29	0.03	3.58	0.35	3.27	2.97	0.55	36.00	14.79	0.49	4.23
Non Mags+106		4.07	0.86	4.34	0.07	5.05	0.79	4.29	3.92	0.42	32.80	7.87	1.20	6.05
Non Mags+53		4.08	1.42	7.18	0.09	6.43	1.33	7.24	4.78	0.51	32.20	7.73	1.89	9.55
Non Mags+20		11.77	2.02	29.49	0.11	23.56	1.91	29.94	4.91	1.52	32.10	22.26	2.03	29.60
Non Mags+CS5		1.82	1.71	3.86	0.10	3.21	1.61	3.91	15.98	0.77	26.80	2.87	1.72	3.89
Total Mags		60.58	0.53	39.62	0.04	46.43	0.48	39.11	57.75	92.13	7.31	26.07	0.47	35.15
Total Non Mags		28.72	1.35	48.17	0.08	41.83	1.27	48.64	4.98	3.77	32.82	55.52	1.50	53.32
-CS5		10.70	0.92	12.21	0.06	11.75	0.86	12.24	14.55	4.10	29.20	18.40	0.87	11.53
CALC FEED		100.00	0.81	100.00	0.06	100.00	0.75	100.00	37.98	100.00	16.98	100.00	0.81	100.00



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## 5 COMMINATION

Comminution testing was restricted to the Saint Dizier Bulk Composite sample. This consisted of determination of Impact Work Index, Bond Ball Mill Work Index, Bond Rod Mill Work Index, Bond Abrasion Index and SG.

Full results are contained in Appendix 4 and summarised in Table 10.

**Table 10 – Saint Dizier Bulk Composite Comminution Parameters**

Parameter	Value	Units
Impact Work Index	30.9	kWh/t
Bond Ball Mill Work Index	17.7	kWh/t
Bond Rod Mill Work Index	19.0	kWh/t
Bond Abrasion Index	0.1168	
SG	3.2	

Results indicate the ore is moderately hard.

Comparison of the laboratory grind times for the Saint Dizier Bulk Composite and Saint Dizier drill hole composites (composites 2, 3 and 4) is recommended to determine relative grindability of these.



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## 6 MAGNETIC SEPARATION

Magnetic separation testing consisted of roughing of the ground ore followed by regrind and cleaning of the magnetic product in a single stage. This was largely focused on minimising tin losses to the magnetite concentrate, while reducing the quantity of magnetite in the feed to the gravity circuit to more manageable levels.

Magnetic separation testwork was carried out on both the Saint Dizier Bulk Composite and Saint Dizier Composite 2+3 samples. Both the roughing and cleaning separation stages were carried out using a laboratory SALA wet drum low intensity magnetic separator.

The combine rough and cleaner non-mags products from the magnetic separation testwork formed the feed to the gravity separation testwork.

### 6.1 Bulk Composite

Results for the magnetic separation testwork completed on the Saint Dizier Bulk Composite are contained in Appendix 5 and summarised in Table 11. The magnetic separation consisted of roughing following a primary grind to 100% passing 212 µm. The rougher mags product was reground to 100% passing 53 µm and cleaned in a single stage. Both rougher and cleaner non-mags products were combine to form feed to the subsequent gravity testwork.

**Table 11 - Saint Dizier Bulk Composite: Summary of Magnetic Separation Results (tests LC01+02)**

Primary grind size = 100% passing 212 µm, Regrind size = 100% passing 53 µm

Sample Description	Weight (g)	Assays			
		% Sn	% Fe	% S	% SiO <sub>2</sub>
Coarse/Rougher Non Mags	4935.0	0.95	14.2	1.85	39.8
<b>Fine/Cleaner Mags</b>	<b>3815.7</b>	<b>0.46</b>	<b>62.2</b>	<b>0.47</b>	<b>3.94</b>
Fine/Cleaner Non Mags	558.4	1.71	16.1	2.58	29.8
<b>Total Non-Mags (rougher + cleaner)</b>	<b>5493.4</b>	<b>1.03</b>	<b>14.4</b>	<b>1.92</b>	<b>38.8</b>
Calc Feed	9309.1	0.79	33.99	1.33	24.50
<b>Distributions:</b>	<b>Weight</b>	<b>Sn</b>	<b>Fe</b>	<b>S</b>	<b>SiO<sub>2</sub></b>
Coarse/Rougher Non Mags	53.0%	63.4	22.1	73.8	86.1
Fine/Cleaner Non Mags	6.0%	12.9	2.8	11.7	7.3
<b>Recovery to Total Non-Mags (rougher + cleaner)</b>	<b>59.0%</b>	<b>76.3</b>	<b>25.0</b>	<b>85.5</b>	<b>93.4</b>
<b>Fine/Cleaner Mags</b>	<b>41.0%</b>	<b>23.7</b>	<b>75.0</b>	<b>14.5</b>	<b>6.6</b>



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41% of the feed mass deported to the final magnetite product, at an Fe grade of 62.2%. The final magnetite product was relatively clean containing 0.47% S and 3.94% SiO<sub>2</sub>.

Sn grade of the final magnetite product was 0.46%, representing a loss of 23.7% of the feed Sn units. Of this 23.7% loss, it is estimated ~8% (0.15% Sn<sub>soluble</sub>) is soluble Sn based on results of the Davis tube characterisation work (refer Section 4.1).

Overall mass recovery to the non-mags product (rougher plus cleaner non-mags) was 59%, with Sn recovery at 76.3%, to a grade of 1.03% Sn. Magnetite content of the non-mags was reduced to manageable levels for gravity separation.

## 6.2 Composite 2+3

Results for the magnetic separation testwork completed on the Saint Dizier Bulk Composite are contained in Appendix 11 and summarised in Table 12. The magnetic separation consisted of roughing following a primary grind to 80% passing 250 µm. The rougher mags product was reground to 80% passing 31 µm and cleaned in a single stage. Both rougher and cleaner non-mags products were combine to form feed to the subsequent gravity testwork.

**Table 12 - Saint Dizier Composite 2+3: Summary of Magnetic Separation Results (T15+T16)**

TEST TYPE	Rghr		Cleaner		FEED MATERIAL Composite 2+3						
	SALA Wet Drum	SALA Wet Drum	SALA Wet Drum	SALA Wet Drum							
Feed Solids (g)	2000.0	2000.0									
Feed Water (L)	17.6	17.6									
Pump Flow Rate (lpm)	1.4	1.4									
Density (%)	10.0	10.0									
Time (min)	17.5	18									
Pump 01 Output (%)	56	56									
Pump 02 Output (%)	56	56									
Comments	Rghr mag sep followed by regrind and cleaner mag sep. Primary grind P80 = 250 um, R/G P80 = 31 um										

Products	Wt (gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	SiO <sub>2</sub> (%)	Dist (%)	S (%)	Dist (%)
Cleaner Magnetics	723.0	37.7	0.46	18.3	60.9	74.2	5.40	8.2	5.25	37.3
Cleaner Non Magnetics	185.7	9.7	1.97	20.1	13.1	4.1	34.4	13.5	5.12	9.3
Rougher Non Magnetics	1009.6	52.6	1.11	61.6	12.8	21.8	36.7	78.3	5.39	53.4
Calc Feed	1918.4	100.0	0.95	100.0	31.0	100.0	24.7	100.0	5.31	100.0

Cummulated Products	Wt (gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	SiO <sub>2</sub> (%)	Dist (%)	S (%)	Dist (%)
<b>Cleaner Magnetics</b>	<b>723.0</b>	<b>37.7</b>	<b>0.46</b>	<b>18.3</b>	<b>60.9</b>	<b>74.2</b>	<b>5.40</b>	<b>8.2</b>	<b>5.25</b>	<b>37.3</b>
Rougher Magnetics	908.7	47.4	0.77	38.4	51.1	78.2	11.3	21.7	5.22	46.6
Calc Feed	1918.4	100.0	0.95	100.0	31.0	100.0	24.7	100.0	5.31	100.0

Cummulated Products	Wt (gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	SiO <sub>2</sub> (%)	Dist (%)	S (%)	Dist (%)
<b>Rougher+cleaner Non-Magnetics</b>	<b>1195.4</b>	<b>62.3</b>	<b>1.24</b>	<b>81.7</b>	<b>12.8</b>	<b>25.8</b>	<b>36.3</b>	<b>91.8</b>	<b>5.35</b>	<b>62.7</b>
<b>Cleaner Magnetics</b>	<b>723.0</b>	<b>37.7</b>	<b>0.46</b>	<b>18.3</b>	<b>60.9</b>	<b>74.2</b>	<b>5.4</b>	<b>8.2</b>	<b>5.25</b>	<b>37.3</b>
Calc Feed	1918.4	100.0	0.95	100.0	31.0	100.0	24.7	100.0	5.31	100.0



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38% of the feed mass deported to the final magnetite product, at an Fe grade of 60.9%. The final magnetite product contained 0.46% Sn, 5.25% S and 5.4% SiO<sub>2</sub>.

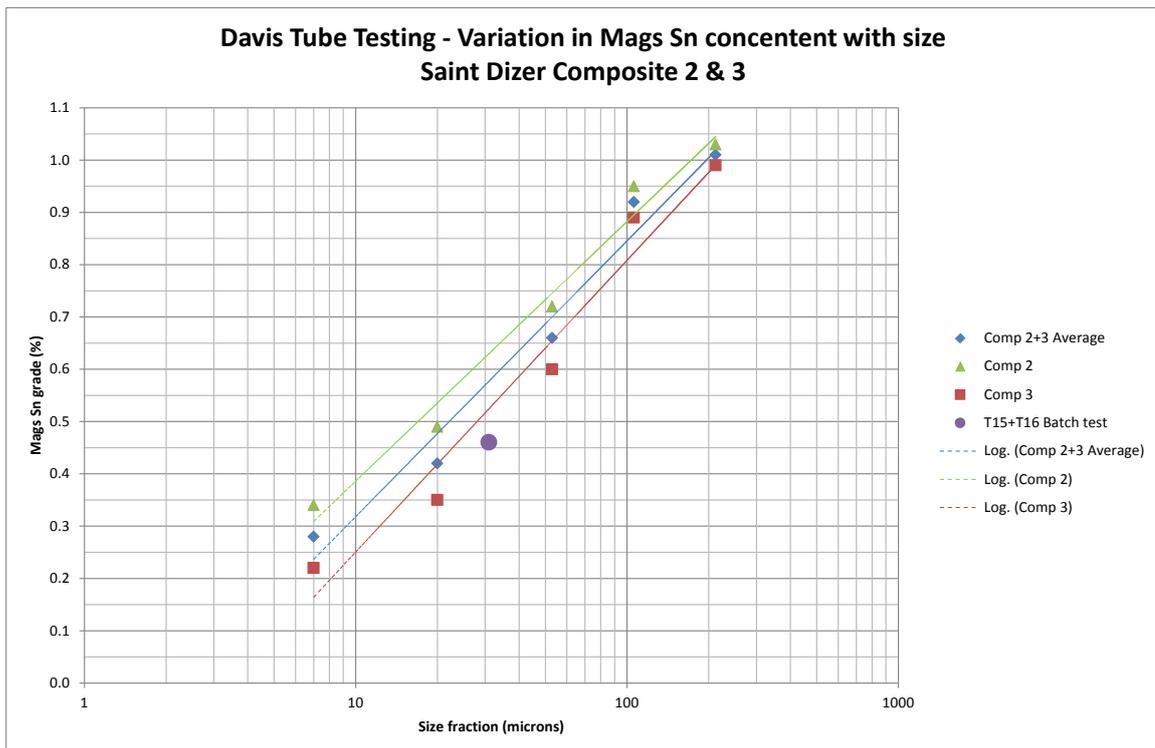
The final magnetite product represented a loss of 18.3% of the feed Sn units at a Sn grade of 0.46% Sn.

Overall mass recovery to the non-mags product (rougher plus cleaner non-mags) was 62%, with Sn recovery at 81.7%, to a grade of 1.24% Sn.

The magnetic separation rejects a significant amount of mass from the feed to the gravity circuit while reducing magnetite content to manageable levels for gravity separation.

Figure 6-1 compares the variation in Sn grade of the magnetic fraction with size, seen in the Davis tube characterisation testwork, with that achieved in the cleaner mags product from T15+T16. Sn loss in the cleaner mags product was in-line with the Davis tube results.

**Figure 6-1**



Sn loss to the cleaner mags product could potentially be reduced by a further reduction in regrind size (regrind size in T15+T16 was P80 = 31µm).

At a grind size of P80 <20 µm, Sn loss to the cleaner mags could potential be reduced to <15%. However, at such fine regrind size it is expected additional Sn liberated (compared with a regrind size of 31 µm) from magnetite would be largely lost to slimes.



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### 7 GRAVITY SEPARATION

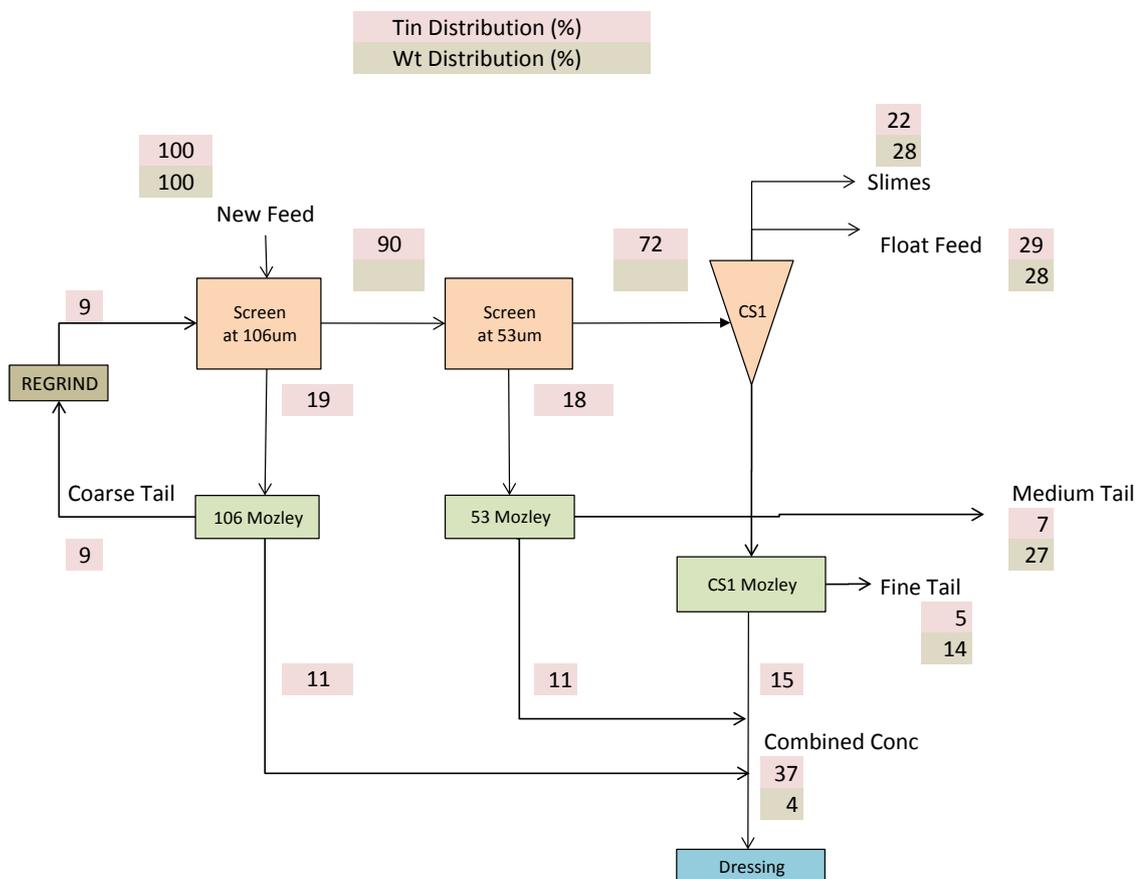
Gravity separation testwork was carried out on the combine rough and cleaner non-mags products produced from magnetic separation testwork on the respective composites for both the Saint Dizier Bulk Composite and Saint Dizier Composite 2+3.

#### 7.1 Bulk Composite

Full results for gravity separation testwork completed on the saint Dizier Bulk Composite are contained in Appendix 6.

The combine rougher and cleaner non-mags products produced from tests LC01+LC02 formed the feed to the gravity separation testwork completed on the Saint Dizier Bulk Composite. This consisted of consisted of lock cycle testing (test LC03) via the flowsheet shown in Figure 7-1.

Figure 7-1 – Saint Dizier Bulk Composite: Gravity Lock Cycle Test LC03 Flowsheet





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Table 13 shows the size by size analysis of the gravity feed material.

**Table 13 – Saint Dizier Bulk Composite: Size by Size Analysis of combine non-mags/gravity feed, P80 = 139 µm**

SIZE um	WT %	Sn		Fe		S		SiO <sub>2</sub>	
		%	dist	%	dist	%	dist	%	dist
150	17.00	0.61	10.1	13.15	15.5	1.9	16.6	44.50	19.3
106	12.19	0.78	9.3	14.00	11.8	2.0	12.5	44.30	13.8
75	10.26	0.90	9.0	14.20	10.1	2.0	10.6	41.60	10.9
53	8.21	0.99	7.9	14.45	8.2	1.9	8.0	40.60	8.5
38	8.74	1.09	9.3	14.45	8.7	2.0	8.9	37.90	8.5
28	4.43	3.44	14.9	23.10	7.1	5.4	12.0	25.30	2.9
8	16.55	1.16	18.7	14.50	16.6	1.7	14.3	38.00	16.1
<8	22.62	0.94	20.8	14.00	21.9	1.5	17.1	34.70	20.1
CALC	100.00	1.02	100.0	14.44	100.0	2.0	100.0	39.14	100.0
ASSAY		1.04		14.35		1.9		38.10	

Notably 20.8% of the Sn is present in the <8 µm fraction, indicating slimes losses are expected to be inherently high.

Results for the gravity lock cycle testing are shown in Table 14 and Figure 7-2.

Both concentrate grade and recovery were quite stable across the 10 cycles completed. Overall recovery to the combine concentrates averaged 37% of gravity circuit feed (28.2% based on ore feed) at an average grade 9.9% Sn for the final 4 cycles.

Major diluents in the combine concentrates were Fe at 36.5% and S at 19.4%, with only 6.3% SiO<sub>2</sub>.

Losses from the gravity circuit for the final four cycles averaged;

- Medium tail (+53 µm) = 6.7% of gravity circuit feed (5.1% based on ore feed)
- Fine tail (CS2/CS1 = 4.1% of gravity circuit feed (3.1% based on ore feed)
- Tin float feed (CS3/CS2-CS5) = 28.8% of gravity circuit feed (22% based on ore feed)
- Slimes (<CS5) = 22.2% of gravity circuit feed (16.9% based on ore feed)

Given the modest gravity recovery, and very high losses to both the magnetite concentrate (23.7%) and slimes tails (16.9%), is it expected overall Sn recovery for the Saint Dizier Bulk Composite is limited to something less than 50%.



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Table 14 – Saint Dizier Bulk Composite Lock Cycle Gravity Results (test LC03)



BURNIE LABORATORY: LOCKED CYCLE GRAVITY TEST

Table with 2 columns: Field (PROJECT, TEST NO, FEED, DATE, TECH) and Value (T0887, LC03, LC02 NON MAGS, 60614, ID)

EXIT STREAMS

Main data table with columns for Cycle No (1-7), various chemical components (gm, %Sn, %Fe, %S, %SiO2), and an average column (AV(8-9)).

REGRIND DATA

Table with 2 columns: Parameter (New Feed, Re grind feed, Re grind Time, Re grind D/C) and values for cycles 1-10.

INTERNAL STREAMS

Table with 4 columns: Stream Type (Medium Mids, Fine Mids, End Re grind), Component, and Values. Includes a GRIND D/C P80=93 box.

DISTRIBUTIONS

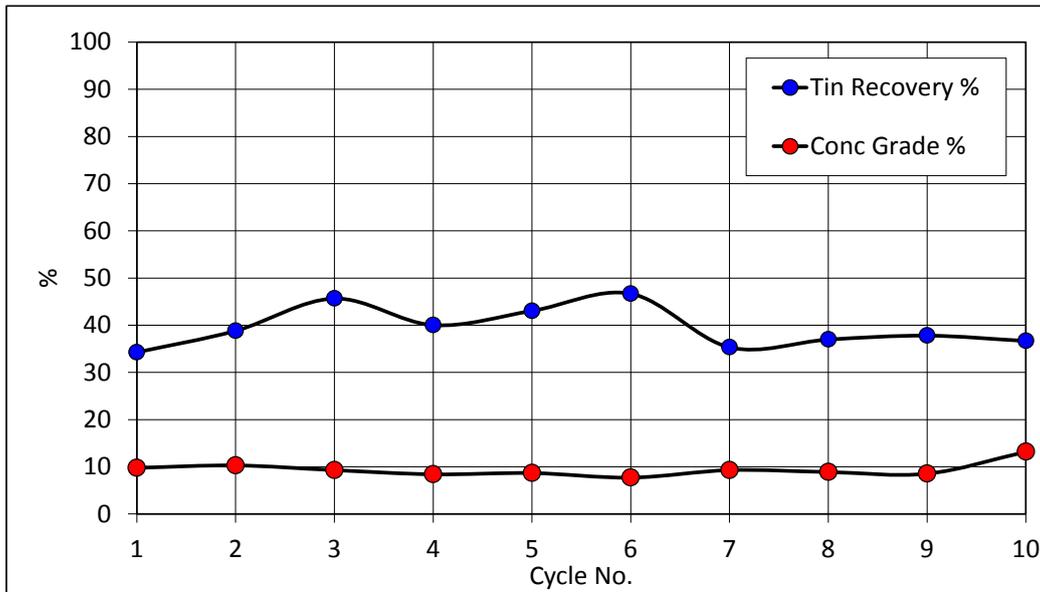
Large table with columns: Component, Cycle, and Distribution values. Includes sub-headers for AV (8-9) and FROM NEW FEED (%).



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**Figure 7-2 – Saint Dizier Bulk Composite: Gravity Lock Cycle Test (LC03)**





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## 7.2 Composite 2+3

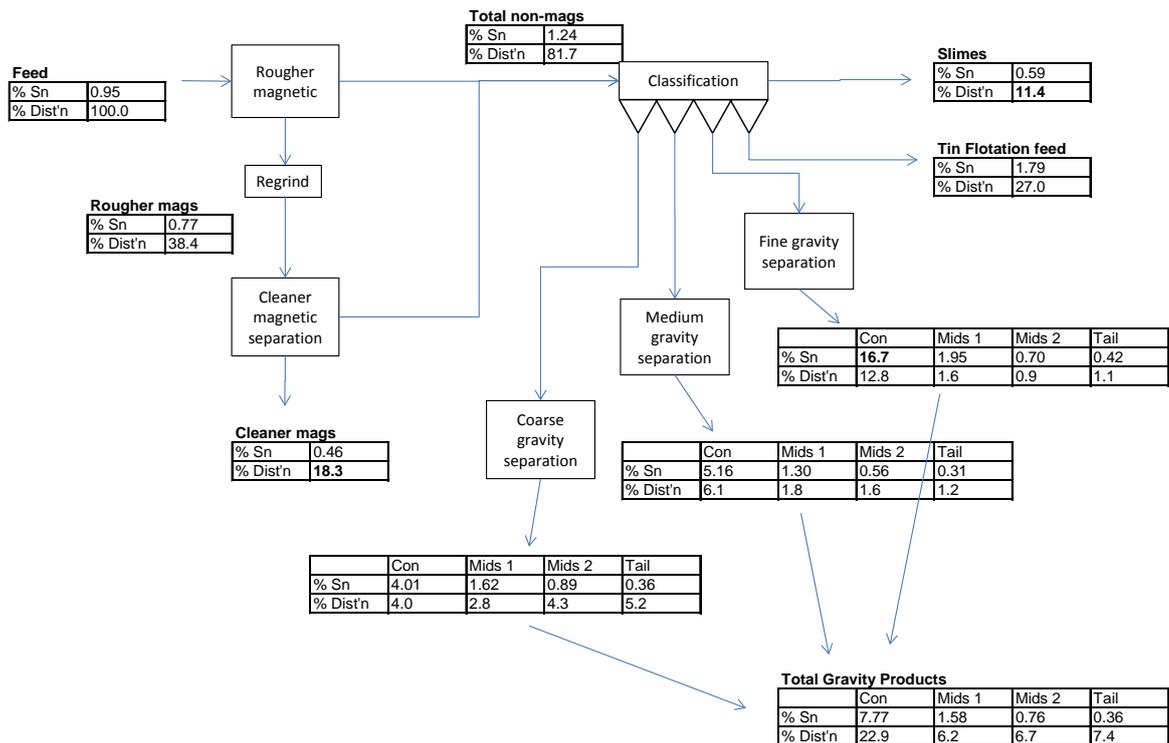
Full results for gravity separation testwork completed on Saint Dizier Composite 2+3 are contained in Appendix 12.

The combine rougher and cleaner non-mags products produced from tests T15+T16 formed the feed to the gravity separation testwork completed on the Saint Dizier Composite 2+3. This consisted initially of batch magnetic separation testing (test T07) followed by lock cycle testing (test LC08).

### 7.2.1 Batch testings

Figure 7-3 summarises the overall Sn deportment across the magnetic separation an initial batch gravity tests completed on the Saint Dizier Composite 2+3, with release curves shown in Figure 7-4.

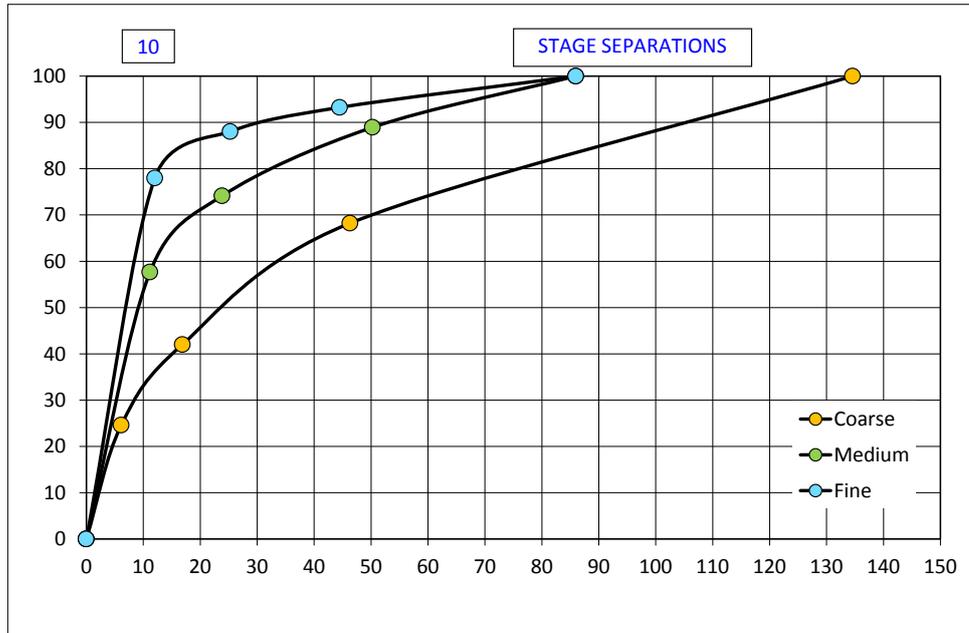
**Figure 7-3 - Saint Dizier Comp 2+3 Batch magnetic and gravity separation Sn deportment summary**





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**Figure 7-4 – Saint Dizier Composite 2+3: Batch Gravity Separation Release Curves**



81.7% of the Sn was recovered to the gravity feed. This material was sized into 5 size fractions; “coarse” (+106 µm), “medium” (+53 µm) and “fine” (+33 µm) gravity feed fractions, “tin float feed” (-33 +7 µm), and “slimes” (-7 µm) with batch gravity separations carried out on the “coarse”, “medium” and “fine” fractions.

11.4% of the Sn reported to the slimes fraction, 27% to the “tin float feed” fraction, and 43.3% to the gravity feed fractions.

For the 3 gravity fractions overall 22.3% of the Sn was recovered to the gravity concentrates. However, as these were only batch tests the middling products and tails were not recycled and reground so this does not provide a direct indication of the overall achievable gravity recovery.

Although the gravity performance on the coarse fraction was fairly poor, this improved considerable in the medium and particularly the fine fraction. The fine fraction gave 78% recovery (based on feed to that fraction) to a 16.7% Sn concentrate, with the dilution largely as sulfides and magnetite so it should upgrade readily in concentrate dressing.

## 7.2.2 Lock cycle testing

Given the encouraging results seen in batch gravity testing lock cycle testing was completed (LC08).

Table 15 shows size by size analysis of the combine non-mags/gravity feed to the lock cycle gravity test, while Figure 7-5 the gravity lock cycle test flowsheet.



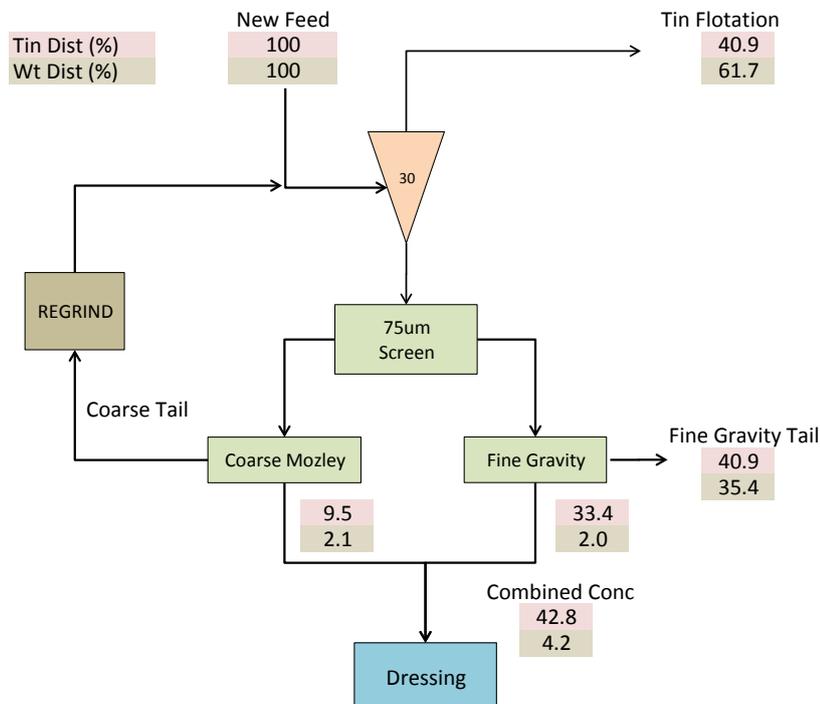
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**Table 15 Saint Dizier Composite 2+3: Size by Size Analysis of combine non-mags/gravity feed, P80 = 191 µm**

SIZE um	WT %	Sn		Fe		S		SiO2	
		%	dist	%	dist	%	dist	%	dist
150	23.81	0.72	13.5	10.75	20.3	4.51	21.5	38.10	25.1
106	6.10	1.18	5.7	14.00	6.8	5.97	7.3	34.50	5.8
75	5.59	1.28	5.6	13.65	6.1	6.33	7.1	34.90	5.4
53	5.98	1.31	6.2	13.00	6.2	4.53	5.4	35.80	5.9
38	6.96	1.33	7.3	12.00	6.6	5.17	7.2	35.40	6.8
28	4.95	4.80	18.7	23.10	9.1	14.50	14.4	21.70	3.0
19	7.41	1.79	10.5	13.85	8.2	6.33	9.4	33.10	6.8
12	7.54	1.58	9.4	12.65	7.6	5.11	7.7	34.50	7.2
8	4.02	1.37	4.3	12.30	3.9	5.07	4.1	35.40	3.9
CALC-8	27.63	0.87	18.9	11.55	25.3	2.90	16.0	39.50	30.1
ASSAY	100.00	1.27	100.00	12.60	100.00	5.00	100.00	36.20	100.00

Notably 18.9% of the Sn is present in the <8 µm fraction, indicating slimes losses are expected to be inherently high.

**Figure 7-5 – Saint Dizier Composite 2+3: Summary of Gravity Lock Cycle Test (LC08)**



Results for the gravity lock cycle testing are shown in Table 16 and Figure 7-6.



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Table 16 Saint Dizier Composite 2+3 Lock Cycle Gravity Results (test LC08)



Table with 2 columns: Field (PROJECT, TEST NO, FEED, FROM TEST, DATE, TECH) and Value (T0887, LC08, etc.)

Table with 12 columns: CYCLE NO, 1-10, WT AV. Rows include Gravity coarse conc, Gravity fine conc, Gravity Final Tail, Over Flow, and Combined Concentrate with various chemical assays.

REGRIND DATA

Table with 11 columns: Parameter (New Feed, Re grind feed, Re grind Time, Underflow) and 10 values.

t75 tail

INTERNAL STREAMS

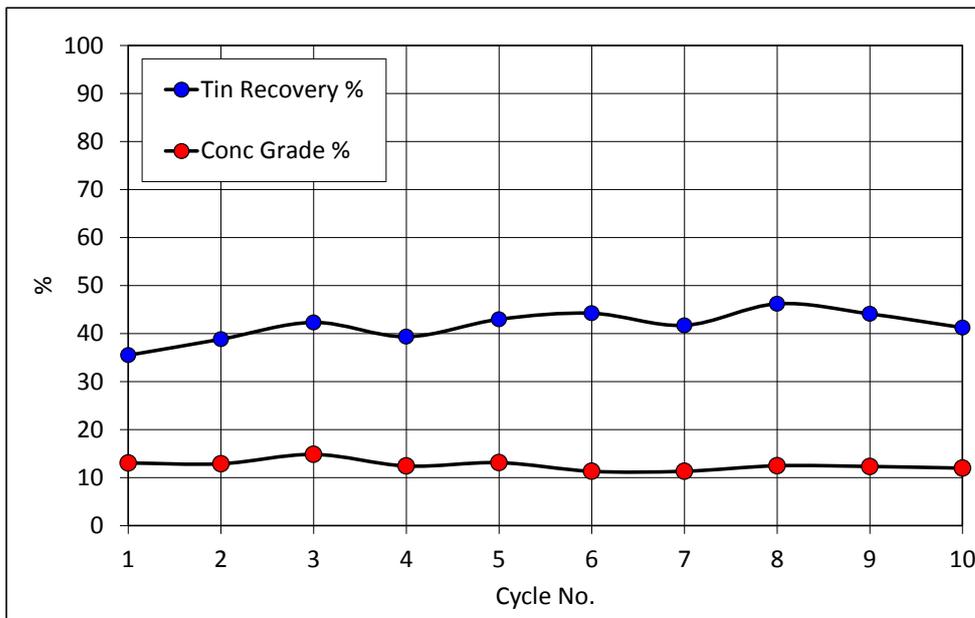
Summary table for internal streams: Final Re grind Feed, Final Reg Discharge, Mids-75, and NEW FEED with chemical assays.

Table with 12 columns: DISTRIBUTIONS, AV, and FROM NEW FEED (%). Rows include MASS, TIN, IRON, and SILICA with various assay results.



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**Figure 7-6 – Saint Dizier Composite 2+3: Gravity Lock Cycle Test (LC08)**



Both concentrate grade and recovery were quite stable across the 10 cycles completed. Overall recovery to the combine concentrates averaged 42.8% of gravity circuit feed (35% based on ore feed) at an average grade 12.1% Sn for the final 7 cycles.

Major diluents in the combine concentrates were Fe at 33.7% and S at 27.6% (equivalent to ~52% pyrite), with only 4.31% SiO<sub>2</sub>. Give this the concentrate should upgrade readily in concentrate dressing.

18.9% of the gravity circuit feed tin units (15.4% based on ore feed) were lost to the -75µm tails. However, screening this at 38-40 µm and directing the undersize to the deslime feed will significantly reduce the loss associated with this tail to 5.7% of gravity circuit feed (4.7% based on ore feed).

40.9% of the gravity circuit feed tin units (33.4% based on ore feed) deported to the cyclone overflow. This combine with the undersize from the fine gravity tail will give 54% tin recovery (44.1% based on ore feed) to deslime feed.

As expected due to the fine cassiterite mineralogy, overall recovery will be very dependent on tin flotation. However, it is expected somewhere from mid 50's to 60% recovery is likely achievable.



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## 8 GRAVITY CONCENTRATE DRESSING

At the time of writing minimal gravity concentrate dressing testwork had been completed. This was restricted to a single dry magnetic separation test, T11 (refer Table 17 and Appendix 5) carried out on concentrate produced from the Saint Dizier Bulk Composite.

**Table 17 – Test T11; Dry magnetic separation of gravity concentrate**

NAME	Wt (gm)	Calc(gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics 1 (1500 gauss)	48.2	48.2	35.92	4.87	15.7	44.90	45.1	2.31	12.4	14.95	51.1
Magnetics 2 (5000 gauss)	26.7	26.7	19.90	6.25	11.2	37.50	20.9	5.54	16.5	6.13	11.6
Non Magnetics	59.3	59.3	44.19	18.45	73.1	27.60	34.1	10.75	71.1	8.85	37.2
TOTAL	134.20		100.00	11.15	100.0	35.78	100.0	6.68	100.0	10.50	100.0

Table 18 shows results of QXRD analysis carried out on the products from test T11 (refer Appendix 2 for full QXRD and SEM analysis). Clearly the major diluents present in the concentrate are pyrite, marcasite, magnetite and siderite. SEM results also indicate significant intergrowths of cassiterite and both magnetite and siderite.

In test T11 magnetite has largely reported (~97% recovery) to the 1500 gauss magnetic product, while siderite has reported to both the 1500 and 5000 gauss products, giving a combine recovery of ~83%.

Although high intensity magnetic separation has provided good removal of siderite from the concentrate, this has been at the expense of significant tin loss (11.2% to the 5000 gauss product). Given this high Sn loss sulfuric acid leaching of the concentrate will provide a superior overall outcome for the removal of siderite from the concentrate (total leaching costs are expected to be well less than the value of Sn loss in high intensity magnetic separation).



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**Table 18 – QXRD of products from test T11**

Phase	Mag 1 - 1500 Gauss	Mag 2 - 5000 Gauss	Non Mag - 5000 Gauss
Cassiterite	5.9	7.3	23.3
Pyrite	14.9	5.7	10.4
Pyrrhotite	0	0	0
Siderite	39.2	62.6	12.3
Arsenopyrite	1.5	0.8	1.6
Goethite	1.6	10.1	21.9
Quartz	1	1.8	4.9
Marcasite	10.8	5.9	10
Topaz	0.1	0.6	0
Zircon	0.1	0.1	0.8
Diopside (pyrox)	0	0.6	5.5
Forsterite (ol)?	0.7	1.8	4
Fluorite	0.1	0	0
Phlogopite	0	0	0
Dravite (tourm)	0	0.1	3.3
Galena	0.1	0	0
Microcline	0	0	0.9
Magnetite	21.7	0.5	0.3
Chlorite	0.3	0.4	0
Dolomite	1.9	1.7	0.9

At the time of writing no gravity concentrate dressing testwork on the concentrate produced in test LC08 from Saint Dizier Comp2+3 had been completed. Currently planned work includes carrying out sulfide dressing flotation, followed by wet magnetic separation and concentrate leaching to remove sulfides, magnetite and carbonate minerals which are the major diluents present in the gravity concentrate.



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## 9 DESLIME AND TIN FLOTATION

At the time of writing only preliminary/scouting deslime and tin flotation testwork had been completed. Results for this work are contained in Appendix 13.

The feed material to these preliminary/scouting is summarised in Table 19.

**Table 19 – Summary of preliminary/scouting tin flotation tests**

Test number	Feed material description
T0887 test T08	Non-mags product produced from test LC02. LC02 was the cleaning stage of the roughing, plus regrind and cleaning magnetic separation test carried out on the Saint Dizier Bulk Composite.
T0887 test T20 to T24	Comp 2+3, ground to P80 = 53µm and deslimed via cyclosizer at CS4 prior to tin flotation

Direct flotation of the reground non-mags product in test T08 gave very poor results. Flotation of this product was not explored further.

Tests T20 to T24 explored the “direct tin flotation” of Comp 2+3, following a primary grind to P80 = 53µm and desliming via cyclosizer at CS4, in a series of roughing only tests. Table 20 summarises tin flotation conditions for these, with results shown in Figure 9-1, Figure 9-2 and Figure 9-3.

**Table 20 – Summary of tin float conditions for tests T20 to T24**

Test	SSF (g/t)	Na <sub>2</sub> SO <sub>3</sub> (g/t)	SPA (g/t)
T20	397	298	893 (dosed in 2 stages)
T23	393	-	393
T24	-	-	394

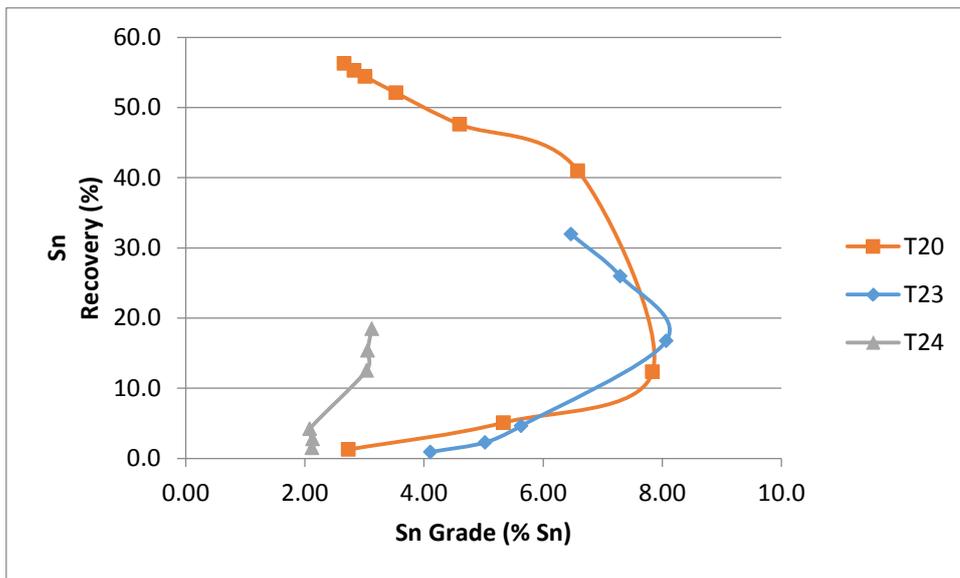
- Results for this series of tests (particularly T20) are encouraging in terms of the tin grades achieved (from roughing only). Although recoveries to tin rougher concentrate were only modest, there is likely room for significant optimisation of the overall grade/recovery response.
- Sulfide scavenger flotation response was good under the conditions for these tests with over 90% of sulfur rejected. However, further work is required to reduce Sn losses from this stage.
- The very high levels of magnetite present in these tests did not appear to be particularly detrimental to tin flotation. Initially magnetite did not float strongly in these tests until SPA doses were increased to well beyond 400 g/t. At doses less than this reasonable selectivity against magnetite and siderite was achieved.



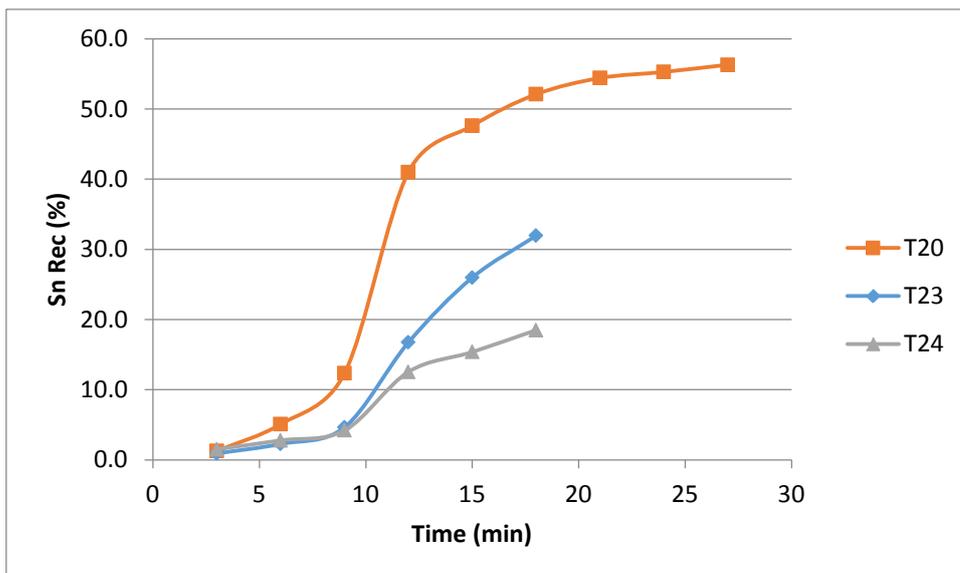
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- Sodium sulfite was dosed to test its application as a siderite depressant. Although this did not particularly impact selectivity achieved, initial flotation kinetics were improved compared to tests without sodium sulfite dosed. However, in all tests initial flotation kinetics were poor suggesting an activation/conditioning issue.
- With no SSF doses tin flotation performance was extremely poor

**Figure 9-1 – Saint Dizier Comp 2+3 “Direct Tin Flotation” tests; Sn grade vs Sn recovery**



**Figure 9-2– Saint Dizier Comp 2+3 “Direct Tin Flotation” tests; Sn recovery vs time**

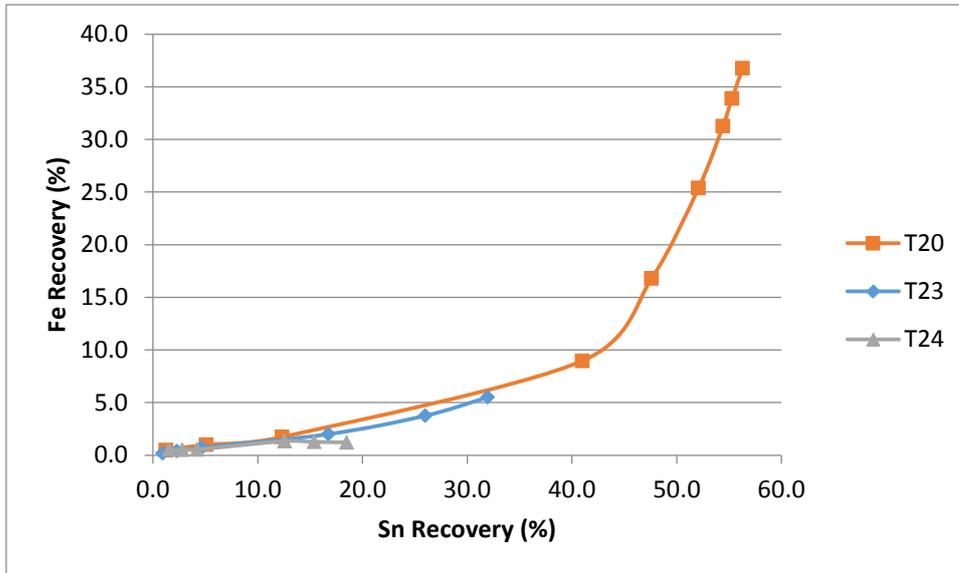




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**Figure 9-3– Saint Dizier Comp 2+3 “Direct Tin Flotation” tests; Sn recovery vs Fe recovery**



It is currently planned to complete more detailed deslime and tin flotation testwork on the combine gravity cyclone overflow and <40 µm fraction of the fine gravity tails generated from lock cycle gravity test T0887 LC08.



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## 10 CONCLUSIONS

### 10.1 Bulk Composite

The Saint Dizier Bulk Composite sample collected from the costean is heavily weathered, and is not thought to be representative of the overall mineable Saint Dizier mineral resource.

The overall metallurgy of the Bulk Composite is difficult. Given the very high soluble tin content, modest gravity recovery, very high losses to both the magnetite concentrate (23.7%) and slimes tails (16.9%), its expected overall Sn recovery for the Saint Dizier Bulk Composite is limited to something less than 50%.

Results for the Composite 2+3 material to date are more encouraging.

Key differences between the Bulk Composite and intersections from ST06 (from which Composite 2+3 was produced) are;

- Portion of soluble tin (as a % of total tin);  
Bulk sample; 22%, intersections - top; 8%, middle; 3%, bottom; 13.5%
- Liberation of the drill samples is poorer than the bulk sample
- Quantity of magnetite;  
Bulk sample; 31%, intersections - top; 22%, middle; 35%, bottom; 59%
- binary associations of cassiterite with magnetite;  
Bulk sample; 11%, intersections top; 1%, middle; 3%, bottom; 21%
- Drill intersections have significantly less cassiterite locked with magnetite and less soluble tin associated with the magnetic fraction;

Magnetic separation testwork on the Bulk Composite sample showed very high losses of Sn to the magnetite product compared to the drill hole composites (Comp 2, 3 and 4), being a combination of both high soluble tin deportment to the magnetic fraction and very fine intergrowths of cassiterite in magnetite.

- Drill intersections have;
  - less tin in ultra-fine size fraction – likely lower slimes losses
  - higher sulfur ~5% c.f. 1.3%

### 10.2 Composite 2+3

Results for the Composite 2+3 material to date are encouraging.



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The magnetic separation stage represents a significant Sn loss for the overall circuit at 18.3%. However, this gives a significant mass reduction feeding into the gravity circuit with magnetite levels in the gravity feed reduced to more manageable levels.

Overall recovery to the combine gravity concentrates averaged 35% based on ore feed at an average grade 12.1% Sn in lock cycle gravity testing.

Major diluents in the combine gravity concentrates were Fe at 33.7% and S at 27.6% (equivalent to ~52% pyrite), with only 4.31% SiO<sub>2</sub>. Give this the concentrate should upgrade readily in concentrate dressing.

44.1% of Sn units based on ore feed deported to deslime feed, while 4.7% (based on ore feed) were lost to the fine gravity tails.

As expected due to the fine cassiterite mineralogy, overall recovery from Composite 2+3 will be very dependent on tin flotation. However, it is expected somewhere from mid 50's to 60% recovery is likely achievable.



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## **11 ONGOING WORK**

At the time of writing various metallurgical testwork on the Saint Dizier Composite 2+3 was still in progress, with results, interpretation and reporting for the overall program yet to be finalised.

This ongoing work is focused on;

- Gravity concentrate dressing – This is planned to investigate upgrading of the gravity concentrate via sulfide flotation to reject sulfide minerals diluting the concentrate, magnetic separation to reject any residual magnetite and sulfuric acid leaching to remove carbonates present.
- Deslime and tin flotation – Planned feed to this testwork is the gravity cyclone overflow and ,40µm portion of the fine gravity tails generated from the gravity lock cycle testing

It is expected all currently planned testwork will be completed during 1<sup>st</sup> quarter 2015, with finalised results for the overall program reported in the 2016 annual progress update.



**WorleyParsons**

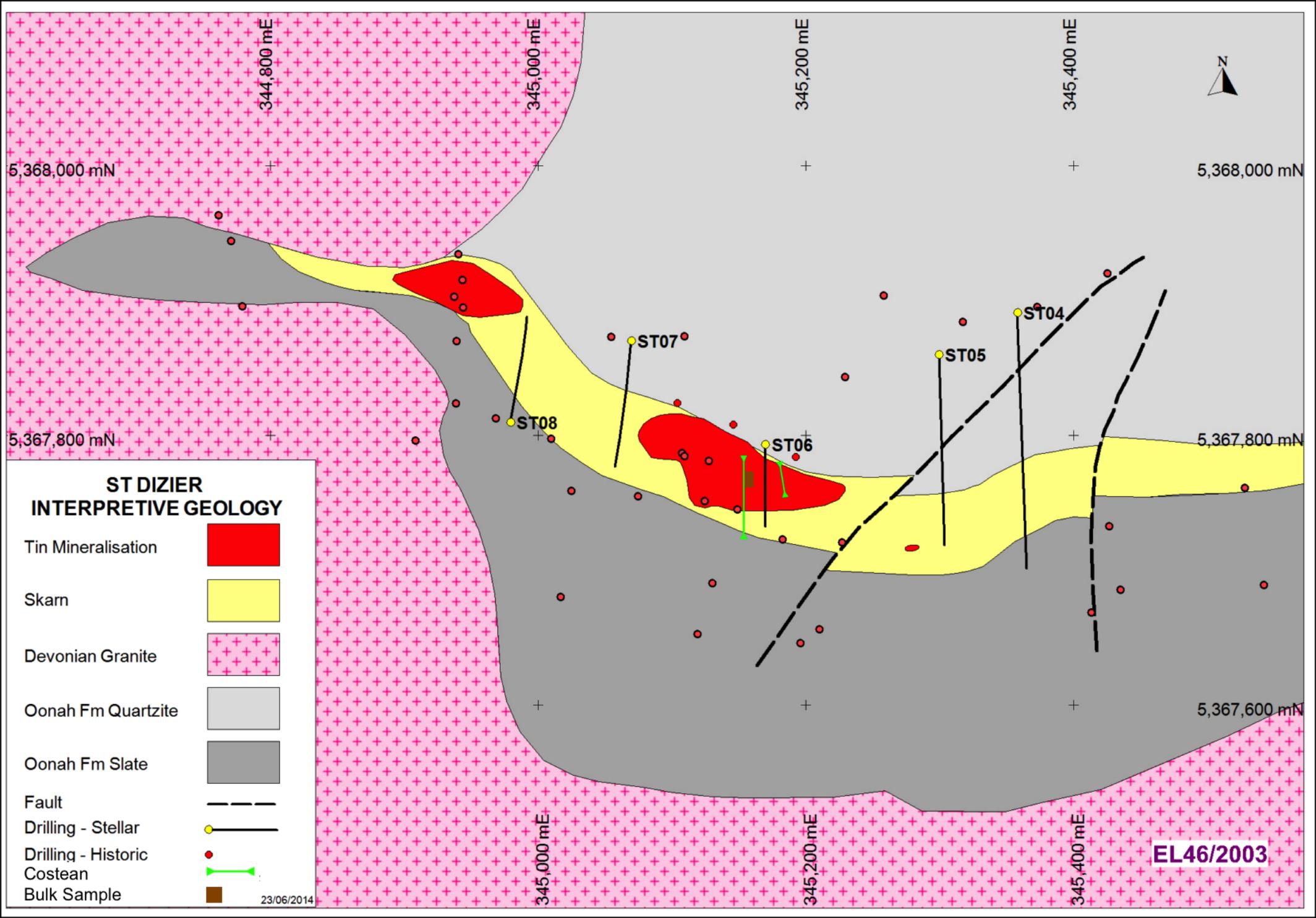
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## Appendix 1 – Sample Details



1200RL

1000RL

5367600N

5367800N

H1 14.6 - 59.6  
45.0m @ 0.8% Sn

H10 32.0 - 66.0  
34.0m @ 0.8% Sn

H3 58.5 - 94.2  
35.7m @ 0.6% Sn

M4 98.0 - 123.0  
26.0m @ 0.5% Sn

ST01 86.0 - 101.0  
15.0m @ 0.9% Sn

SD9 166.0 - 175.0  
9.0m @ 0.6% Sn

ST06 106.0 - 114.0  
8.0m @ 0.7% Sn

ST06 10.2 - 86.0  
75.8m @ 0.9% Sn

M1 1.8 - 94.8  
93.0m @ 1.8% Sn

ST01 44.0 - 79.0  
35.0m @ 0.5% Sn

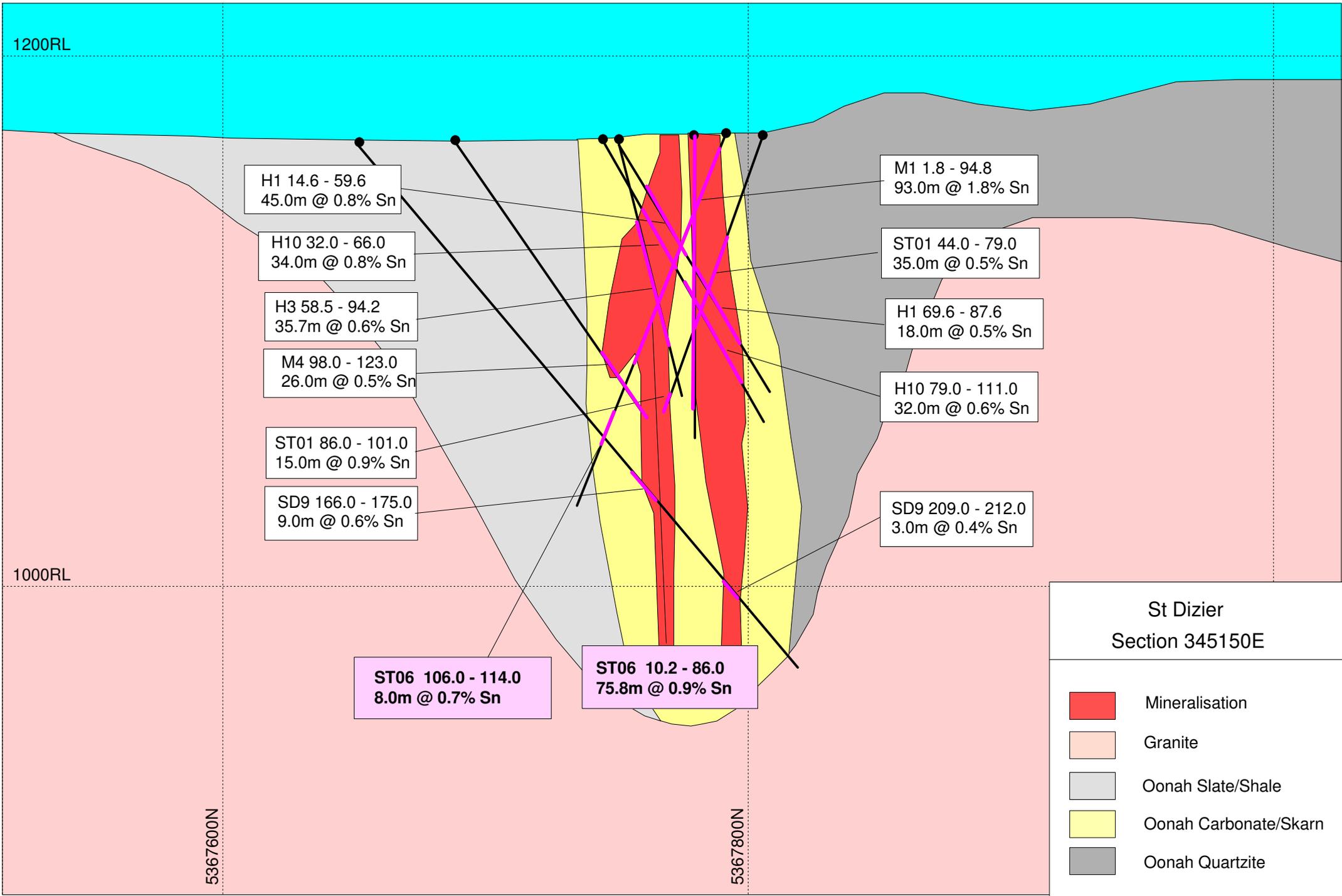
H1 69.6 - 87.6  
18.0m @ 0.5% Sn

H10 79.0 - 111.0  
32.0m @ 0.6% Sn

SD9 209.0 - 212.0  
3.0m @ 0.4% Sn

**St Dizier**  
Section 345150E

	Mineralisation
	Granite
	Oonah Slate/Shale
	Oonah Carbonate/Skarn
	Oonah Quartzite



**Stellar Resources Ltd - Drill Hole Assay Data**

Project	Prospect	Hole_id	Depth_from	Depth_to	Sample_id	Sn %	S_Sn ppm	Cu ppm	Pb ppm	Zn ppm	Ag g/t	Fe %	S %	As ppm	Bi ppm	WO3 ppm	SG
Heemskirk	St Dizier	ST06	4.2	5.7	290647	0.01	80.00	342.00	130.00	2150.00	8.00	5.24	4.30	750.00	30.00	0.04	2.73
Heemskirk	St Dizier	ST06	7.2	8.7	290648	0.05	170.00	1510.00	<10	370.00	3.00	22.60	23.50	19300.00	360.00	0.04	3.43
Heemskirk	St Dizier	ST06	10.2	11.7	290649	2.10	3550.00	3780.00	10.00	1740.00	9.00	24.00	25.30	25100.00	1090.00	0.06	3.55
Heemskirk	St Dizier	ST06	11.7	13.2	290650	0.55	300.00	2420.00	10.00	1350.00	4.00	17.80	16.45	27600.00	220.00	0.04	3.31
Heemskirk	St Dizier	ST06	13.2	14.6	290651	1.56	80.00	3590.00	<10	150.00	2.00	26.00	26.70	9820.00	150.00	0.06	3.69
Heemskirk	St Dizier	ST06	14.6	15.4	290652	1.97	280.00	3000.00	<10	950.00	5.00	24.70	26.40	3850.00	170.00	0.04	3.65
Heemskirk	St Dizier	ST06	15.4	16.2	290653	0.51	220.00	2770.00	<10	1100.00	7.00	21.20	21.20	9440.00	250.00	0.05	3.49
Heemskirk	St Dizier	ST06	16.2	17.7	290654	0.49	100.00	988.00	<10	150.00	<1	10.95	9.09	260.00	10.00	0.02	3.11
Heemskirk	St Dizier	ST06	17.7	19.2	290655	2.58	420.00	2740.00	<10	120.00	2.00	27.80	16.85	2270.00	90.00	0.05	3.53
Heemskirk	St Dizier	ST06	19.2	20.3	290656	0.23	220.00	494.00	90.00	110.00	3.00	19.70	3.72	710.00	50.00	0.01	2.12
Heemskirk	St Dizier	ST06	20.3	21.9	290657	0.19	80.00	720.00	<10	110.00	<1	11.45	4.32	130.00	40.00	0.02	2.94
Heemskirk	St Dizier	ST06	21.9	23.0	290658	0.44	80.00	1330.00	<10	130.00	1.00	16.05	9.57	350.00	40.00	0.03	2.95
Heemskirk	St Dizier	ST06	23.0	24.0	290659	1.98	60.00	2550.00	<10	80.00	1.00	24.60	16.00	860.00	100.00	0.04	3.38
Heemskirk	St Dizier	ST06	24.0	25.0	290660	1.38	280.00	1530.00	10.00	40.00	<1	27.20	10.25	7880.00	130.00	0.04	3.13
Heemskirk	St Dizier	ST06	25.0	26.0	290661	1.16	210.00	2440.00	<10	70.00	1.00	29.80	16.55	1070.00	120.00	0.04	3.14
Heemskirk	St Dizier	ST06	26.0	27.0	290662	1.31	240.00	1680.00	<10	40.00	1.00	29.50	10.75	60.00	70.00	0.03	3.26
Heemskirk	St Dizier	ST06	27.0	28.0	290663	1.33	120.00	2600.00	<10	50.00	<1	30.30	16.40	7230.00	130.00	0.05	3.39
Heemskirk	St Dizier	ST06	28.0	29.0	290664	1.88	230.00	3250.00	<10	70.00	1.00	31.90	20.00	340.00	80.00	0.05	3.45
Heemskirk	St Dizier	ST06	29.0	30.0	290665	1.41	210.00	3190.00	<10	60.00	1.00	30.10	16.85	660.00	90.00	0.04	3.38
Heemskirk	St Dizier	ST06	30.0	31.0	290666	1.74	190.00	1610.00	<10	50.00	1.00	35.60	9.85	760.00	90.00	0.05	3.30
Heemskirk	St Dizier	ST06	31.0	32.0	290667	0.67	450.00	219.00	<10	40.00	<1	46.60	1.20	150.00	20.00	0.04	3.14
Heemskirk	St Dizier	ST06	32.0	33.0	290668	0.62	500.00	243.00	<10	50.00	<1	52.40	1.02	140.00	90.00	0.05	3.03
Heemskirk	St Dizier	ST06	33.0	34.0	290669	0.26	220.00	1060.00	<10	70.00	<1	35.30	6.53	3060.00	170.00	0.04	3.00
Heemskirk	St Dizier	ST06	34.0	35.0	290670	0.82	530.00	743.00	<10	220.00	<1	27.30	6.23	8260.00	150.00	0.04	3.40
Heemskirk	St Dizier	ST06	35.0	36.0	290671	1.25	770.00	301.00	<10	1720.00	<1	37.00	0.33	270.00	60.00	0.05	3.48
Heemskirk	St Dizier	ST06	36.0	37.0	290672	0.20	430.00	999.00	<10	160.00	<1	25.80	5.07	8010.00	170.00	0.06	3.61
Heemskirk	St Dizier	ST06	37.0	38.0	290673	0.82	810.00	503.00	<10	70.00	<1	29.80	0.20	1070.00	<10	0.04	3.09
Heemskirk	St Dizier	ST06	38.0	39.0	290674	0.39	460.00	293.00	<10	140.00	<1	25.10	2.31	1450.00	30.00	0.04	3.44
Heemskirk	St Dizier	ST06	39.0	40.0	290675	0.15	640.00	45.00	<10	130.00	<1	17.70	0.40	60.00	<10	0.03	2.39
Heemskirk	St Dizier	ST06	40.0	41.0	290676	0.13	780.00	18.00	<10	30.00	<1	21.80	0.38	110.00	<10	0.03	2.15
Heemskirk	St Dizier	ST06	41.0	42.0	290677	0.04	310.00	174.00	<10	260.00	<1	9.37	0.22	80.00	<10	0.02	2.57
Heemskirk	St Dizier	ST06	42.0	43.0	290678	0.28	690.00	89.00	<10	210.00	<1	7.87	0.15	60.00	40.00	0.03	2.58
Heemskirk	St Dizier	ST06	43.0	44.0	290679	0.71	1090.00	61.00	20.00	380.00	<1	21.30	0.09	50.00	90.00	0.04	3.03
Heemskirk	St Dizier	ST06	44.0	45.0	290680	0.29	1220.00	66.00	10.00	220.00	<1	13.35	0.08	50.00	30.00	0.04	3.11
Heemskirk	St Dizier	ST06	45.0	46.0	290681	0.19	490.00	56.00	<10	60.00	<1	9.58	0.05	70.00	30.00	0.03	2.60
Heemskirk	St Dizier	ST06	46.0	47.0	290682	0.23	650.00	155.00	<10	80.00	<1	26.00	0.59	260.00	60.00	0.04	3.04
Heemskirk	St Dizier	ST06	47.0	48.0	290683	1.37	1480.00	644.00	<10	60.00	<1	26.90	1.19	390.00	80.00	0.05	2.89
Heemskirk	St Dizier	ST06	48.0	49.0	290684	1.25	7150.00	107.00	<10	350.00	<1	20.20	0.85	170.00	40.00	0.07	3.19
Heemskirk	St Dizier	ST06	49.0	50.0	290685	0.64	1300.00	32.00	<10	40.00	<1	21.10	0.38	120.00	40.00	0.03	2.68
Heemskirk	St Dizier	ST06	50.0	51.0	290686	0.13	280.00	155.00	<10	220.00	<1	16.50	0.98	100.00	10.00	0.02	3.17
Heemskirk	St Dizier	ST06	51.0	52.0	290687	0.11	320.00	329.00	10.00	110.00	<1	7.08	1.53	30.00	10.00	0.02	2.94
Heemskirk	St Dizier	ST06	52.0	53.0	290688	0.13	400.00	364.00	10.00	130.00	<1	9.76	2.43	50.00	10.00	0.03	2.93
Heemskirk	St Dizier	ST06	53.0	54.0	290689	0.08	320.00	466.00	40.00	150.00	<1	8.50	2.33	80.00	<10	0.02	3.16
Heemskirk	St Dizier	ST06	54.0	55.0	290690	0.05	250.00	467.00	150.00	600.00	1.00	8.19	2.72	90.00	10.00	0.02	3.20
Heemskirk	St Dizier	ST06	55.0	56.0	290691	0.02	150.00	479.00	10.00	100.00	<1	7.46	3.03	70.00	<10	0.02	3.17
Heemskirk	St Dizier	ST06	56.0	57.0	290692	0.03	100.00	423.00	<10	310.00	<1	7.12	2.77	30.00	<10	0.02	3.00
Heemskirk	St Dizier	ST06	57.0	58.0	290693	0.67	110.00	1020.00	<10	290.00	<1	14.00	6.07	20.00	40.00	0.03	3.23
Heemskirk	St Dizier	ST06	58.0	59.0	290694	0.78	120.00	642.00	<10	80.00	<1	20.50	3.48	190.00	30.00	0.03	3.16
Heemskirk	St Dizier	ST06	59.0	60.0	290695	0.19	90.00	755.00	<10	910.00	<1	11.25	4.12	400.00	20.00	0.02	3.14
Heemskirk	St Dizier	ST06	60.0	61.0	290696	0.28	230.00	2280.00	<10	220.00	1.00	29.50	1.99	50.00	20.00	0.02	3.30
Heemskirk	St Dizier	ST06	61.0	62.0	290697	0.67	180.00	1150.00	<10	80.00	1.00	22.40	2.92	270.00	20.00	0.02	3.27
Heemskirk	St Dizier	ST06	62.0	63.0	290698	0.37	260.00	702.00	<10	130.00	1.00	47.80	2.04	260.00	80.00	0.04	3.38
Heemskirk	St Dizier	ST06	63.0	64.0	290699	1.20	650.00	198.00	<10	90.00	<1	49.80	0.56	680.00	120.00	0.05	3.28
Heemskirk	St Dizier	ST06	64.0	65.0	290700	0.42	490.00	648.00	<10	100.00	<1	53.30	1.80	1530.00	120.00	0.07	4.16
Heemskirk	St Dizier	ST06	65.0	66.0	290701	0.06	280.00	187.00	<10	140.00	<1	57.00	0.06	140.00	20.00	0.05	4.43
Heemskirk	St Dizier	ST06	66.0	67.0	290702	1.67	490.00	215.00	<10	370.00	1.00	53.10	1.99	350.00	20.00	0.08	3.97

39.8m @ 0.90%Sn

Project	Prospect	Hole_id	Depth_from	Depth_to	Sample_id	Sn %	S_Sn ppm	Cu ppm	Pb ppm	Zn ppm	Ag g/t	Fe %	S %	As ppm	Bi ppm	WO3 ppm	SG
Heemskirk	St Dizier	ST06	67.0	68.0	290703	2.47	670.00	768.00	<10	30.00	1.00	44.30	1.35	1920.00	70.00	0.28	3.75
Heemskirk	St Dizier	ST06	68.0	69.0	290704	1.08	400.00	829.00	<10	50.00	<1	29.00	6.92	40.00	<10	0.05	3.99
Heemskirk	St Dizier	ST06	69.0	70.0	290705	1.84	440.00	306.00	<10	60.00	<1	37.20	1.89	30.00	<10	0.07	3.67
Heemskirk	St Dizier	ST06	70.0	71.0	290706	0.29	200.00	629.00	<10	100.00	<1	24.00	3.57	1010.00	100.00	0.04	2.74
Heemskirk	St Dizier	ST06	71.0	72.0	290707	1.20	90.00	935.00	<10	100.00	<1	23.90	7.27	110.00	50.00	0.06	3.27
Heemskirk	St Dizier	ST06	72.0	73.0	290708	0.26	170.00	848.00	<10	130.00	<1	34.10	6.11	3700.00	70.00	0.04	3.50
Heemskirk	St Dizier	ST06	73.0	74.0	290709	0.76	180.00	611.00	<10	80.00	<1	24.20	4.03	30.00	20.00	0.04	2.76
Heemskirk	St Dizier	ST06	74.0	75.0	290710	2.84	120.00	2430.00	<10	110.00	<1	32.90	17.30	<10	130.00	0.06	3.58
Heemskirk	St Dizier	ST06	75.0	76.0	290711	1.67	260.00	1220.00	<10	80.00	1.00	46.90	8.06	2520.00	120.00	0.05	3.61
Heemskirk	St Dizier	ST06	76.0	77.0	290712	0.23	310.00	131.00	<10	160.00	<1	42.90	1.27	20.00	30.00	0.05	3.59
Heemskirk	St Dizier	ST06	77.0	78.0	290713	1.63	240.00	1010.00	<10	70.00	<1	42.50	7.63	1530.00	110.00	0.06	3.78
Heemskirk	St Dizier	ST06	78.0	79.0	290714	0.75	270.00	337.00	<10	70.00	<1	50.50	2.96	210.00	50.00	0.05	4.23
Heemskirk	St Dizier	ST06	79.0	80.0	290715	0.61	180.00	379.00	<10	160.00	<1	12.05	3.65	10350.00	30.00	0.03	2.90
Heemskirk	St Dizier	ST06	80.0	81.0	290716	0.55	220.00	397.00	<10	100.00	<1	16.60	2.90	420.00	40.00	0.03	3.51
Heemskirk	St Dizier	ST06	81.0	82.0	290717	0.22	180.00	513.00	<10	110.00	<1	12.75	4.48	1800.00	120.00	0.04	2.81
Heemskirk	St Dizier	ST06	82.0	83.0	290718	0.06	60.00	245.00	<10	590.00	<1	5.84	0.74	10.00	<10	0.02	2.92
Heemskirk	St Dizier	ST06	83.0	84.0	290719	1.20	440.00	849.00	<10	240.00	<1	33.70	4.57	560.00	50.00	0.04	4.35
Heemskirk	St Dizier	ST06	84.0	85.0	290720	3.41	290.00	2650.00	<10	160.00	<1	32.60	16.95	10.00	80.00	0.06	3.90
Heemskirk	St Dizier	ST06	85.0	86.0	290721	1.19	90.00	880.00	<10	760.00	<1	15.70	7.15	80.00	60.00	0.04	3.50
Heemskirk	St Dizier	ST06	86.0	87.0	290722	0.07	<50	30.00	<10	40.00	<1	3.88	0.26	<10	10.00	0.06	3.20
Heemskirk	St Dizier	ST06	87.0	88.0	290723	0.08	70.00	214.00	<10	570.00	<1	5.40	1.35	200.00	20.00	0.02	2.72
Heemskirk	St Dizier	ST06	88.0	89.0	290724	0.01	<50	32.00	<10	180.00	<1	3.04	0.16	20.00	<10	0.02	2.99
Heemskirk	St Dizier	ST06	89.0	90.0	290725	0.03	250.00	22.00	<10	320.00	<1	6.99	0.08	210.00	10.00	0.02	2.63
Heemskirk	St Dizier	ST06	90.0	91.0	290726	0.02	80.00	6.00	<10	500.00	<1	4.14	0.06	60.00	<10	0.02	2.86
Heemskirk	St Dizier	ST06	91.0	92.0	290727	0.03	350.00	<5	<10	250.00	<1	5.49	0.06	450.00	10.00	0.02	2.91
Heemskirk	St Dizier	ST06	92.0	93.0	290728	0.09	810.00	7.00	<10	720.00	<1	5.73	0.08	150.00	<10	0.02	2.96
Heemskirk	St Dizier	ST06	93.0	94.0	290729	0.18	1950.00	30.00	<10	1790.00	<1	19.35	0.14	210.00	10.00	0.02	2.82
Heemskirk	St Dizier	ST06	94.0	95.0	290730	0.19	1810.00	42.00	<10	550.00	<1	12.00	0.15	1190.00	<10	0.02	3.01
Heemskirk	St Dizier	ST06	95.0	96.0	290731	0.03	330.00	5.00	<10	540.00	<1	3.96	0.06	210.00	<10	0.02	2.68
Heemskirk	St Dizier	ST06	96.0	97.0	290732	0.02	290.00	14.00	<10	900.00	<1	5.30	0.10	420.00	<10	0.02	2.67
Heemskirk	St Dizier	ST06	97.0	98.0	290733	<0.01	70.00	20.00	<10	370.00	<1	2.43	0.04	50.00	<10	0.02	2.65
Heemskirk	St Dizier	ST06	98.0	99.0	290734	<0.01	<50	51.00	<10	670.00	<1	2.11	0.08	40.00	<10	0.02	2.79
Heemskirk	St Dizier	ST06	104.0	105.0	290735	<0.01	120	<5	<10	50	<1	1.04	0.01	10	<10	0.08	2.47
Heemskirk	St Dizier	ST06	105.0	106.0	290736	0.11	460	<5	<10	180	<1	42.6	0.41	6700	20	0.07	4.27
Heemskirk	St Dizier	ST06	106.0	107.0	290737	1.37	1490	<5	<10	150	<1	55.8	0.38	6460	20	0.06	4.06
Heemskirk	St Dizier	ST06	107.0	108.0	290738	0.11	550	38	<10	70	<1	48.9	0.36	4620	30	0.05	3.6
Heemskirk	St Dizier	ST06	108.0	109.0	290739	0.04	370	306	<10	40	<1	29.2	0.49	3280	30	0.04	3.86
Heemskirk	St Dizier	ST06	109.0	110.0	290740	0.45	680	215	<10	250	<1	42.5	0.95	20700	90	0.04	2.6
Heemskirk	St Dizier	ST06	110.0	111.0	290741	0.08	430	19	<10	160	<1	45.7	2.14	20800	130	0.06	3.79
Heemskirk	St Dizier	ST06	111.0	112.0	290742	0.05	380	84	<10	380	<1	21.1	0.24	2540	30	0.04	2.73
Heemskirk	St Dizier	ST06	112.0	113.0	290743	2.96	2620	12	<10	80	<1	47.6	0.47	11500	40	0.05	4.2
Heemskirk	St Dizier	ST06	113.0	114.0	290744	0.57	1020	308	<10	1120	<1	32.3	0.52	1950	20	0.05	3.33
Heemskirk	St Dizier	ST06	114.0	115.0	290745	0.1	200	48	<10	500	<1	25.1	0.1	350	<10	0.04	4.38
Heemskirk	St Dizier	ST06	115.0	116.0	290746	0.11	310	<5	<10	90	<1	2.05	0.02	210	10	0.02	3.17
Heemskirk	St Dizier	ST06	116.0	117.0	290747	<0.01	50	<5	10	170	<1	3.14	0.09	30	20	0.03	2.77
Heemskirk	St Dizier	ST06	117.0	118.0	290748	0.2	710	105	<10	1490	1	25.5	0.15	270	30	0.07	2.87
Heemskirk	St Dizier	ST06	118.0	119.0	290749	0.42	990	209	<10	13900	1	40.8	0.96	220	<10	0.05	3.82
Heemskirk	St Dizier	ST06	119.0	120.0	290750	0.03	210	235	30	1770	<1	10	0.18	920	10	0.03	2.85
Heemskirk	St Dizier	ST06	120.0	121.0	290751	0.07	300	510	130	2040	1	15.05	0.21	270	10	0.03	2.86
Heemskirk	St Dizier	ST06	121.0	122.0	290752	<0.01	<50	140	30	280	<1	4.01	1.56	160	10	0.02	2.96
Heemskirk	St Dizier	ST06	130.0	131.0	290753	0.09	280	820	<10	1620	1	10.35	1.08	190	140	0.02	2.84
Heemskirk	St Dizier	ST06	131.0	132.0	290754	0.08	230	241	10	5780	<1	9.38	0.93	1190	70	0.02	3.21
Heemskirk	St Dizier	ST06	135.0	136.0	290755	0.36	2030	1275	40	3090	2	10.9	3.4	7680	220	0.03	2.99

29m @ 0.99%Sn

8m @ 0.70% Sn



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SAINT DIZIER METALLURGICAL TESTWORK  
2014 PROGRESS REPORT

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## Appendix 2 – Bulk Composite Mineralogy

# ALS Metallurgy

## Stellar Resources Limited St Dizier Project Bulk Composite Mineralogy

June 2014



McArthur Ore Deposit Assessments Pty Ltd

Gary J McArthur PhD FAusIMM MMICA MSEG

Suite 6, 1st Floor, Brownell Place, 11 Wilson St (P.O. Box 1303) Burnie TAS 7320 AUSTRALIA  
Tel (03) 6431 1701 Fax (03) 6431 1278 Mobile 0419 367240 email gary@modapl.com.au

## ALS METALLURGY

### Stellar Resources – St Dizier Bulk Composite Mineralogy June 2014

#### Method

A surface Bulk Composite sample from Stellar Resources' St Dizier Prospect was submitted for mineralogical assessment. The sample was sized into 5 fractions: +212 $\mu$ m, +106 $\mu$ m, +53 $\mu$ m, +20 $\mu$ m, and +8 $\mu$ m) and these were mounted on two polished mounts by Australian Petrographics (Queanbeyan, NSW).

The standard MODA technique was adopted to quantify the mineralogy.

In a first scan, for each fraction, 100 grains were selected at random and the area % of each mineral present was visually estimated. The minerals logged were: *pyrite* (Py), *pyrrhotite* (Po), *arsenopyrite* (As), *cassiterite* (Cs), *chalcopyrite* (Cp), *goethite+hematite* (GoHe), *magnetite* (Mt) and *gangue* (*quartz, silicates, carbonates, etc*, Ga). This allowed calculation of an overall mineralogical composition.

In a second scan, for each fraction, up to 50 grains containing Sn (almost exclusively *cassiterite*) were selected at random and logged as per the first scan.

The normal liberation and association parameters were calculated.

Photomicrographs were taken of each size fraction and these were annotated using PowerPoint.

#### Results

##### **Composition**

The following minerals were identified, in approximate descending order:

- Gangue (*quartz, silicates, carbonate, tourmaline?, carbonaceous matter, fluorite, talc* etc.)
- *Magnetite*
- *Goethite*
- *Pyrite* (60% crystalline and 40% *melnikovite*)
- *Arsenopyrite*
- *Cassiterite*
- *Chalcopyrite*
- *Pyrrhotite*
- *Hematite*
- *Sphalerite*
- *Covellite* (rare)
- *Chalcocite* (very rare)
- *Stannite* (very rare)

The overall composition of the Bulk Composite is summarised below:

**St Dizier Bulk Comp Composition Vol% (from total scan)**

Fraction	Wt%	Py	Po	As	Cs <sup>#</sup>	Cp	GoHe	Mt	Ga
+212µm	25.8	1.5	0.1	0.1	Tr	Tr	5.1	27.8	65.5
+106µm	22.3	1.7	0.1	Tr	Tr	Tr	6.3	31.9	60.1
+53µm	18.3	2.8	Tr	Tr	2.0	Tr	6.0	39.5	49.8
+25µm	13.9	1.0	Tr	Tr	Tr	Tr	4.8	24.7	69.6
+7µm	7.3	2.0	Tr	Tr	Tr	Tr	4.6	29.1	64.3
<b>TOTAL</b>	<b>87.6</b>	<b>1.8</b>	<b>0.1</b>	<b>Tr</b>	<b>0.4</b>	<b>Tr</b>	<b>5.5</b>	<b>30.9</b>	<b>61.4</b>

Py=pyrite, Po=pyrrhotite, As=arsenopyrite, Cs=cassiterite, Cp=chalcopyrite, GoHe=goethite+hematite, Mt=magnetite, Ga=gangue  
# count statistics very poor for the scarce cassiterite

**Liberation**

An essential summary of the liberation parameters for *cassiterite* is:

**St Dizier Bulk Comp Cassiterite liberation distribution%**

Fraction	Sn Wt%	Free	Binary with						Ternary
			Py	Po	As	GoHe	Mt	Ga	
+212µm	20.0	0	0	0	0	0	10	42	48
+106µm	20.2	43	0	0	0	0	24	15	18
+53µm	16.9	65	1	0	0	0	1	23	11
+25µm	15.7	66	0	0	0	1	11	16	6
+7µm	12.0	82	0	0	0	3	5	8	1
<b>TOTAL</b>	<b>84.6</b>	<b>47</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>11</b>	<b>22</b>	<b>19</b>

**St Dizier Bulk Comp Cassiterite association%**

Fraction	Sn Wt%	%associated with					
		Py	Po	As	GoHe	Mt	Ga
+212µm	20.0	14	0	0	3	47	90
+106µm	20.2	9	0	0	0	33	33
+53µm	16.9	1	0	0	4	8	32
+25µm	15.7	0	0	0	2	17	22
+7µm	12.0	0	0	0	3	5	8
<b>TOTAL</b>	<b>84.6</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>24</b>	<b>41</b>

*Stannite* is a very rare component, generally hosted by *chalcopyrite*. This *stannite* scarcity was unexpected given the core assays have sulphide Sn at an average of 6% of the total Sn (data provided by Ray Hazeldene, Stellar Resources). The limited correlation of sulphide Sn with Bi (rather than Cu) suggests a Bi-SnS phase may exist.

G.J.McArthur PhD FAusIMM MMICA MSEG

Principal Mineralogist

11.6.14

As=arsenopyrite  
Cp=chalcopyrite  
Cs=cassiterite  
Ga=gangue  
Go=goethite  
He=hematite  
Me=melnikovite pyrite  
Mt=magnetite  
Py=crystalline pyrite  
Tc=talc

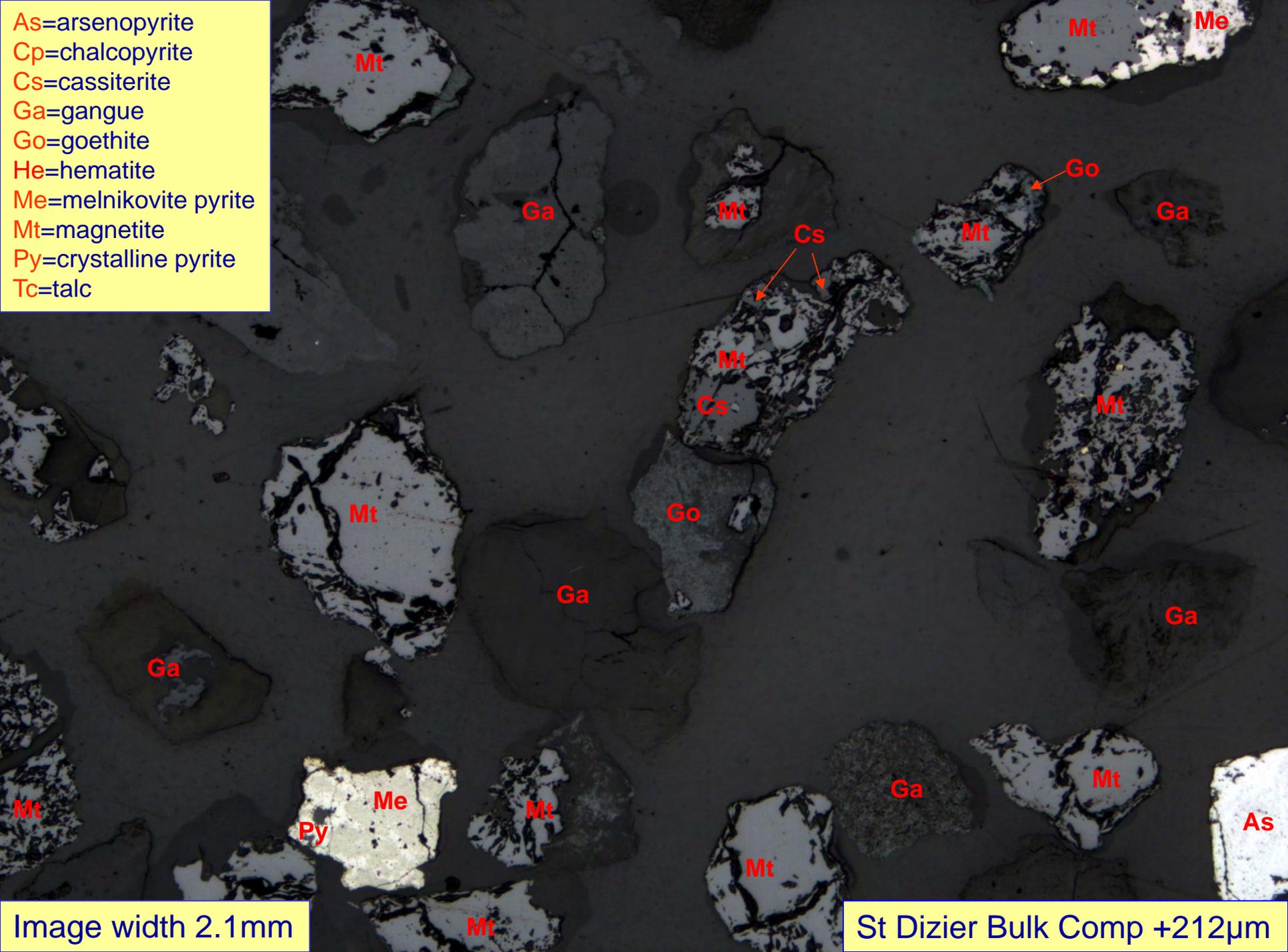


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St Dizier Bulk Comp +212µm

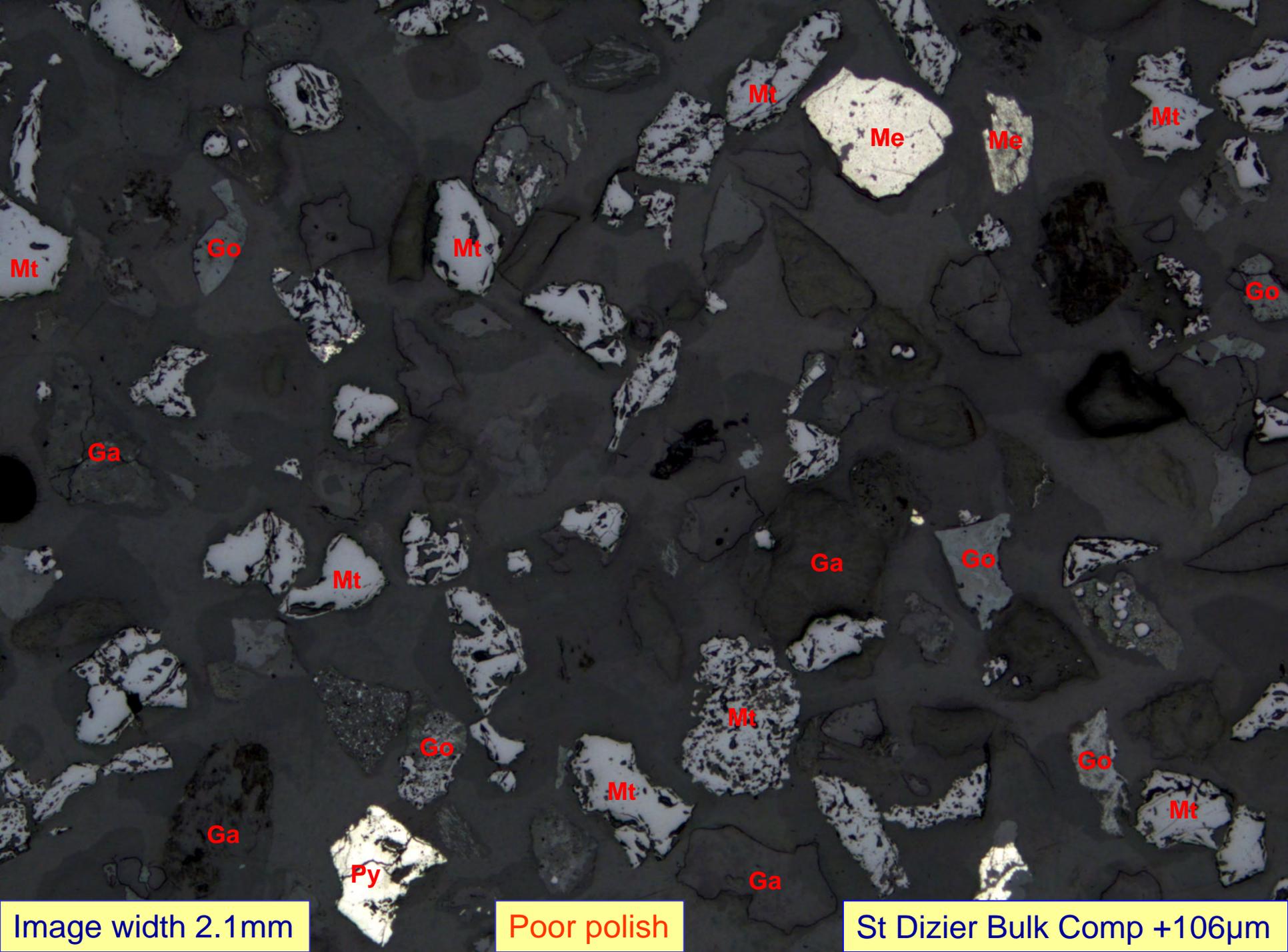


Image width 2.1mm

Poor polish

St Dizier Bulk Comp +106µm

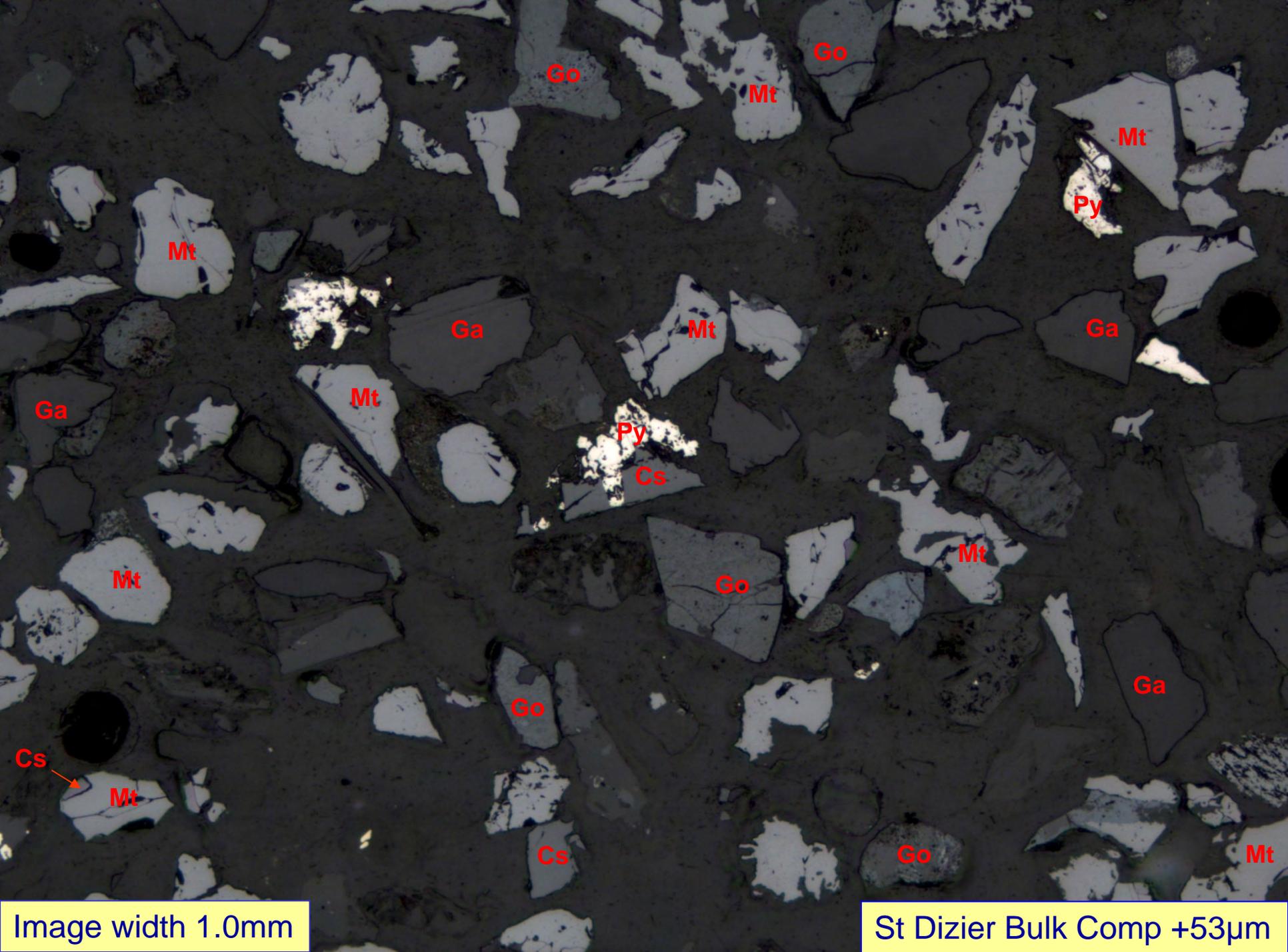
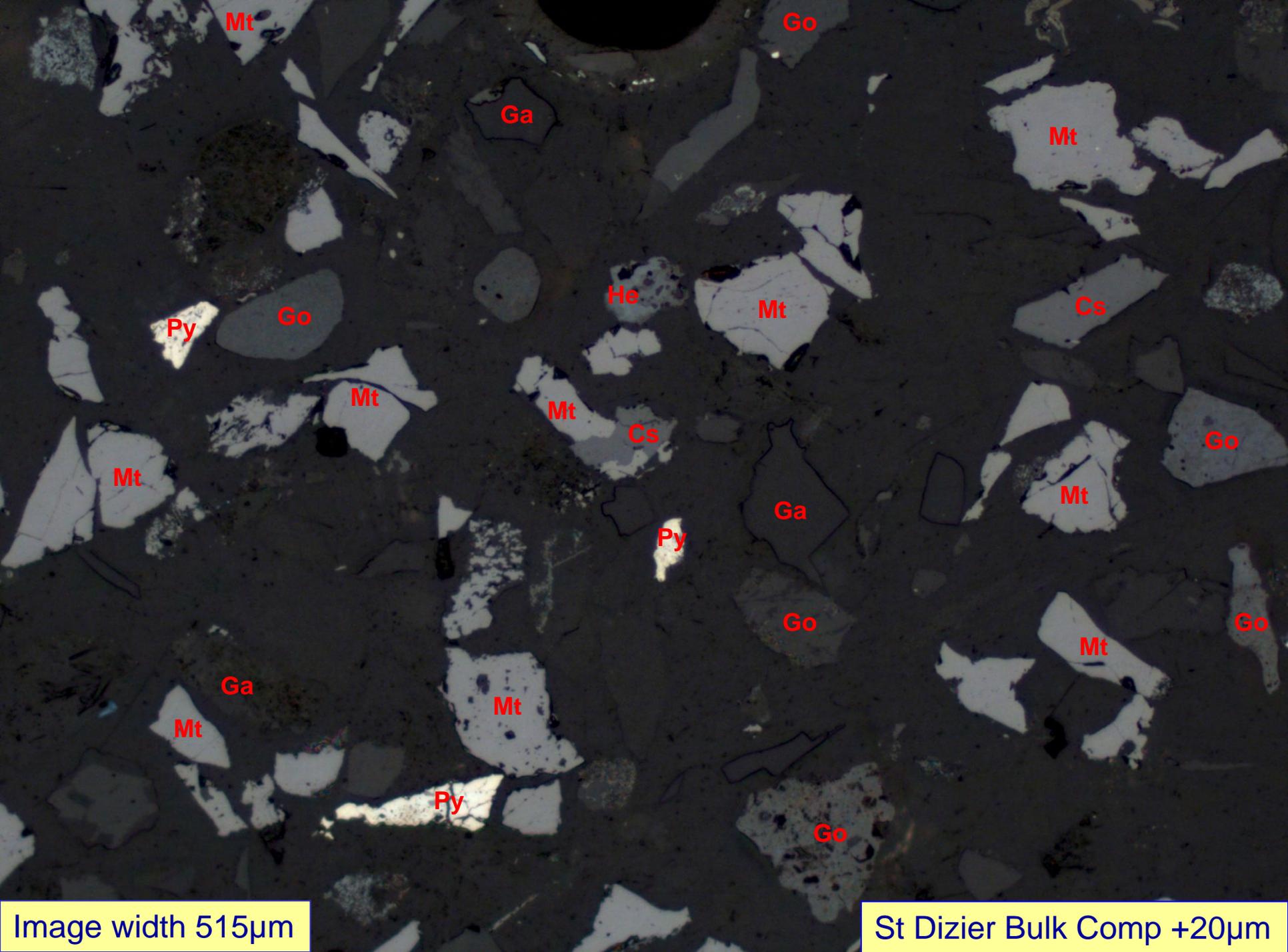


Image width 1.0mm

St Dizier Bulk Comp +53µm



Mt

Go

Ga

Mt

Py

Go

He

Mt

Cs

Mt

Mt

Cs

Go

Mt

Ga

Mt

Py

Go

Go

Mt

Ga

Mt

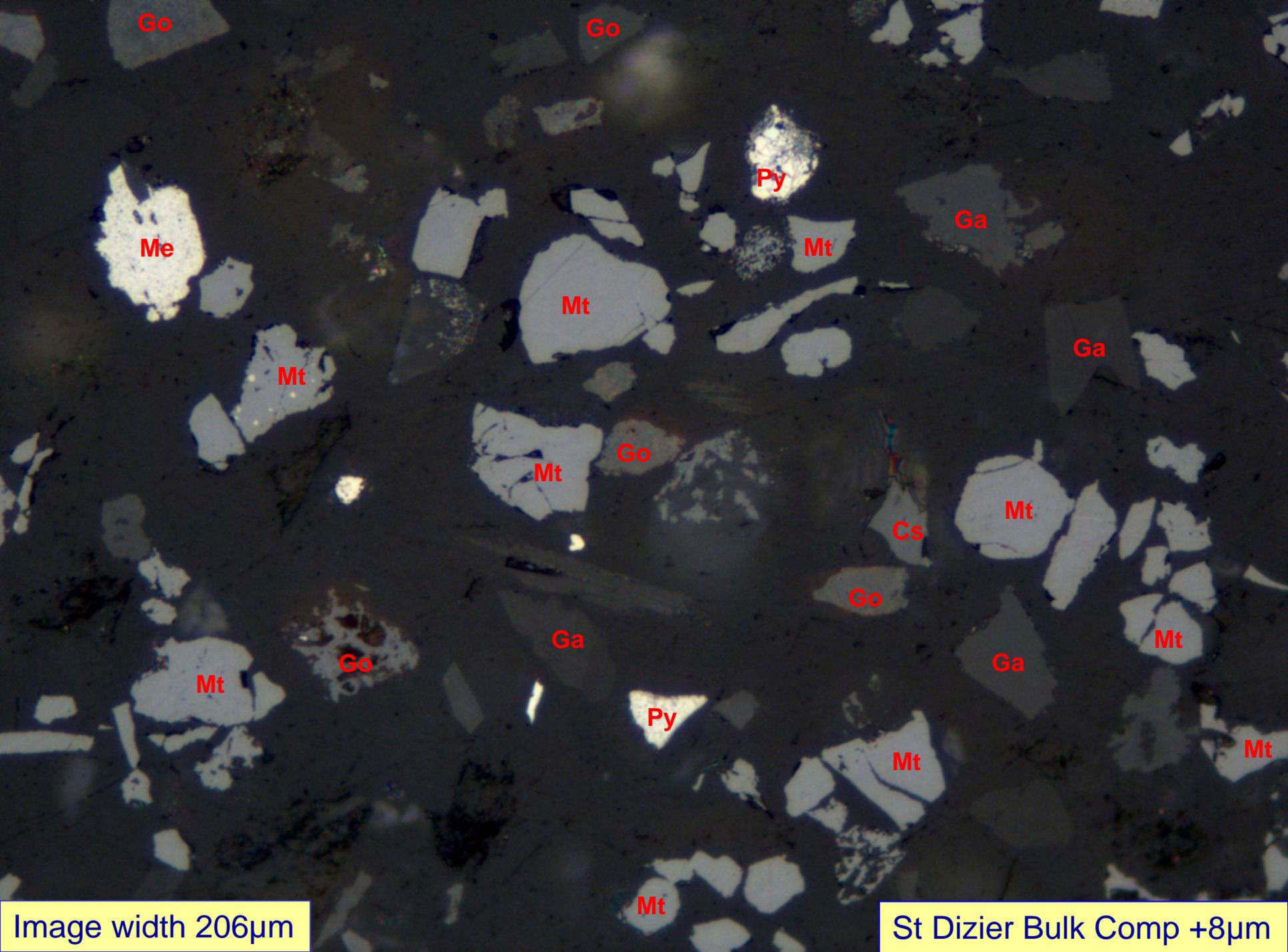
Mt

Py

Go

Image width 515µm

St Dizier Bulk Comp +20µm



Go

Go

Py

Me

Ga

Mt

Mt

Ga

Mt

Mt

Go

Cs

Mt

Go

Ga

Mt

Mt

Go

Ga

Py

Mt

Mt

Mt

Image width 206µm

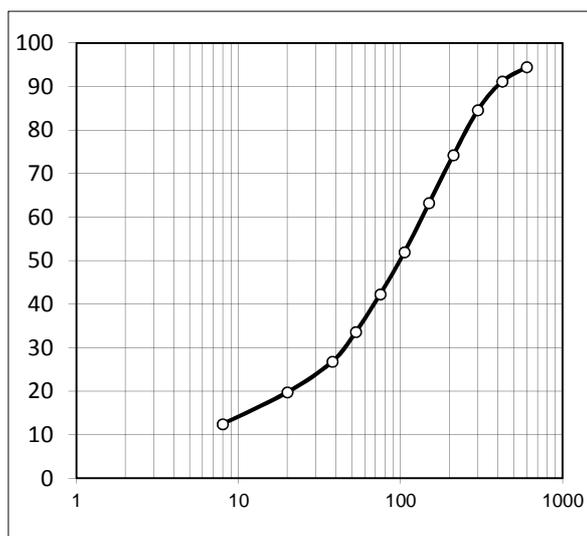
St Dizier Bulk Comp +8µm



BURNIE LABORATORY  
MINERALOGY SIZING

PROJECT	T0887
SAMPLE	St Dizier Comp
FROM TEST	
DATE	160514
TECHNICIAN	MS

St Dizier Comp		SIZE um	WEIGHTS		
			gm	(%)	%PASS
P80	261	600	9.27	5.56	94.4
		425	5.39	3.23	91.2
		300	11.02	6.61	84.6
		212	17.27	10.36	74.2
		150	18.30	10.98	63.2
		106	18.77	11.27	52.0
		75	16.16	9.70	42.3
		53	14.39	8.64	33.6
		38	11.36	6.82	26.8
		20	11.82	7.09	19.7
	CS5	8	12.11	7.27	12.5
		SUB	20.76	12.46	
		TOTAL	166.62	100.00	



ANALYSES

SIZE um	WT %	Sn		Fe		S		SiO2		Mount Number
		%	dist	%	dist	%	dist	%	dist	
212	25.78	0.64	20.0	29.20	21.8	1.34	27.5	28.80	30.8	887004
106	22.25	0.75	20.2	40.20	25.9	1.36	24.1	21.60	19.9	887005
53	18.34	0.76	16.9	41.20	21.9	1.18	17.2	19.45	14.8	887006
20	13.91	0.93	15.7	38.40	15.5	1.26	13.9	20.50	11.8	887007
8	7.27	1.36	12.0	36.10	7.6	1.60	9.3	20.90	6.3	
<8	12.46	1.02	15.4	20.70	7.5	0.81	8.0	31.50	16.3	
CALC	100.00	0.83	100.0	34.57	100.0	1.26	100.0	24.09	100.0	
ASSAY		0.82		34.00		1.22		24.40		



**PARTICLE MINERALOGY REPORT**

**St Dizier Bulk Comp  
June 2014**

**A +212µm 26 % by weight**

**GJMcA 5.6.14  
B +106µm 22 % by weight**

**C +53µm 18 % by weight**

**D +20µm 14 % by weight**

**E +8µm 7 % by weight**

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
1.5	0.1	0.1	0.0	0.0	5.1	27.8	65.5	100
16	5	10	0	1	22	54	79	

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
1.7	0.1	0.0	0.0	0.0	6.3	31.9	60.1	100
41	10	0	0	0	42	72	82	

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
2.8	0.0	0.0	2.0	0.0	6.0	39.5	49.8	100
69	0	0	100	0	35	96	83	

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
1.0	0.0	0.0	0.0	0.0	4.8	24.7	69.6	100
50	0	0	0	0	30	88	93	

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
2.0	0.0	0.0	0.0	0.0	4.6	29.1	64.3	100
100	0	0	0	0	46	94	96	

ASSAYS

Calc'd	SG	Cu	Sn	As	S	Fe
3.58	0.01	0.00		0.1	1.2	37.0
Actual			0.64		1.3	29.2

ASSAYS

Calc'd	SG	Cu	Sn	As	S	Fe
3.69	0.00	0.00		0.0	1.3	40.7
Actual			0.75		1.4	40.2

ASSAYS

Calc'd	SG	Cu	Sn	As	S	Fe
3.97	0.00	2.74		0.0	1.9	44.9
Actual			0.76		1.2	41.2

ASSAYS

Calc'd	SG	Cu	Sn	As	S	Fe
3.49	0.00	0.00		0.0	0.8	34.2
Actual			0.93		1.3	38.4

ASSAYS

Calc'd	SG	Cu	Sn	As	S	Fe
3.62	0.00	0.00		0.0	1.5	37.9
Actual			1.36		1.6	36.1

COMPOSITE PROPORTIONS

	Py	Po	As	Cs	GoHe	Mt	Ga
Mono	0	0	0	0	20	50	55
Binary	17	100	0	0	50	33	30
Ternary	59	0	100	0	30	16	11
Quat.y+	24	0	0	0	1	0	4
#Grains	9	1	1	0	23	51	83

COMPOSITE PROPORTIONS

	Py	Po	As	Cs	GoHe	Mt	Ga
Mono	60	0	0	0	32	72	77
Binary	36	100	0	0	39	21	15
Ternary	4	0	0	0	29	7	8
Quat.y+	0	0	0	0	0	0	0
#Grains	4	1	0	0	15	44	73

COMPOSITE PROPORTIONS

	Py	Po	As	Cs	GoHe	Mt	Ga
Mono	36	0	0	100	34	89	74
Binary	33	0	0	0	64	11	26
Ternary	31	0	0	0	2	0	0
Quat.y+	0	0	0	0	0	0	0
#Grains	4	0	0	2	17	41	60

COMPOSITE PROPORTIONS

	Py	Po	As	Cs	GoHe	Mt	Ga
Mono	0	0	0	0	62	85	81
Binary	100	0	0	0	36	11	19
Ternary	0	0	0	0	1	4	0
Quat.y+	0	0	0	0	0	0	0
#Grains	2	0	0	0	16	28	75

COMPOSITE PROPORTIONS

	Py	Po	As	Cs	GoHe	Mt	Ga
Mono	100	0	0	0	65	96	89
Binary	0	0	0	0	35	4	11
Ternary	0	0	0	0	0	0	0
Quat.y+	0	0	0	0	0	0	0
#Grains	2	0	0	0	10	31	67

BINARY ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	0	100
Po	0	0	0	0	0	0	100
As	0	0	0	0	0	0	0
Cs	0	0	0	0	0	0	0
GoHe	0	0	0	0	0	7	93
Mt	0	0	0	0	0	20	80
Ga	19	5	0	0	13	63	

BINARY ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	0	100
Po	0	0	0	0	0	0	100
As	0	0	0	0	0	0	0
Cs	0	0	0	0	0	0	0
GoHe	0	0	0	0	0	8	92
Mt	0	0	0	0	0	12	88
Ga	4	10	0	0	19	67	

BINARY ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	0	100
Po	0	0	0	0	0	0	0
As	0	0	0	0	0	0	0
Cs	0	0	0	0	0	0	0
GoHe	0	0	0	0	0	0	100
Mt	0	0	0	0	0	0	100
Ga	9	0	0	0	80	12	

BINARY ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	95	5
Po	0	0	0	0	0	0	0
As	0	0	0	0	0	0	0
Cs	0	0	0	0	0	0	0
GoHe	0	0	0	0	0	0	100
Mt	2	0	0	0	0	0	98
Ga	7	0	0	0	76	17	

BINARY ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	0	0
Po	0	0	0	0	0	0	0
As	0	0	0	0	0	0	0
Cs	0	0	0	0	0	0	0
GoHe	0	0	0	0	0	0	100
Mt	0	0	0	0	0	0	100
Ga	0	0	0	0	74	26	

TOTAL ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	57	0	6	24	100
Po	0	0	0	0	0	0	100
As	100	0	0	0	0	0	100
Cs	0	0	0	0	0	0	0
GoHe	2	0	0	0	0	32	77
Mt	0	0	0	0	0	23	43
Ga	11	1	0	0	18	32	

TOTAL ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	3	1	40
Po	0	0	0	0	0	0	100
As	0	0	0	0	0	0	0
Cs	0	0	0	0	0	0	0
GoHe	4	0	0	0	0	28	65
Mt	0	0	0	0	0	9	25
Ga	3	1	0	0	9	17	

TOTAL ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	31	0	64
Po	0	0	0	0	0	0	0
As	0	0	0	0	0	0	0
Cs	0	0	0	0	0	0	0
GoHe	2	0	0	0	0	0	66
Mt	0	0	0	0	0	0	11
Ga	2	0	0	0	20	3	

TOTAL ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	95	5
Po	0	0	0	0	0	0	0
As	0	0	0	0	0	0	0
Cs	0	0	0	0	0	0	0
GoHe	0	0	0	0	0	1	37
Mt	0	0	0	0	0	4	15
Ga	1	0	0	0	15	3	

TOTAL ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	0	0
Po	0	0	0	0	0	0	0
As	0	0	0	0	0	0	0
Cs	0	0	0	0	0	0	0
GoHe	0	0	0	0	0	0	35
Mt	0	0	0	0	0	0	4
Ga	0	0	0	0	8	3	

DISTRIBUTION MATRIX

	Free	Binary						Tern	Quat
	Py	Po	As	Cs	GoHe	Mt	Ga		
Py	0	0	0	0	0	0	17	59	24
Po	0	0	0	0	0	0	100	0	0
As	0	0	0	0	0	0	100	0	0
Cs	0	0	0	0	0	0	0	0	0
GoHe	20	0	0	0	0	4	47	30	1
Mt	50	0	0	0	0	7	27	16	0
Ga	55	6	1	0	0	4	19	11	4

DISTRIBUTION MATRIX

	Free	Binary						Tern	Quat
	Py	Po	As	Cs	GoHe	Mt	Ga		
Py	60	0	0	0	0	0	36	4	0
Po	0	0	0	0	0	0	100	0	0
As	0	0	0	0	0	0	0	0	0
Cs	0	0	0	0	0				

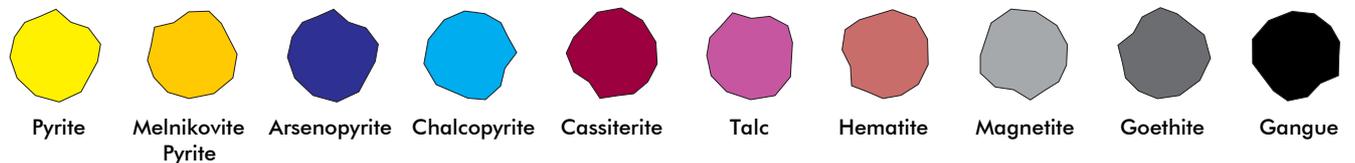
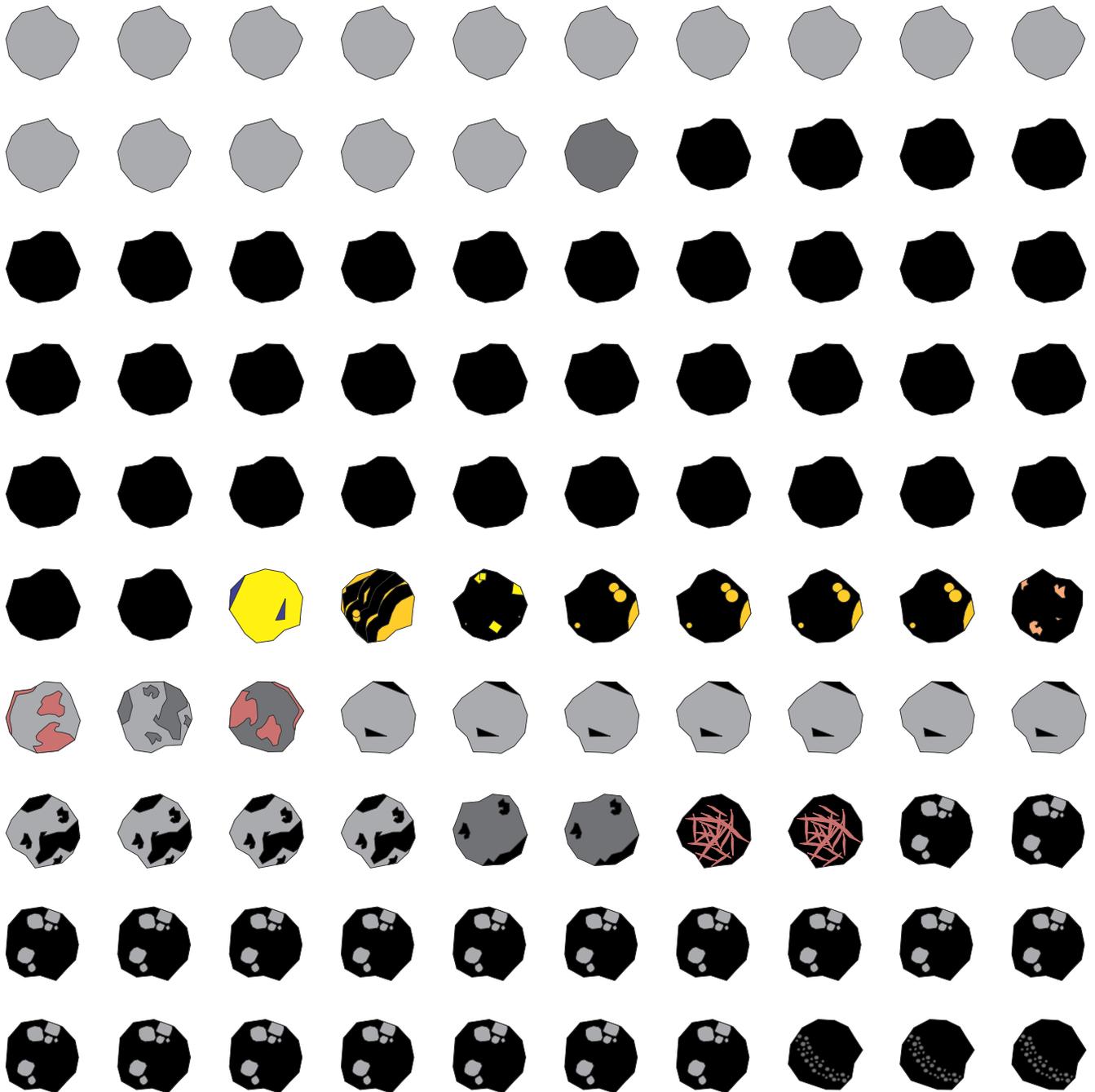
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Bulk Comp

A +212 $\mu$ m

June

2014



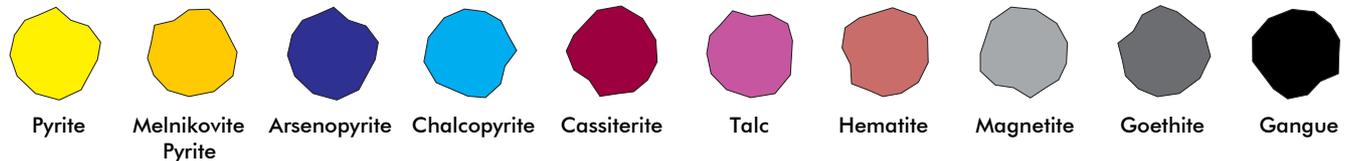
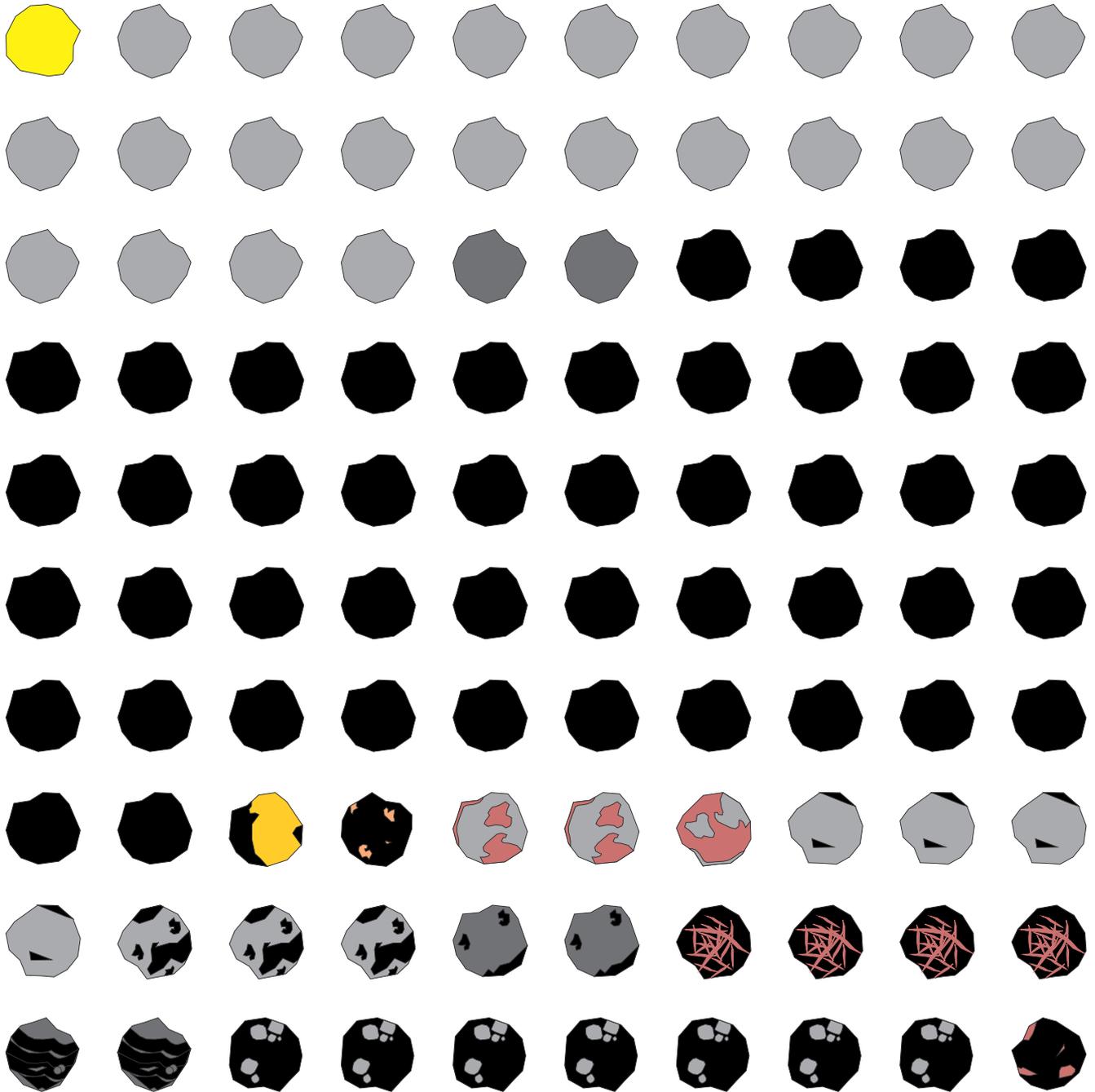
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Bulk Comp

B + 106µm

June

2014



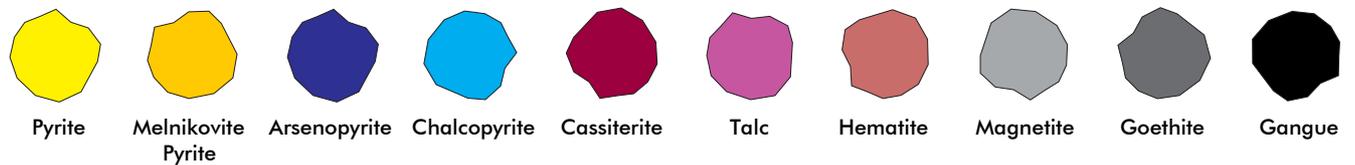
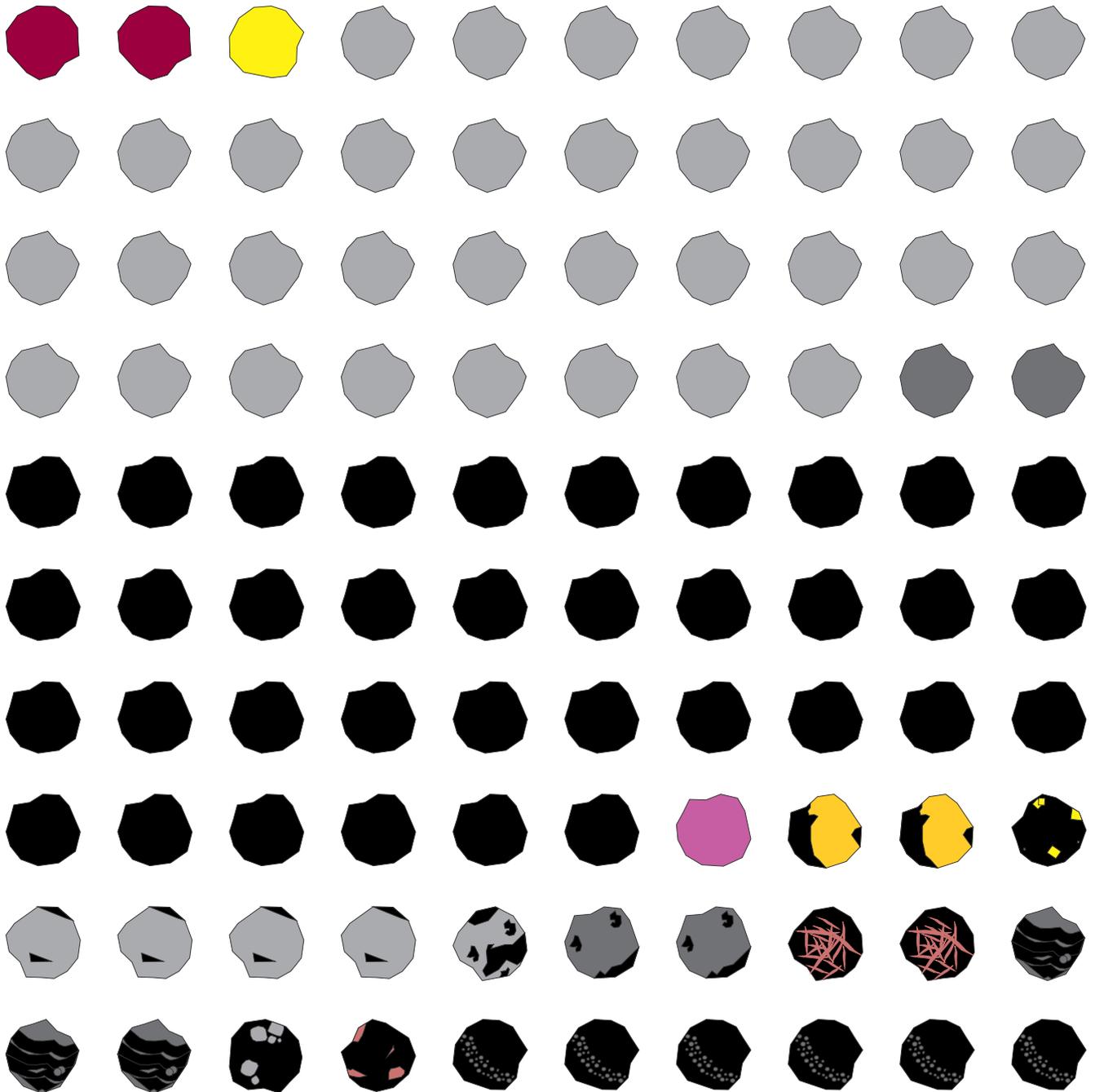
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Bulk Comp

C +53µm

June

2014



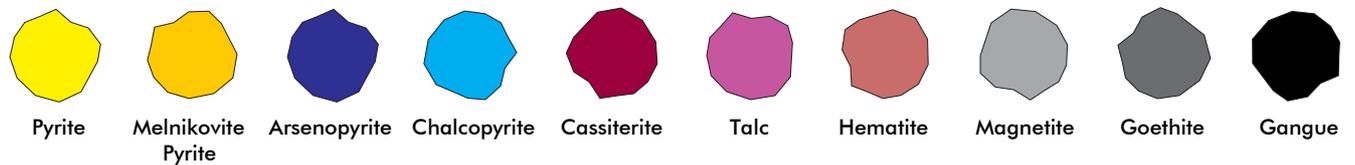
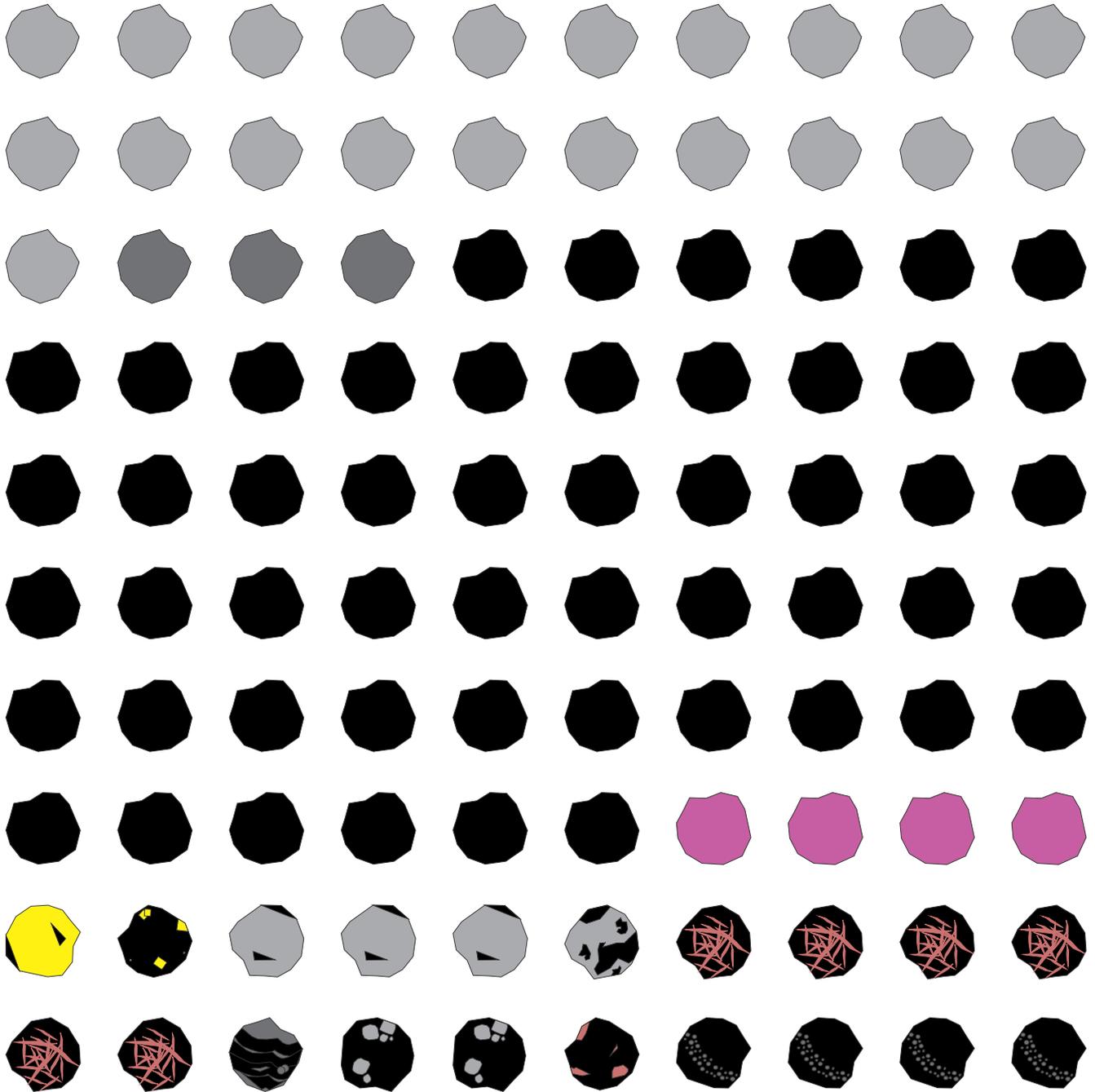
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Bulk Comp

D +20 $\mu$ m

June

2014



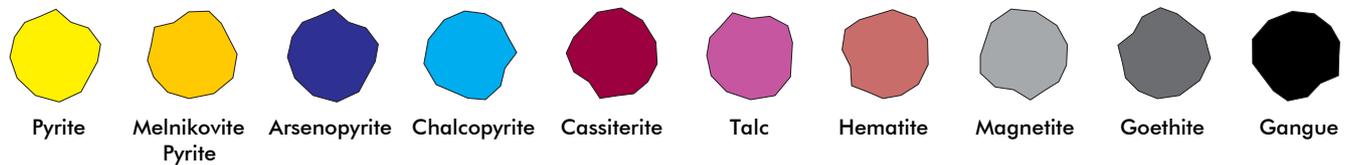
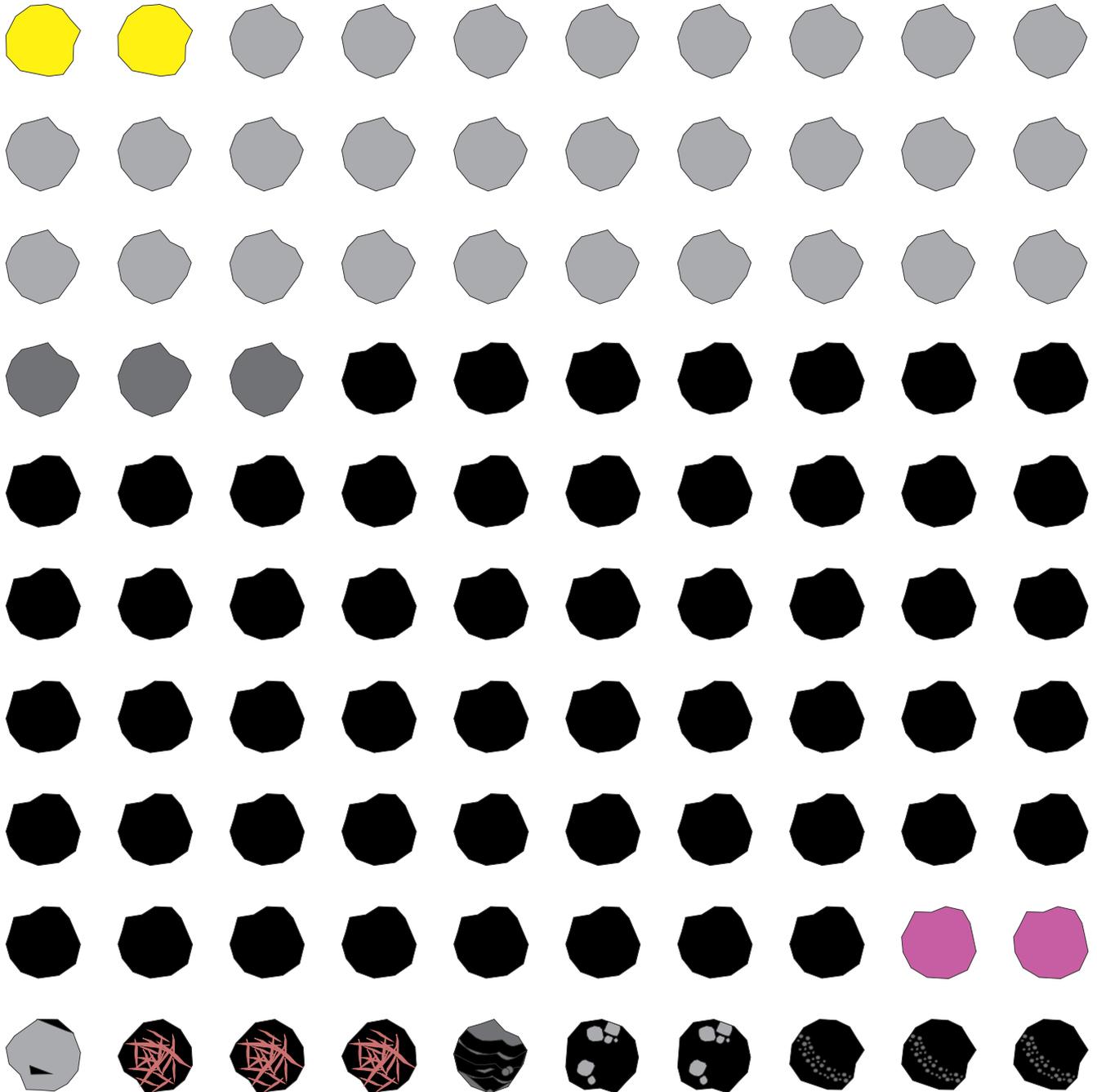
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Bulk Comp

E +8 $\mu$ m

June

2014





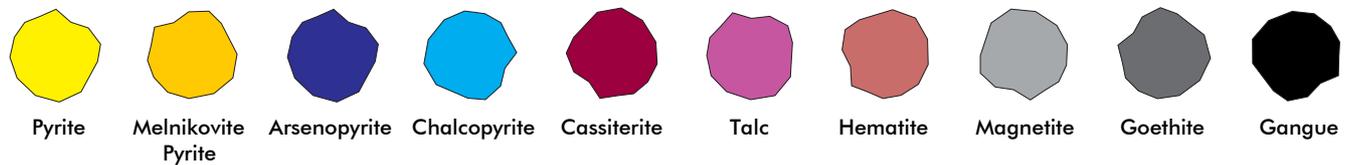
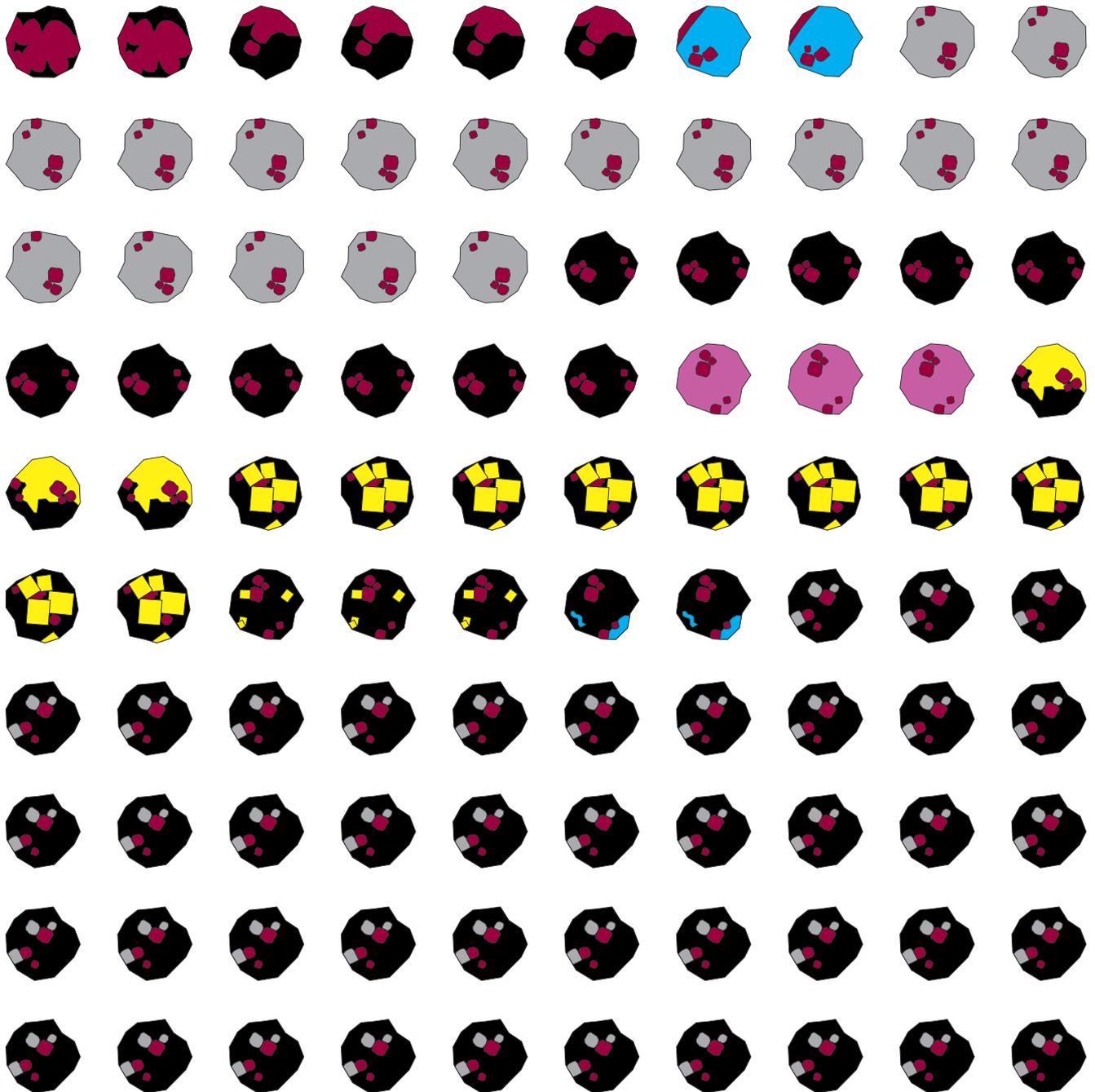
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Bulk Comp  
Sn SCAN

A +212 $\mu$ m

June

2014



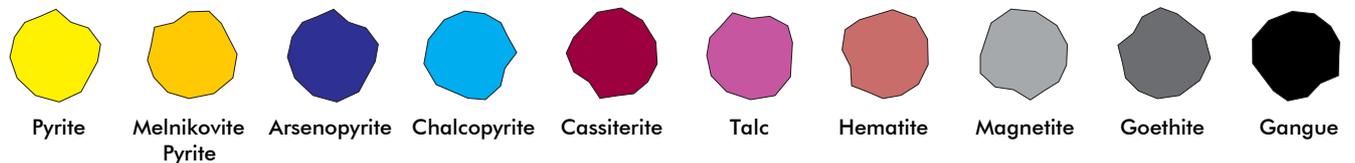
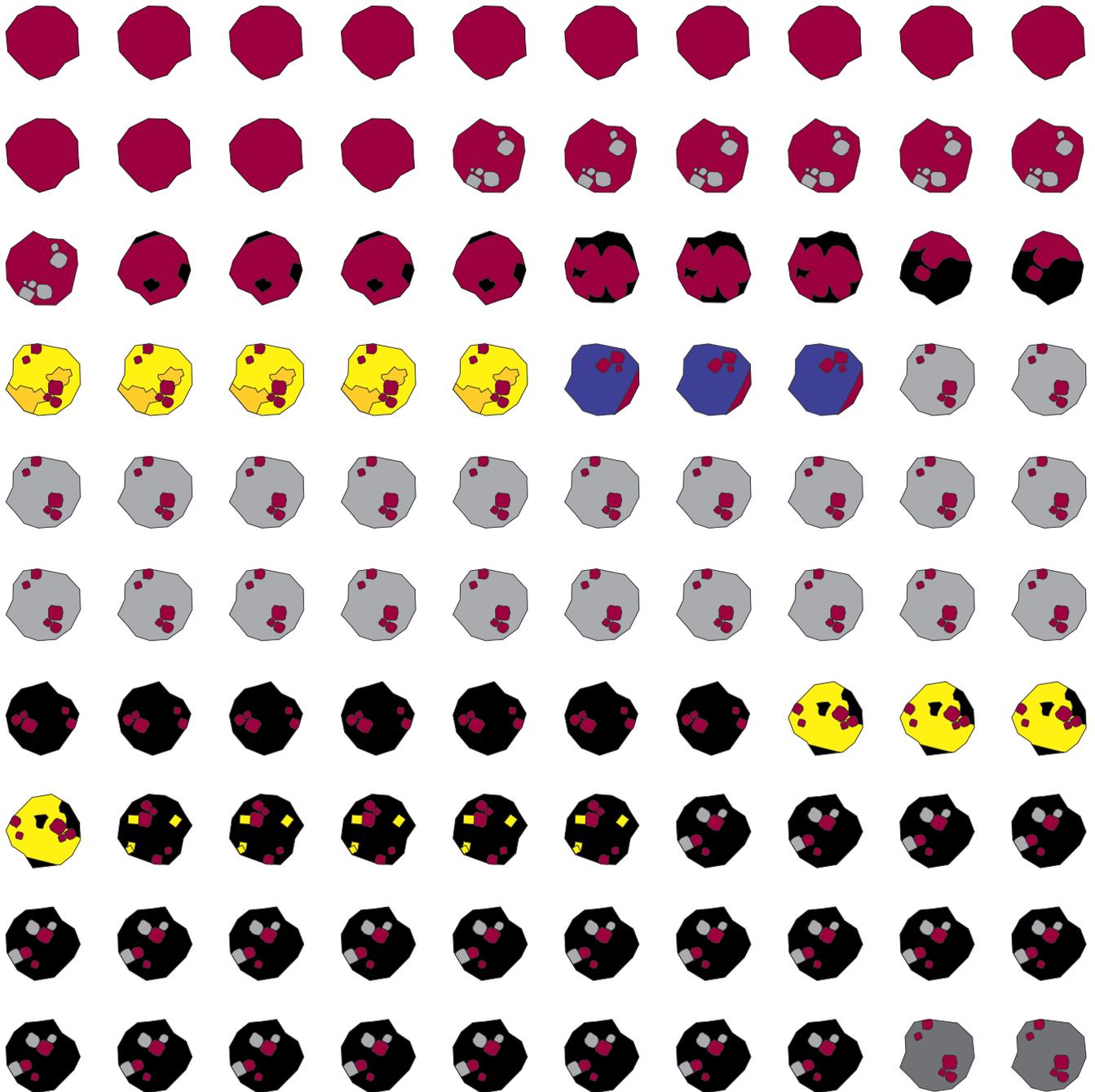
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Bulk Comp  
Sn SCAN

B + 106µm

June

2014



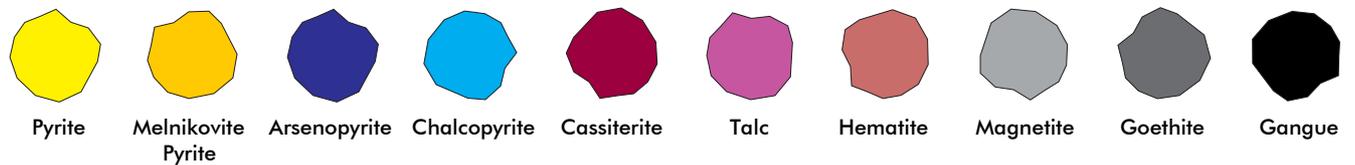
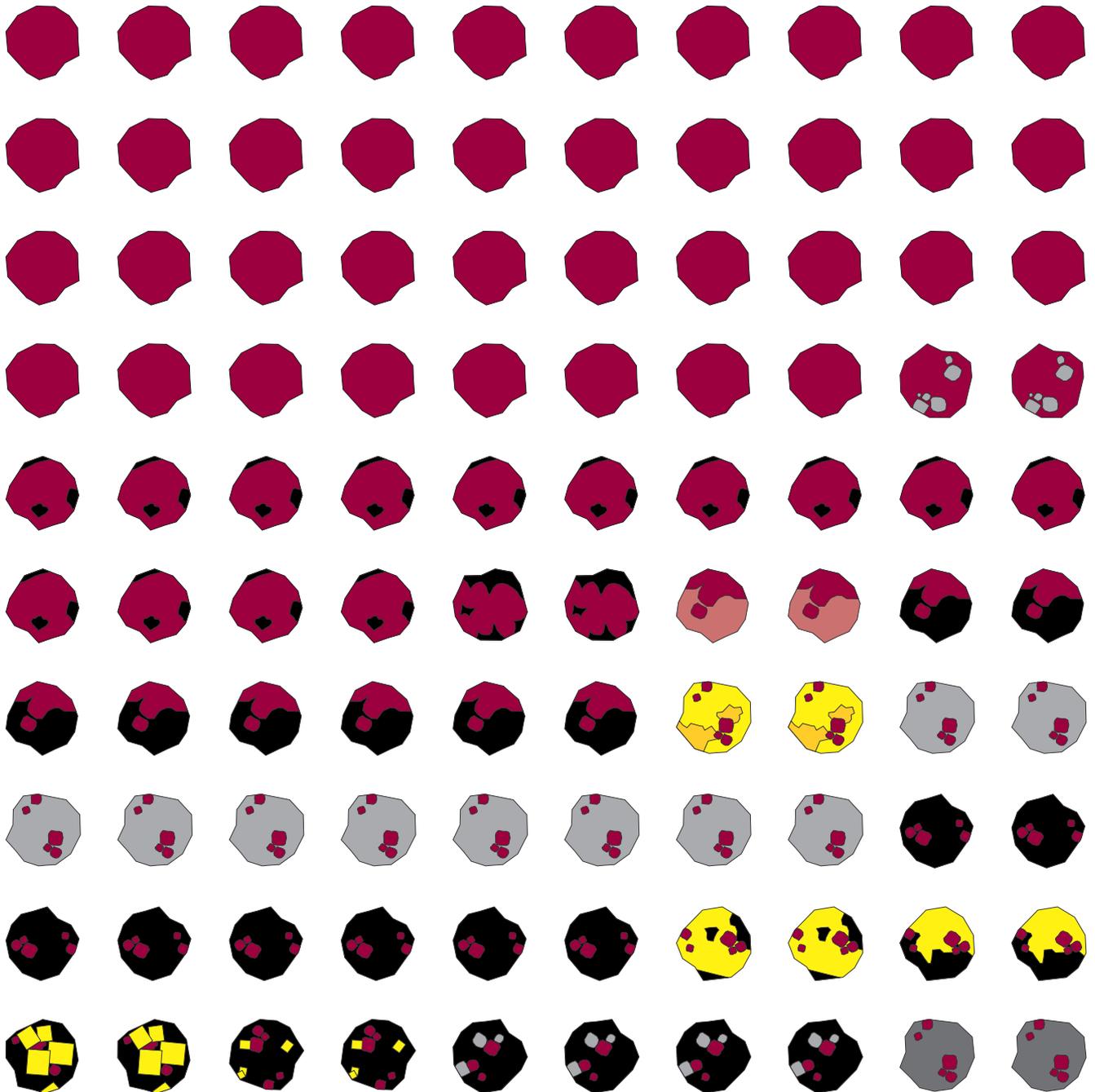
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Bulk Comp  
Sn SCAN

C +53µm

June

2014



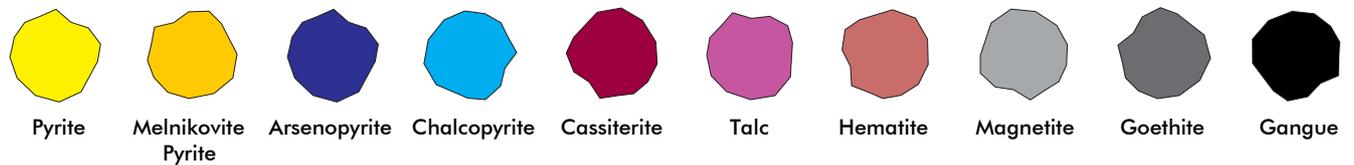
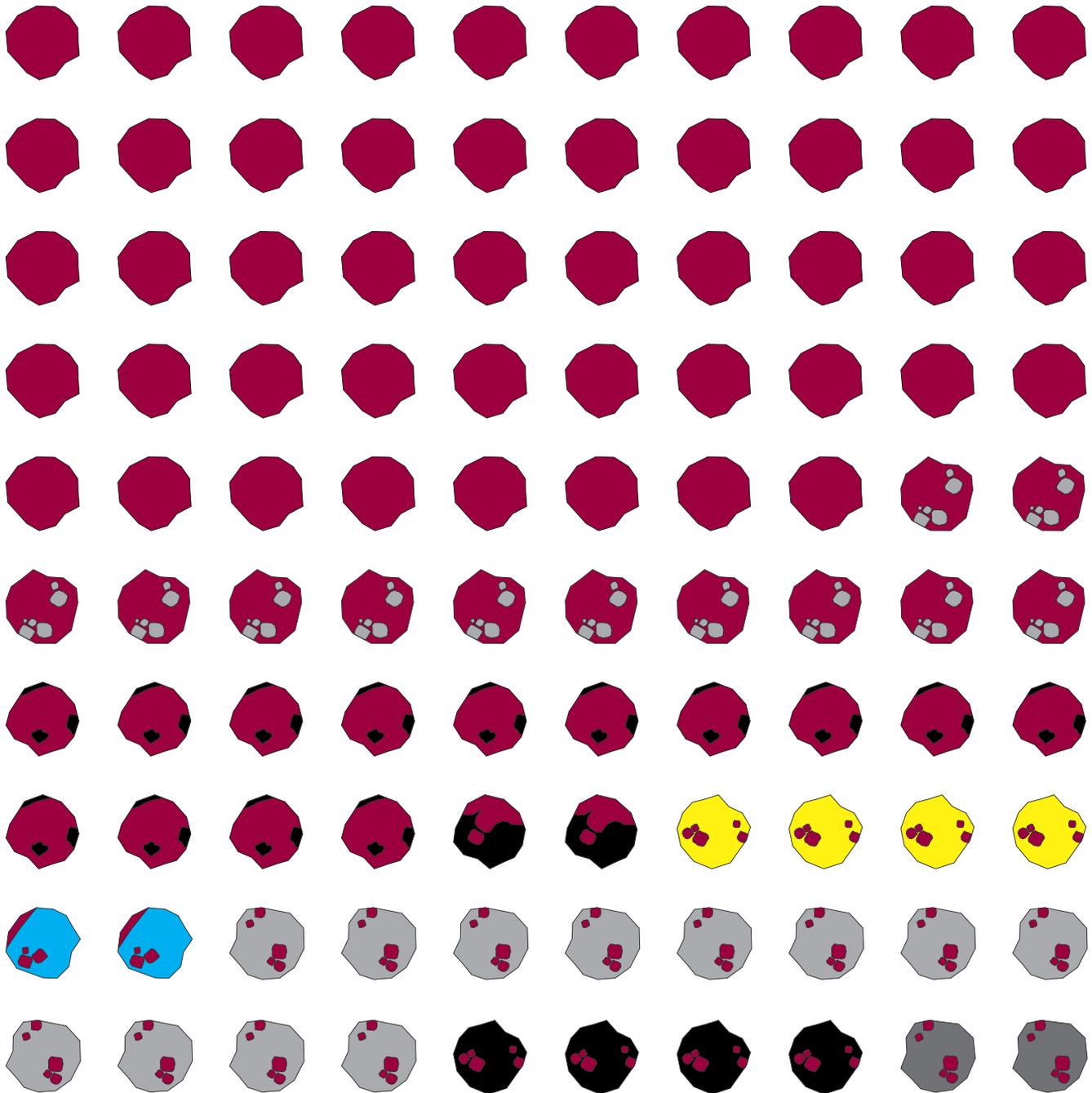
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Bulk Comp  
Sn SCAN

D +20 $\mu$ m

June

2014



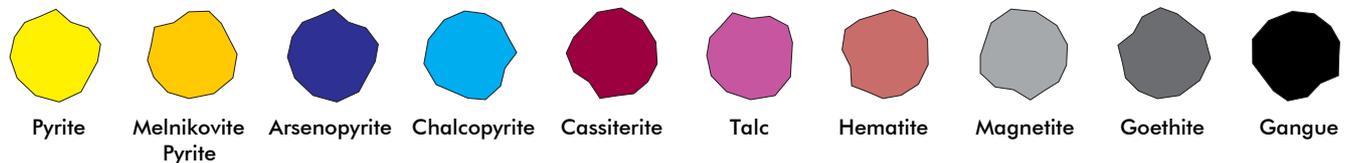
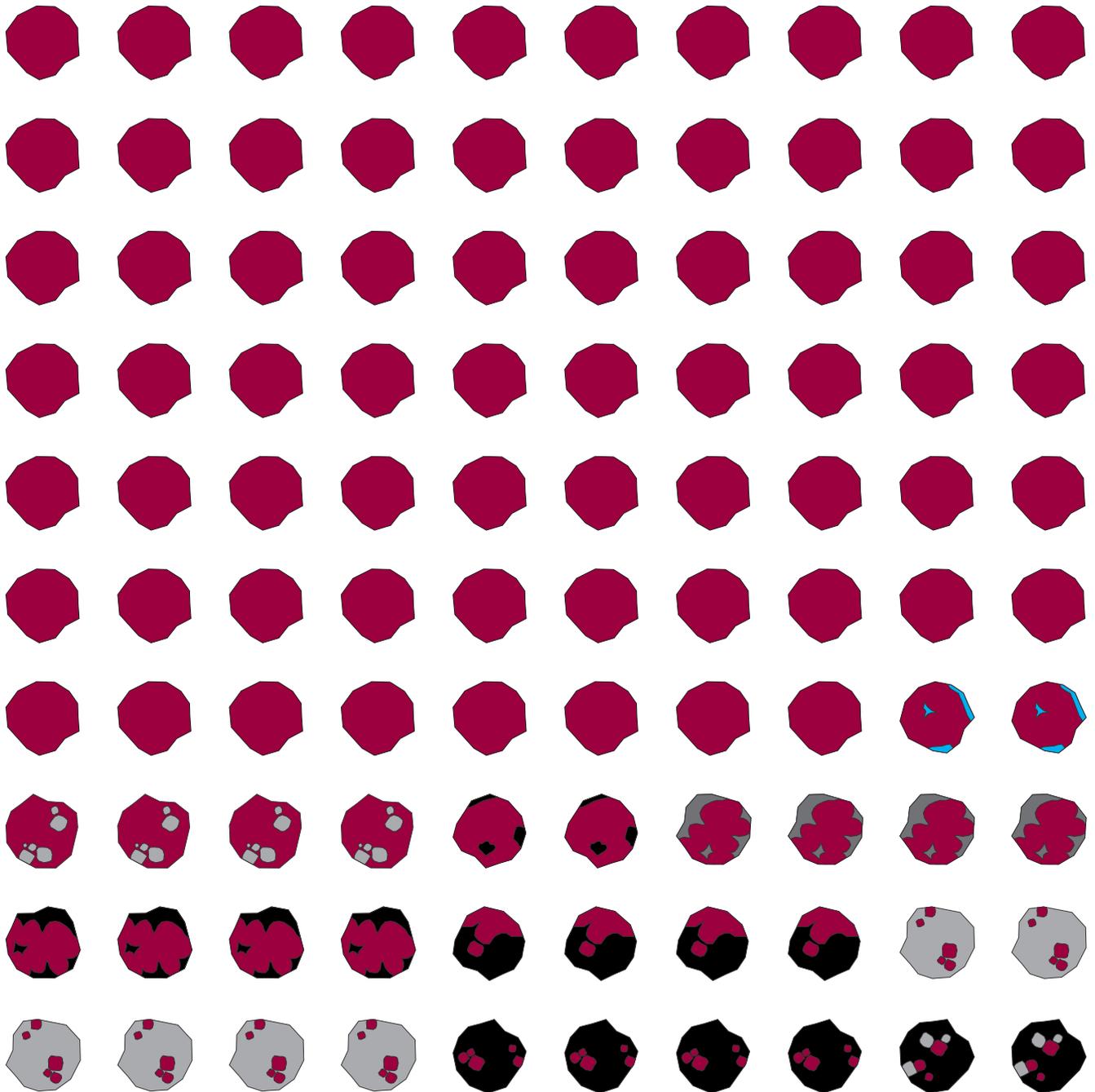
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Bulk Comp  
Sn SCAN

E +8 $\mu$ m

June

2014



# ALS Metallurgy

## Stellar Resources Limited St Dizier Project Magnetics Mineralogy

June 2014



McArthur Ore Deposit Assessments Pty Ltd

*Gary J McArthur PhD FAusIMM MMICA MSEG*

Suite 6, 1st Floor, Brownell Place, 11 Wilson St (P.O. Box 1303) Burnie TAS 7320 AUSTRALIA  
Tel (03) 6431 1701 Fax (03) 6431 1278 Mobile 0419 367240 email [gary@modapl.com.au](mailto:gary@modapl.com.au)

## ALS METALLURGY

### Stellar Resources – St Dizier

#### Magnetics Mineralogy

June 2014

### Method

A magnetic fraction (-53+20µm) from the Stellar Resources' St Dizier testwork was submitted for mineralogical assessment. The sample was mounted as a polished mount by Australian Petrographics (Queanbeyan, NSW).

The standard MODA technique was adopted to quantify the mineralogy.

In a first scan, for each fraction, 100 grains were selected at random and the area % of each mineral present was visually estimated. The minerals logged were: *pyrite* (Py), *pyrrhotite* (Po), *arsenopyrite* (As), *cassiterite* (Cs), *chalcopyrite* (Cp), *goethite+hematite* (GoHe), *magnetite* (Mt) and *gangue* (*quartz, silicates, carbonates, etc*, Ga). This allowed calculation of an overall mineralogical composition.

In a second scan, for each fraction, 25 grains containing Sn (exclusively *cassiterite*) were selected at random and logged as per the first scan.

The normal liberation and association parameters were calculated.

Photomicrographs were taken, and annotated using PowerPoint.

### Results

#### **Composition**

The following minerals were identified, in approximate descending order:

- *Magnetite*
- *Gangue* (*quartz, silicates, carbonate, carbonaceous matter, etc.*)
- *Hematite*
- *Goethite*
- *Pyrite*
- *Cassiterite*
- *Pyrrhotite*
- *Chalcopyrite*
- *Covellite* (rare)
- *Ilmenite* (very rare)

The overall composition of the magnetic fraction is summarised below:

**St Dizier Bulk Comp Composition Vol% (from total scan)**

Fraction	Py	Po	As	Cs <sup>#</sup>	Cp	GoHe	Mt	Ga
+20µm	0.9	0.1	Tr	0.1	Tr	6.8	78.9	13.3

Py=pyrite, Po=pyrrhotite, As=arsenopyrite, Cs=cassiterite, Cp=chalcopyrite, GoHe=goethite+hematite, Mt=magnetite, Ga=gangue  
 # count statistics very poor for the scarce cassiterite

**Cassiterite Liberation**

An essential summary of the liberation parameters for *cassiterite* is:

**St Dizier Magnetics *Cassiterite* liberation distribution%**

Fraction	Free	Binary with						Ternary
		Py	Po	As	GoHe	Mt	Ga	
+20µm	43	0	0	0	0	32	0	51

**Comments**

- There appears to be insufficient identifiable Sn minerals to account for the ~0.4%Sn grade, and no sulphide (acid soluble) Sn was observed. The author suggests Sn may have been scavenged by the *goethite* and *hematite*, but this would require SEM/microanalysis for confirmation. MODA can arrange this at UTas, if required.
- Binaries of *magnetite* and coarsely flaked *carbonaceous matter* were observed.

G.J.McArthur PhD FAusIMM MMICA MSEG

Principal Mineralogist

20.6.14

Cp=chalcopyrite  
Cs=cassiterite  
Ga=gangue  
Go=goethite  
He=hematite  
Me=melnikovite pyrite  
Mt=magnetite  
Py=crystalline pyrite

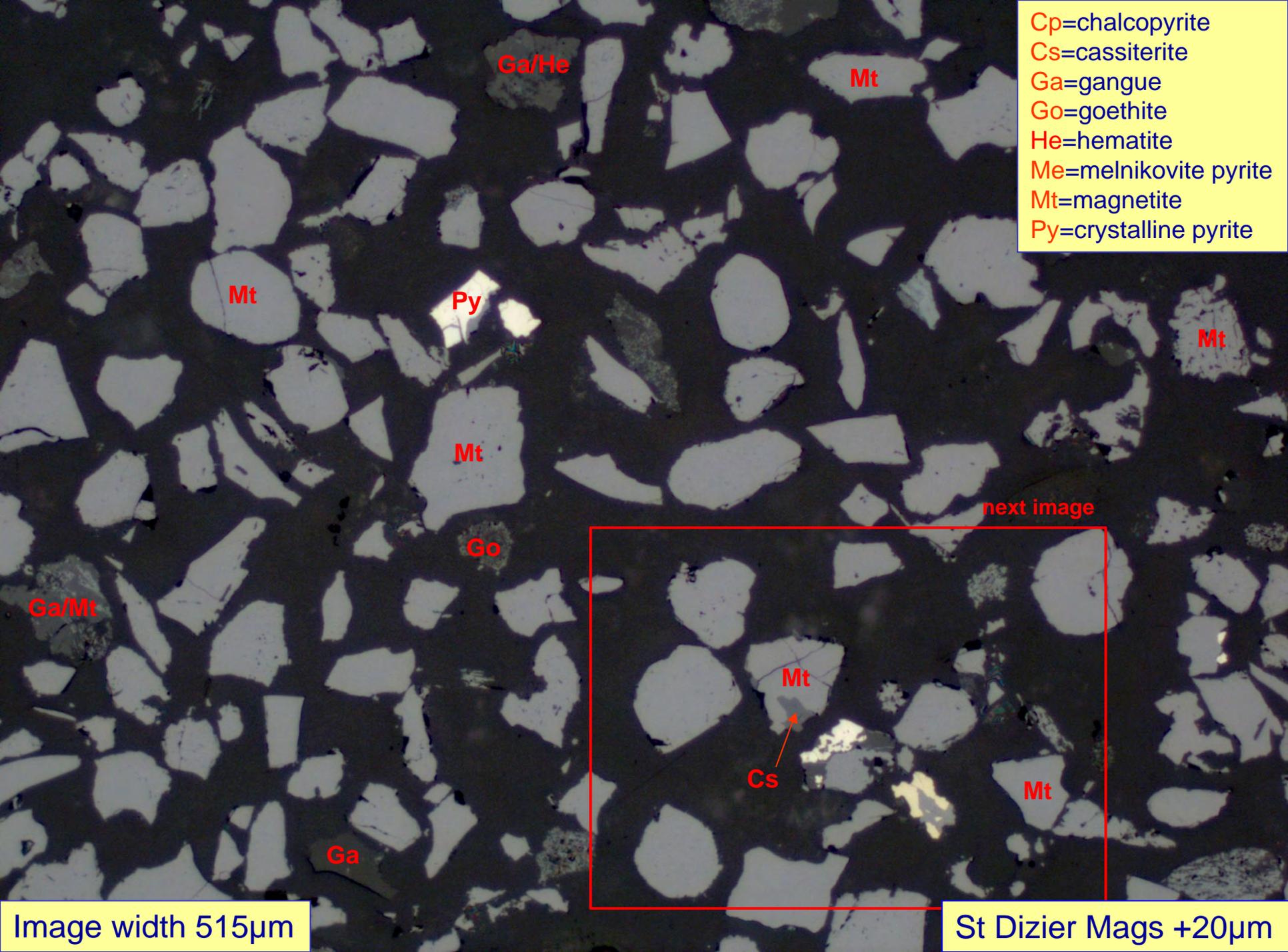


Image width 515µm

St Dizier Mags +20µm

Detail from previous image

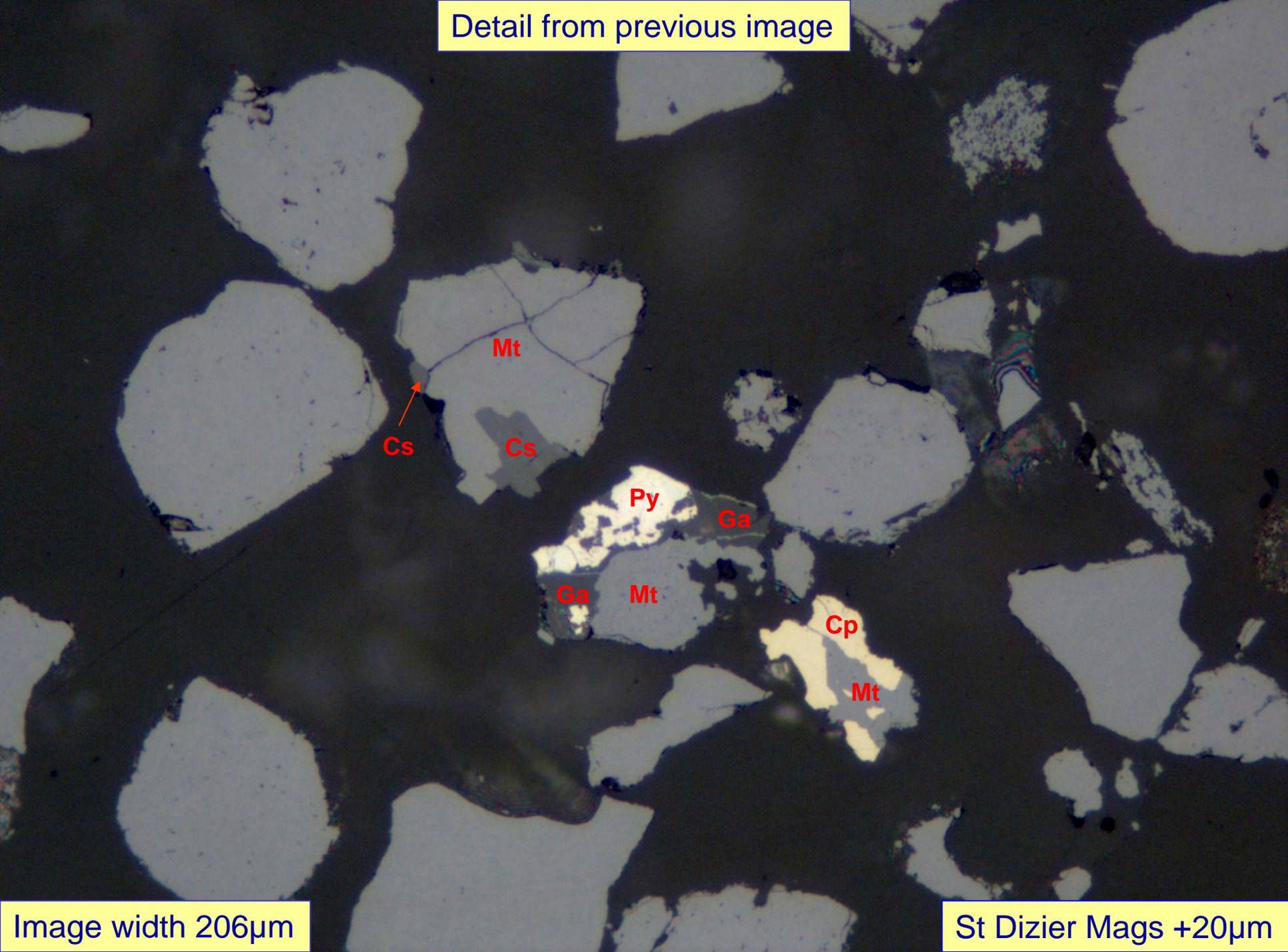
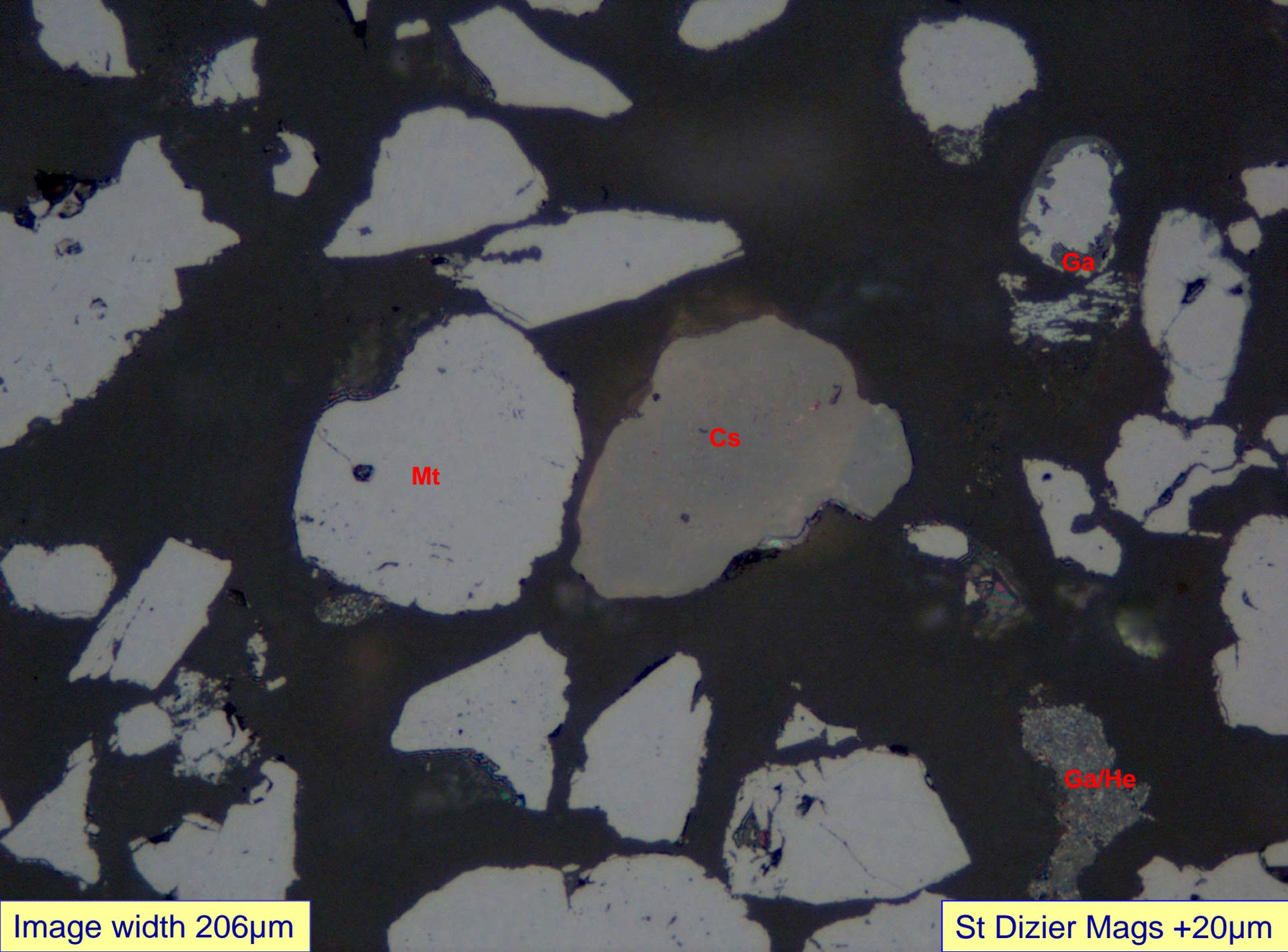


Image width 206µm

St Dizier Mags +20µm



Mt

Cs

Ga

Ga/He

Image width 206µm

St Dizier Mags +20µm

# St Dizier Mags

GJMcA 20.6.14

-53+20µm

## Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
0.9	0.1	0.0	0.1	0.0	6.8	78.9	13.3	100
43	5	0	28	0	38	90	51	

## ASSAYS

	SG	Cu	Sn		As	S	Fe
Calc'd	4.76	0.00	0.08		0.0	0.5	66.3
Actual							

## COMPOSITE PROPORTIONS

	Py	Po	As	Cs	GoHe	Mt	Ga	
<b>Mono</b>	0	0	0	43	15	89	0	
<b>Binary</b>	0	100	0	36	82	9	69	
<b>Ternary</b>	100	0	0	19	3	2	31	
<b>Quat.y+</b>	0	0	0	2	0	0	0	
<b>#Grains</b>	2	1	0	1	18	88	26	1.36

## BINARY ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
<b>Py</b>		0	0	0	0	0	0
<b>Po</b>	0		0	0	0	100	0
<b>As</b>	0	0		0	0	0	0
<b>Cs</b>	0	0	0		0	90	0
<b>GoHe</b>	0	0	0	0		5	95
<b>Mt</b>	0	13	0	0	24		62
<b>Ga</b>	0	0	0	0	62	38	

## TOTAL ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
<b>Py</b>		0	0	0	0	100	100
<b>Po</b>	0		0	0	0	100	0
<b>As</b>	0	0		0	0	0	0
<b>Cs</b>	4	0	0		11	41	21
<b>GoHe</b>	0	0	0	0		7	82
<b>Mt</b>	0	1	0	0	4		8
<b>Ga</b>	6	0	0	6	61	57	

of all

## DISTRIBUTION MATRIX

	Free	Binary						Tern	Quat
		Py	Po	As	Cs	GoHe	Mt		
<b>Py</b>	0		0	0	0	0	0	100	0
<b>Po</b>	0	0		0	0	0	100	0	0
<b>As</b>	0	0	0		0	0	0	0	0
<b>Cs</b>	43	0	0	0		0	32	0	19
<b>GoHe</b>	15	0	0	0	0		4	78	3
<b>Mt</b>	89	0	1	0	0	2		6	2
<b>Ga</b>	0	0	0	0	0	43	27		31

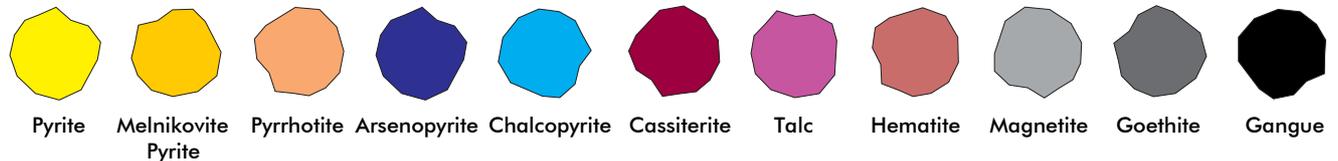
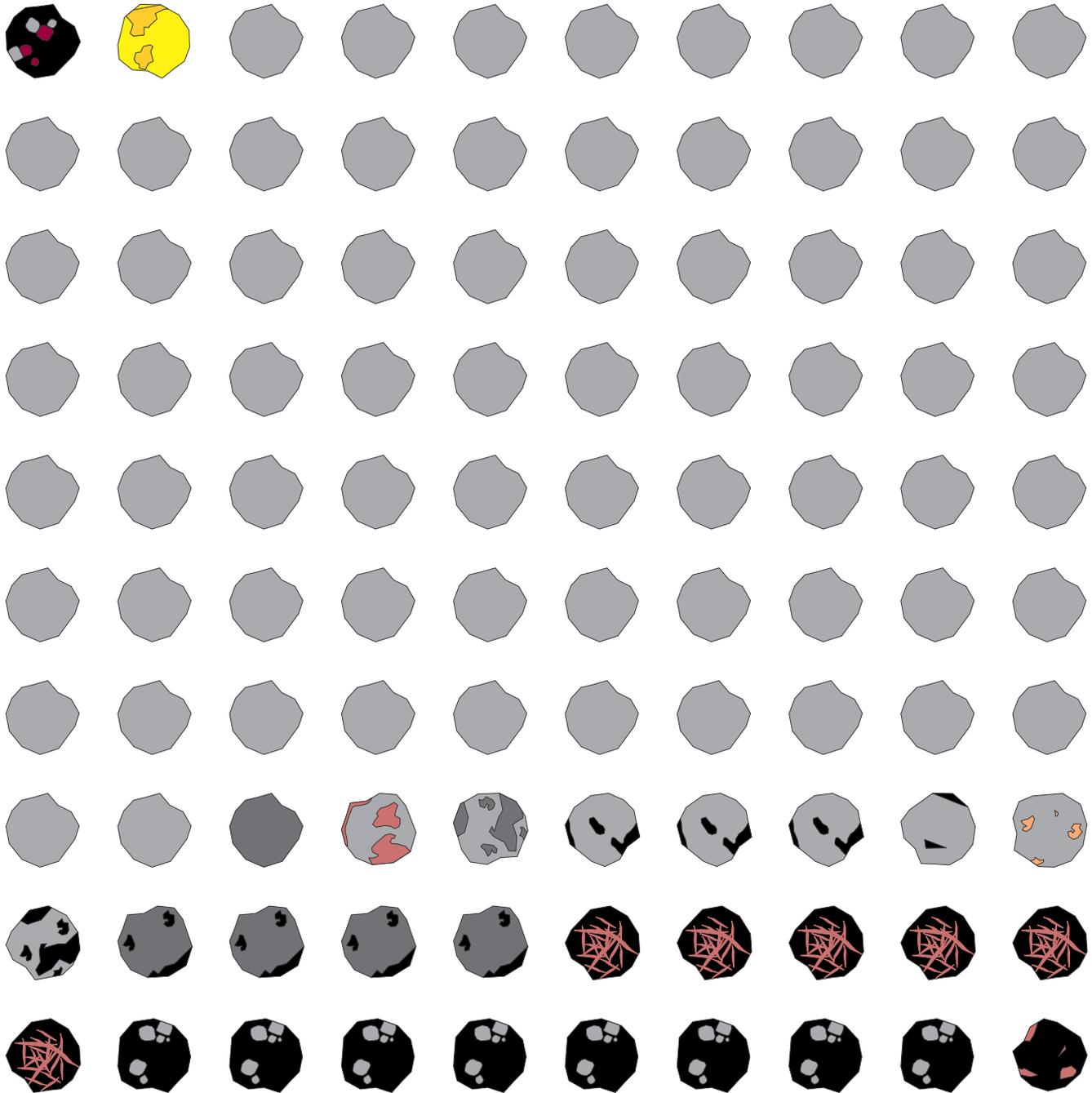
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Mags

-53+20µm

June

2014



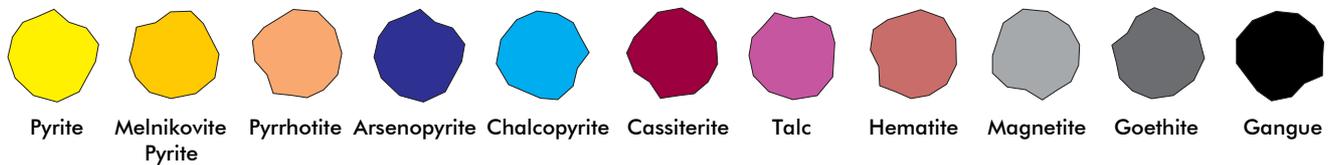
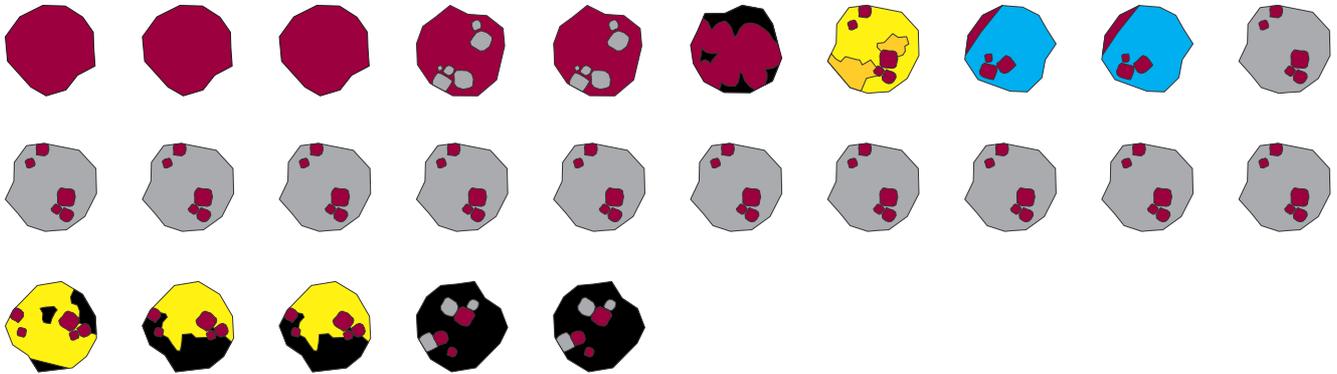
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Mags Sn  
SCAN

-53+20 $\mu$ m

June

2014



# ALS Metallurgy

## Stellar Resources Limited St Dizier Project Magnetics Mineralogy SEM-EDS Microanalysis

June 2014



McArthur Ore Deposit Assessments Pty Ltd

Gary J McArthur PhD FAusIMM MMICA MSEG

Suite 6, 1st Floor, Brownell Place, 11 Wilson St (P.O. Box 1303) Burnie TAS 7320 AUSTRALIA  
Tel (03) 6431 1701 Fax (03) 6431 1278 Mobile 0419 367240 email gary@modapl.com.au

# ALS METALLURGY

## Stellar Resources – St Dizier Magnetics Mineralogy – SEM Microanalysis June 2014

### Method

A magnetic fraction (-53+20µm) from the Stellar Resources' St Dizier testwork was submitted to the Central Science Laboratory (CSL) of the University of Tasmania (UTas) in Hobart for Scanning Electron Microscopy (SEM) and Energy-dispersive X-ray Spectrometry (EDS) to locate non-*cassiterite* Sn. 64 points were analysed using EDS and imaged from back-scattering.

Previous optical mineralogy by MODA had identified minor *cassiterite* but insufficient to account for the 0.4%Sn.

### Results

The author has assessed the analytical results and grouped them into mineral mixture groups. In many cases the phase grain size is smaller than the analytical beam width, so the analysis is of a mixture of two or more minerals. A full list of the analyses is provided at the end of the report but an essential summary follows:

Mineral Group	#	O	Mg	Al	Si	S	Ca	Ti	Mn	Fe	Br	Sn	W
<i>cassiterite</i> + minor magnetite	7	23.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	0.0	72.7	0.0
<i>cassiterite</i> + magnetite	4	36.7	0.7	0.0	0.7	0.0	0.0	0.0	0.0	27.9	0.0	34.0	0.0
magnetite + <i>cassiterite</i>	11	32.5	0.7	0.0	0.4	0.0	0.0	0.0	0.0	53.3	0.1	13.0	0.1
Fe oxide + minor <i>cassiterite</i>	7	30.5	0.8	0.0	0.7	0.0	0.0	0.0	0.7	65.0	0.0	1.4	0.9
Fe oxide + <i>schoenfliesite</i>	7	36.9	6.3	0.1	0.8	0.0	0.0	0.0	0.6	29.1	0.0	24.7	1.6
<i>magnetite</i>	12	27.5	0.2	0.0	0.2	0.0	0.0	0.0	0.0	72.2	0.0	0.0	0.0
Fe oxide + minor silicate	14	35.2	0.3	0.3	1.5	0.0	0.2	0.1	0.6	61.6	0.0	0.0	0.2
<i>pyrrhotite</i>	1	0.0	0.0	0.0	0.0	37.8	0.0	0.0	0.0	62.2	0.0	0.0	0.0
silicate	1	48.7	22.8	0.0	21.1	0.0	0.2	0.0	0.0	7.2	0.0	0.0	0.0

Most of the observed Sn occurs as very fine *cassiterite* inclusions in magnetite.

The mineral ***schoenfliesite* MgSn(OH)<sub>6</sub>**, containing 48.4%Sn, was previously recognised at St Dizier during Renison drilling (*pers.comm. Ray Hazeldene, Stellar*). It is a secondary phase typically found in oxidised Sn-bearing minerals. The author is unfamiliar with this mineral, but upon re-examination, it may be possible to identify it optically. *Schoenfliesite* is documented to be usually fibrous with an SG of 3.48.

In the sample examined, *schoenfliesite* is fine-grained and mixed with *hematite* and *goethite*. Recovery would be extremely difficult.

G.J.McArthur PhD FAusIMM MMICA MSEG  
Principal Mineralogist  
27.6.14

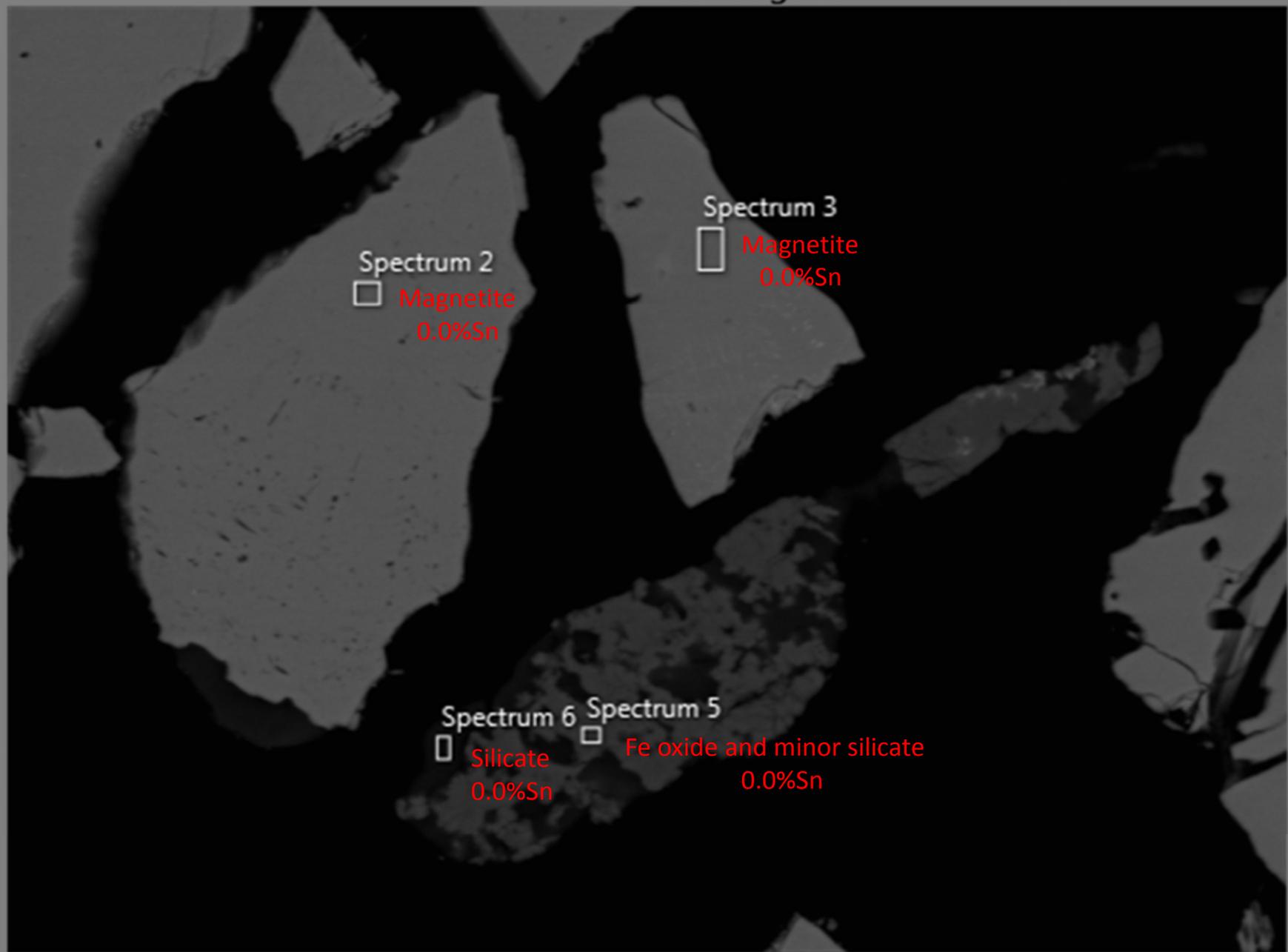
**ST DIZIER MAGS +20microns**

SEM-EDS by Karsten Goemann (Utas)

26.6.14

SITE	SPECTRUM	O	Mg	Al	Si	S	Ca	Ti	Mn	Fe	Br	Sn	W	Total	Phase?
Site 13	Spectrum 41	22.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.23	0.00	75.09	0.00	100	cassiterite + minor Fe oxide
Site 11	Spectrum 35	23.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	75.07	0.00	100	cassiterite + minor magnetite
Site 12	Spectrum 39	23.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.24	0.00	73.69	0.00	100	cassiterite + minor magnetite
Site 12	Spectrum 37	23.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.34	0.00	73.57	0.00	100	cassiterite + minor magnetite
Site 14	Spectrum 44	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.21	0.00	73.54	0.00	100	cassiterite + minor Fe oxide
Site 12	Spectrum 38	23.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.93	0.00	69.27	0.00	100	cassiterite + minor magnetite
Site 12	Spectrum 36	25.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.98	0.00	68.34	0.00	100	cassiterite + minor magnetite
<b>MEAN</b>	<b>7</b>	<b>23.5</b>	<b>0.0</b>	<b>3.8</b>	<b>0.0</b>	<b>72.7</b>	<b>0.0</b>	<b>100</b>	<b>cassiterite + minor magnetite</b>						
Site 9	Spectrum 31	35.52	0.00	0.00	0.19	0.00	0.00	0.00	0.00	26.11	0.00	38.18	0.00	100	cassiterite + magnetite
Site 10	Spectrum 33	34.07	0.00	0.00	0.21	0.00	0.00	0.00	0.00	27.91	0.00	37.81	0.00	100	cassiterite + magnetite
Site 9	Spectrum 30	38.82	1.41	0.00	1.17	0.00	0.00	0.00	0.00	28.52	0.00	30.08	0.00	100	cassiterite + magnetite
Site 10	Spectrum 32	38.37	1.47	0.00	1.23	0.00	0.00	0.00	0.00	28.88	0.00	30.05	0.00	100	cassiterite + magnetite
<b>MEAN</b>	<b>4</b>	<b>36.7</b>	<b>0.7</b>	<b>0.0</b>	<b>0.7</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>27.9</b>	<b>0.0</b>	<b>34.0</b>	<b>0.0</b>	<b>100</b>	<b>cassiterite + magnetite</b>
Site 7	Spectrum 24	36.96	1.16	0.00	0.73	0.00	0.00	0.00	0.00	36.09	0.57	24.49	0.00	100	magnetite + cassiterite
Site 7	Spectrum 23	33.53	0.44	0.00	0.24	0.00	0.00	0.00	0.00	48.65	0.00	17.15	0.00	100	magnetite + cassiterite
Site 6	Spectrum 20	32.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	51.13	0.00	16.51	0.00	100	magnetite + cassiterite
Site 6	Spectrum 19	33.24	0.32	0.00	0.25	0.00	0.00	0.00	0.00	50.57	0.00	15.61	0.00	100	magnetite + cassiterite
Site 3	Spectrum 12	33.39	0.54	0.00	0.49	0.00	0.00	0.00	0.00	51.53	0.00	14.05	0.00	100	magnetite + cassiterite
Site 3	Spectrum 10	32.56	0.57	0.00	0.50	0.00	0.00	0.00	0.00	53.35	0.00	13.03	0.00	100	magnetite + cassiterite
Site 3	Spectrum 11	31.12	0.48	0.00	0.50	0.00	0.00	0.00	0.00	56.80	0.00	11.10	0.00	100	magnetite + cassiterite
Site 2	Spectrum 7	31.36	0.68	0.00	0.53	0.00	0.00	0.00	0.00	57.98	0.00	9.46	0.00	100	magnetite + cassiterite
Site 2	Spectrum 8	30.35	0.57	0.00	0.62	0.00	0.00	0.00	0.00	60.96	0.00	7.51	0.00	100	magnetite + cassiterite
Site 14	Spectrum 46	32.16	1.96	0.00	0.34	0.00	0.00	0.00	0.00	57.10	0.00	7.43	1.02	100	Fe oxide + cassiterite
Site 2	Spectrum 9	29.99	0.54	0.00	0.56	0.00	0.00	0.00	0.00	62.35	0.00	6.56	0.00	100	magnetite + cassiterite
<b>MEAN</b>	<b>11</b>	<b>32.5</b>	<b>0.7</b>	<b>0.0</b>	<b>0.4</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>53.3</b>	<b>0.1</b>	<b>13.0</b>	<b>0.1</b>	<b>100</b>	<b>magnetite + cassiterite</b>
Site 15	Spectrum 48	29.61	1.90	0.00	0.92	0.00	0.00	0.00	0.00	64.33	0.00	2.64	0.61	100	Fe oxide + minor cassiterite
Site 15	Spectrum 51	29.62	1.01	0.00	0.18	0.00	0.00	0.00	0.31	65.69	0.00	2.56	0.63	100	Fe oxide + minor cassiterite
Site 18	Spectrum 62	34.28	0.78	0.00	1.26	0.00	0.00	0.00	0.89	59.58	0.00	1.43	1.78	100	Fe oxide + minor cassiterite
Site 13	Spectrum 42	27.27	0.32	0.00	0.16	0.00	0.00	0.00	2.12	68.41	0.00	1.22	0.50	100	Fe oxide + minor cassiterite
Site 7	Spectrum 25	27.69	0.51	0.00	0.32	0.00	0.00	0.00	0.00	70.52	0.00	0.96	0.00	100	magnetite + minor cassiterite
Site 18	Spectrum 64	33.80	0.47	0.00	1.18	0.00	0.00	0.00	0.62	62.34	0.00	0.50	1.08	100	Fe oxide + minor cassiterite
Site 18	Spectrum 66	31.50	0.40	0.00	1.11	0.00	0.00	0.00	0.76	64.32	0.00	0.42	1.49	100	Fe oxide + minor cassiterite
<b>MEAN</b>	<b>7</b>	<b>30.5</b>	<b>0.8</b>	<b>0.0</b>	<b>0.7</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.7</b>	<b>65.0</b>	<b>0.0</b>	<b>1.4</b>	<b>0.9</b>	<b>100</b>	<b>Fe oxide + minor cassiterite</b>
Site 15	Spectrum 47	43.28	9.75	0.00	0.93	0.00	0.00	0.00	0.00	5.06	0.00	39.05	1.92	100	schoenfliesite + Fe oxide
Site 16	Spectrum 56	44.41	6.31	0.29	1.84	0.00	0.00	0.00	2.06	13.83	0.00	29.29	1.96	100	schoenfliesite + Fe oxide
Site 16	Spectrum 54	43.67	6.75	0.27	1.58	0.00	0.00	0.00	1.75	14.85	0.00	29.18	1.94	100	schoenfliesite + Fe oxide
Site 14	Spectrum 45	30.85	5.76	0.00	0.17	0.00	0.00	0.00	0.00	35.21	0.00	26.45	1.56	100	schoenfliesite + Fe oxide
Site 15	Spectrum 49	37.37	6.60	0.00	0.25	0.00	0.00	0.00	0.00	31.98	0.00	22.47	1.32	100	schoenfliesite + Fe oxide
Site 15	Spectrum 52	25.60	3.75	0.00	0.34	0.00	0.00	0.00	0.42	55.66	0.00	13.23	1.00	100	schoenfliesite + Fe oxide
Site 15	Spectrum 50	33.45	4.93	0.00	0.59	0.00	0.00	0.00	0.00	46.97	0.00	12.88	1.17	100	schoenfliesite + Fe oxide
<b>MEAN</b>	<b>7</b>	<b>36.9</b>	<b>6.3</b>	<b>0.1</b>	<b>0.8</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.6</b>	<b>29.1</b>	<b>0.0</b>	<b>24.7</b>	<b>1.6</b>	<b>100</b>	<b>schoenfliesite + Fe oxide</b>
															MgSn(OH)6 + FeO.OH
Site 8	Spectrum 27	27.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	72.59	0.00	0.00	0.00	100	magnetite
Site 9	Spectrum 28	27.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	72.47	0.00	0.00	0.00	100	magnetite
Site 6	Spectrum 22	27.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	72.43	0.00	0.00	0.00	100	magnetite
Site 1	Spectrum 2	27.43	0.00	0.00	0.21	0.00	0.00	0.00	0.00	72.36	0.00	0.00	0.00	100	magnetite
Site 17	Spectrum 60	27.13	0.52	0.00	0.00	0.00	0.00	0.00	0.00	72.35	0.00	0.00	0.00	100	magnetite
Site 5	Spectrum 18	27.35	0.29	0.00	0.00	0.00	0.00	0.00	0.00	72.35	0.00	0.00	0.00	100	magnetite
Site 7	Spectrum 26	27.31	0.36	0.00	0.00	0.00	0.00	0.00	0.00	72.33	0.00	0.00	0.00	100	magnetite
Site 11	Spectrum 34	27.48	0.00	0.00	0.25	0.00	0.00	0.00	0.00	72.27	0.00	0.00	0.00	100	magnetite
Site 12	Spectrum 40	27.63	0.00	0.00	0.55	0.00	0.00	0.00	0.00	71.82	0.00	0.00	0.00	100	magnetite
Site 14	Spectrum 43	27.78	0.00	0.00	0.21	0.00	0.21	0.00	0.00	71.80	0.00	0.00	0.00	100	magnetite
Site 1	Spectrum 3	27.59	0.41	0.00	0.38	0.00	0.00	0.00	0.00	71.61	0.00	0.00	0.00	100	magnetite
Site 3	Spectrum 13	27.23	0.63	0.00	0.67	0.00	0.00	0.00	0.00	71.46	0.00	0.00	0.00	100	magnetite
<b>MEAN</b>	<b>12</b>	<b>27.5</b>	<b>0.2</b>	<b>0.0</b>	<b>0.2</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>72.2</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>100</b>	<b>magnetite</b>
Site 17	Spectrum 59	30.31	0.00	1.61	0.51	0.00	0.28	0.00	0.00	67.29	0.00	0.00	0.00	100	Fe oxide + minor silicate
Site 17	Spectrum 58	32.55	0.00	1.90	0.46	0.00	0.19	0.00	0.00	64.90	0.00	0.00	0.00	100	Fe oxide + minor silicate
Site 18	Spectrum 67	32.59	0.32	0.00	0.82	0.00	0.00	0.00	0.63	64.27	0.00	0.00	1.37	100	Fe oxide + minor silicate
Site 4	Spectrum 14	34.25	0.00	0.00	1.01	0.00	0.37	0.00	0.52	63.84	0.00	0.00	0.00	100	Fe oxide + minor silicate
Site 16	Spectrum 53	32.16	0.52	0.35	2.27	0.00	0.20	0.24	0.75	63.53	0.00	0.00	0.00	100	Fe oxide + minor silicate
Site 18	Spectrum 63	32.90	0.43	0.00	1.52	0.00	0.00	0.00	0.64	63.45	0.00	0.00	1.07	100	Fe oxide + minor silicate
Site 16	Spectrum 55	32.68	0.00	0.00	3.18	0.00	0.21	0.27	0.55	63.10	0.00	0.00	0.00	100	Fe oxide + minor silicate
Site 16	Spectrum 57	34.42	0.00	0.34	1.62	0.00	0.00	0.26	0.75	62.61	0.00	0.00	0.00	100	Fe oxide + minor silicate
Site 4	Spectrum 15	35.82	0.00	0.00	0.81	0.00	0.38	0.00	0.73	62.25	0.00	0.00	0.00	100	Fe oxide + minor silicate
Site 4	Spectrum 16	35.27	2.58	0.00	2.83	0.00	0.26	0.00	0.00	59.07	0.00	0.00	0.00	100	Fe oxide + minor silicate
Site 18	Spectrum 65	38.88	0.00	0.00	2.19	0.00	0.00	0.00	0.00	58.93	0.00	0.00	0.00	100	Fe oxide + minor silicate
Site 18	Spectrum 61	38.70	0.00	0.00	3.14	0.00	0.19	0.00	0.29	57.69	0.00	0.00	0.00	100	Fe oxide + minor sil

# 887085 Electron Image 1



Spectrum 2  
□ Magnetite  
0.0%Sn

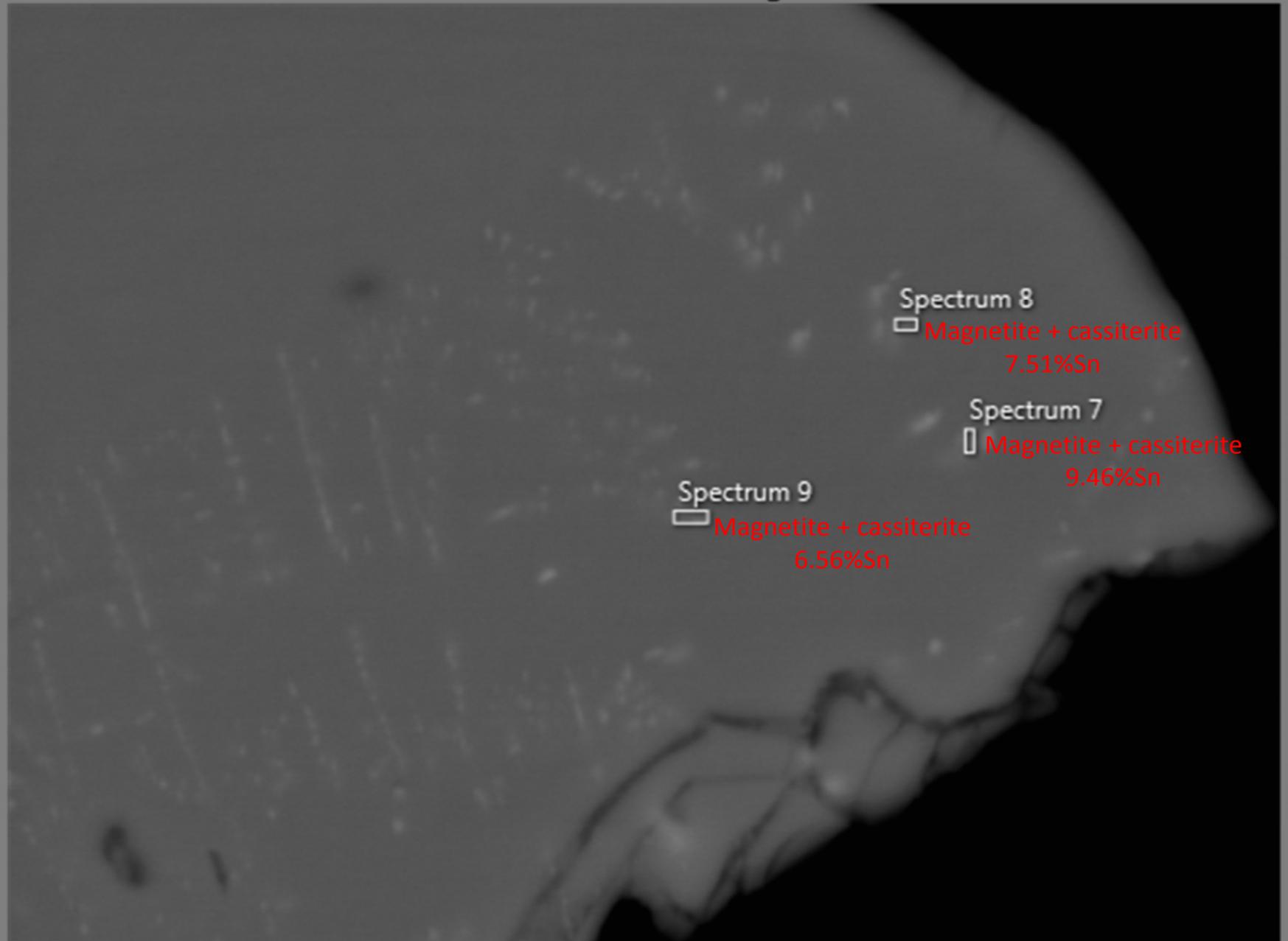
Spectrum 3  
□ Magnetite  
0.0%Sn

Spectrum 6  
□ Silicate  
0.0%Sn

Spectrum 5  
□ Fe oxide and minor silicate  
0.0%Sn

25µm

# 887085 Electron Image 2



5 $\mu$ m

# 887085 Electron Image 3

Spectrum 13

Magnetite  
0.0%Sn

Spectrum 12

+ Magnetite + cassiterite  
14.05%Sn

Magnetite + cassiterite

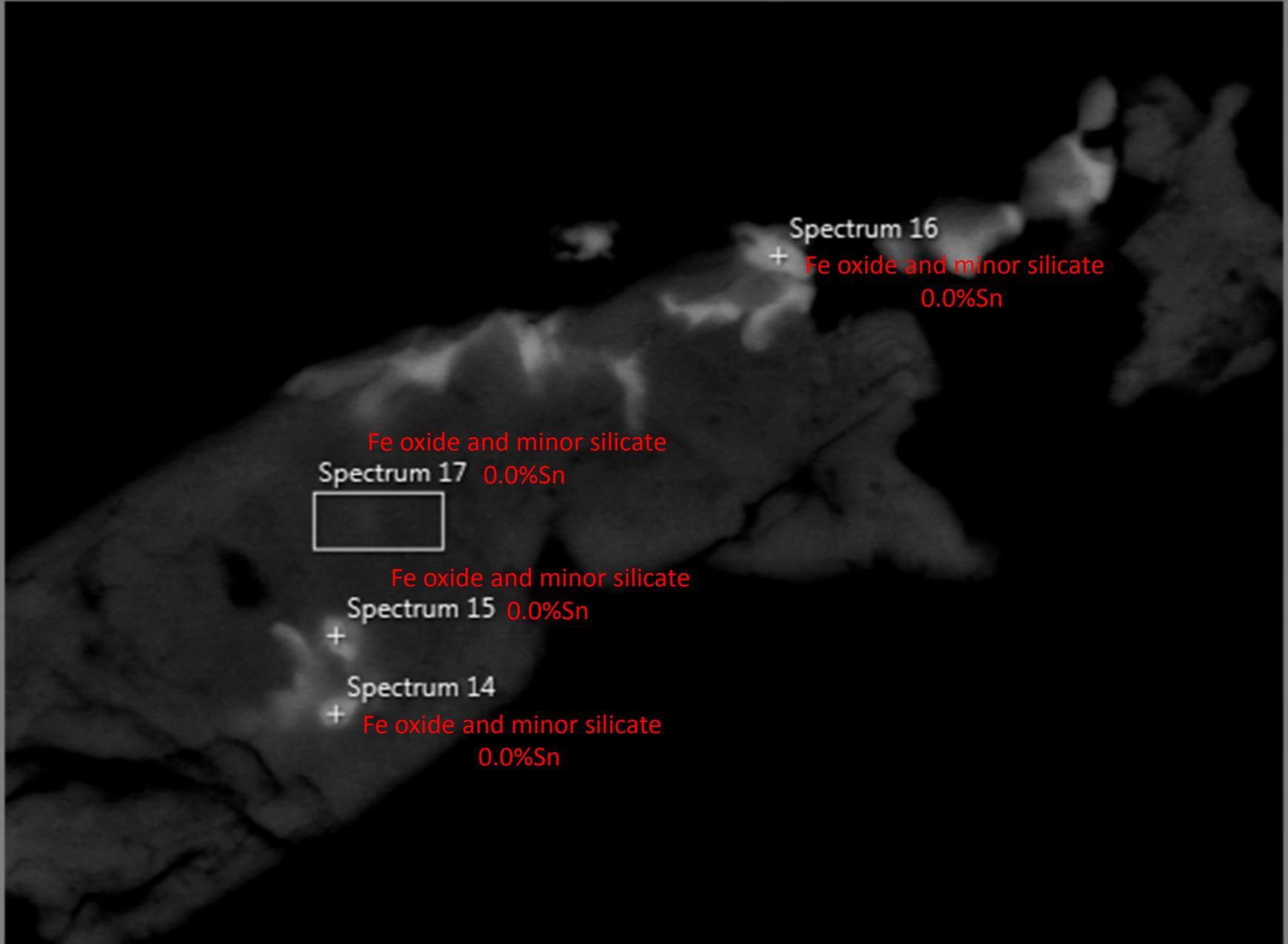
Spectrum 11 11.1%Sn

+ Spectrum 10

+ Magnetite + cassiterite  
13.03%Sn

1 $\mu$ m

# 887085 Electron Image 4



Spectrum 16

+ Fe oxide and minor silicate  
0.0%Sn

Fe oxide and minor silicate  
Spectrum 17 0.0%Sn



Fe oxide and minor silicate  
Spectrum 15 0.0%Sn

+

Spectrum 14

+

Fe oxide and minor silicate  
0.0%Sn

5 $\mu$ m

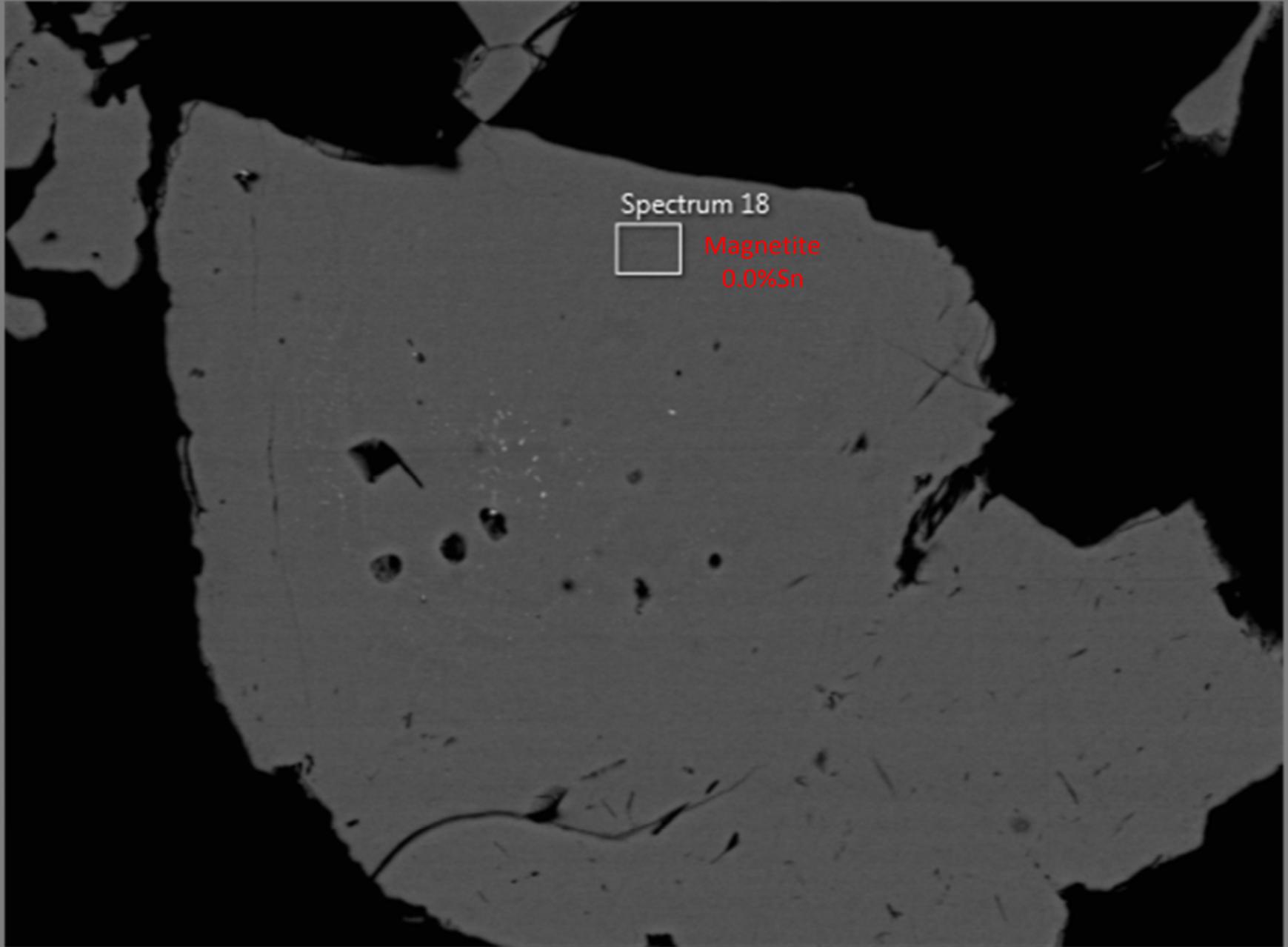
887085 Electron Image 5

Spectrum 18

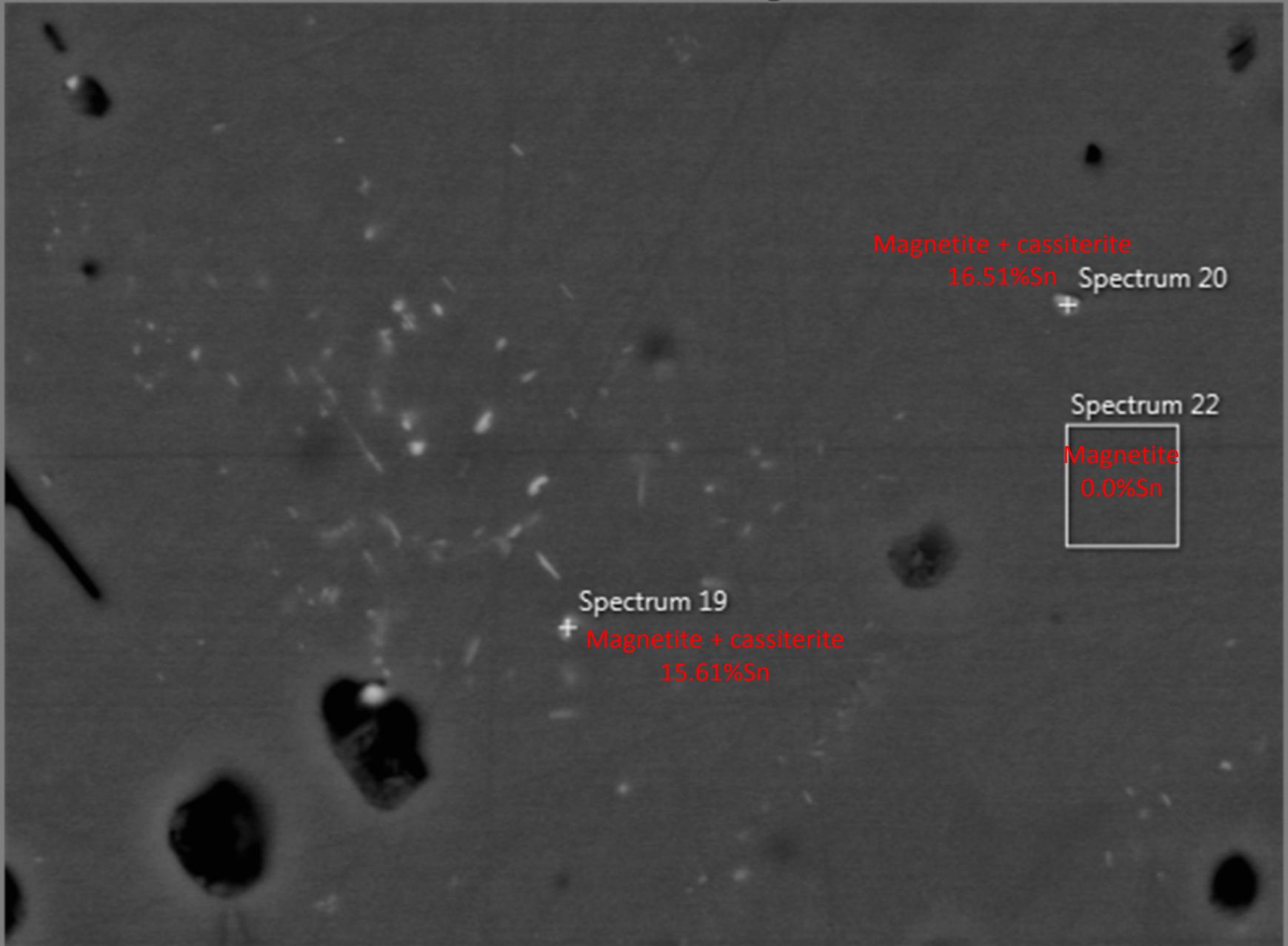


Magnetite  
0.0%Sn

25μm



# 887085 Electron Image 6



Magnetite + cassiterite  
16.51%Sn Spectrum 20



Spectrum 22

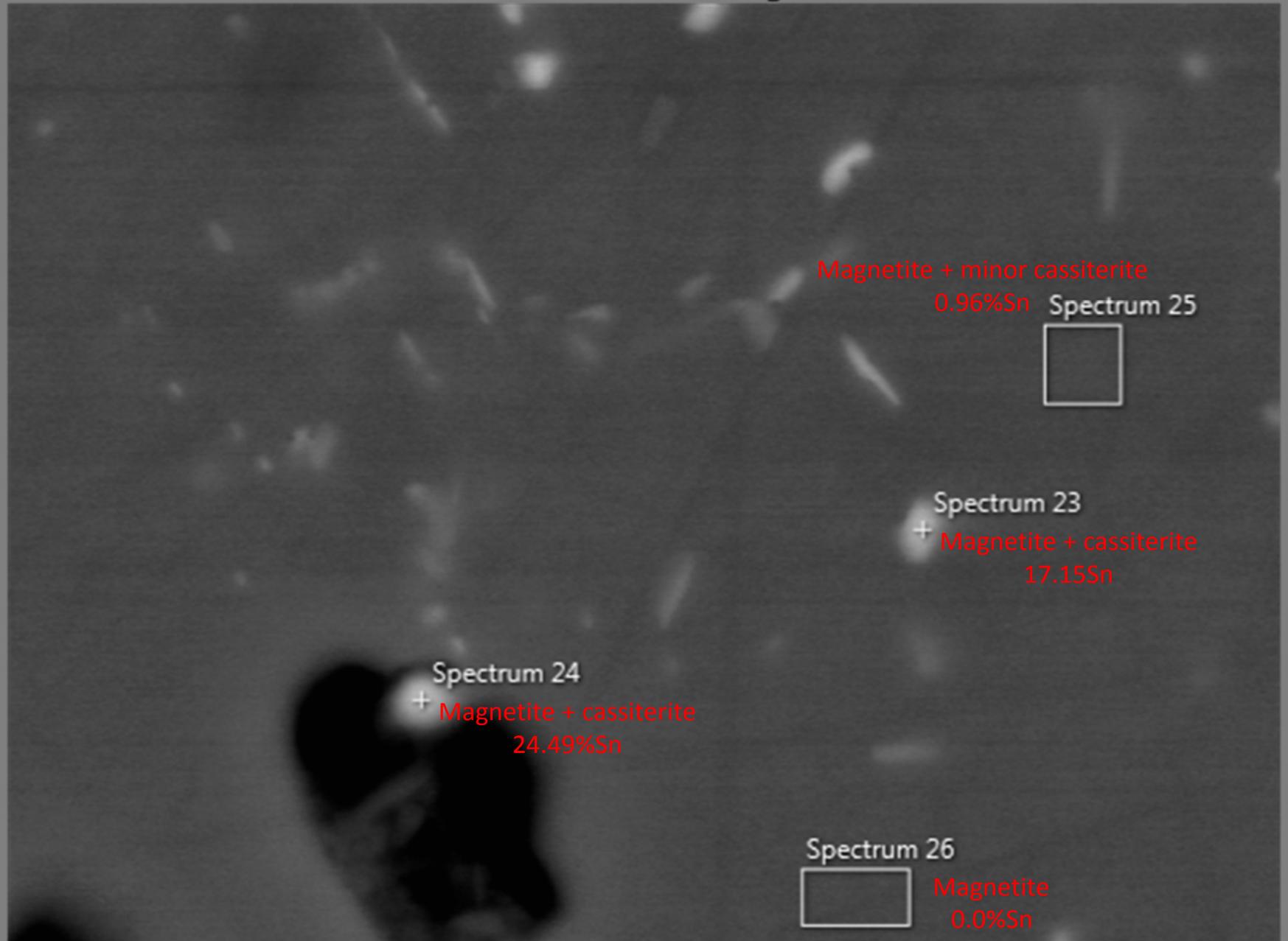
Magnetite  
0.0%Sn

Spectrum 19  
+ Magnetite + cassiterite  
15.61%Sn



5µm

# 887085 Electron Image 7



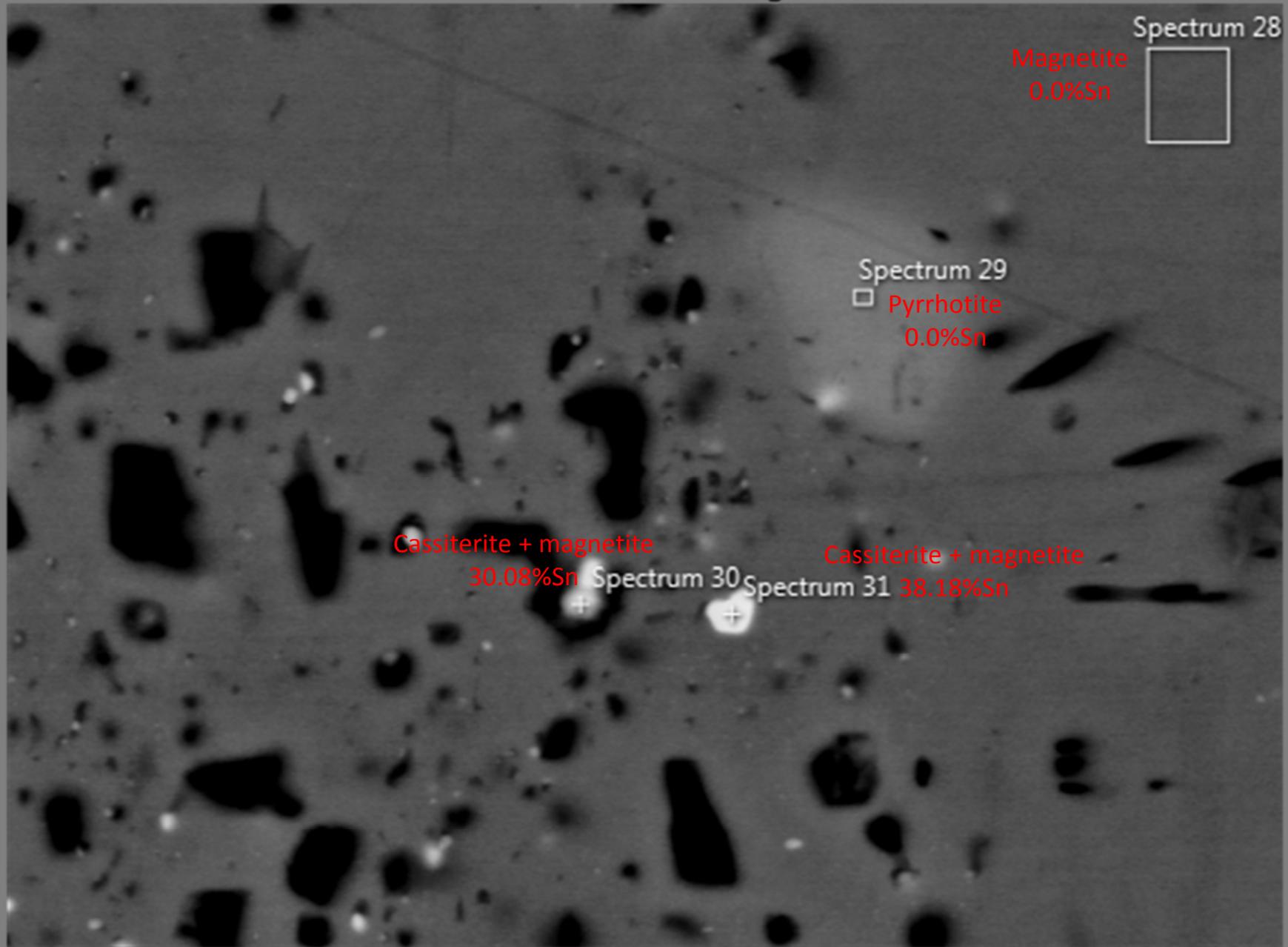
2.5µm

887085 Electron Image 8



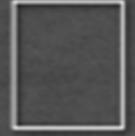
25µm

# 887085 Electron Image 9



Spectrum 28

Magnetite  
0.0%Sn



Spectrum 29

Pyrrhotite  
0.0%Sn

Cassiterite + magnetite  
30.08%Sn

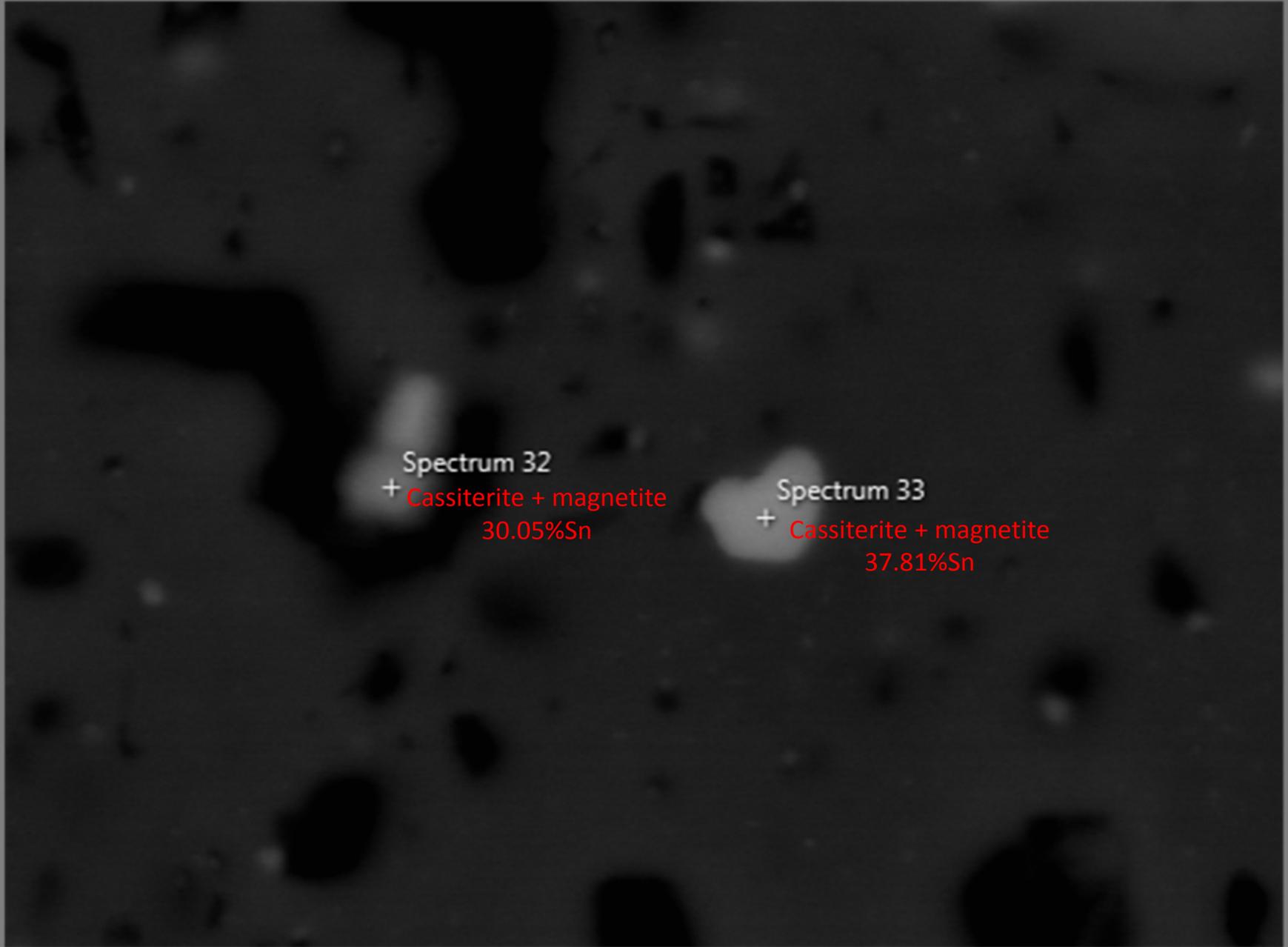
Spectrum 30

Cassiterite + magnetite  
38.18%Sn

Spectrum 31

5µm

# 887085 Electron Image 10



Spectrum 32  
+ Cassiterite + magnetite  
30.05%Sn

Spectrum 33  
+ Cassiterite + magnetite  
37.81%Sn

2.5µm

# 887085 Electron Image 11



Spectrum 34  
□ Magnetite  
0.0%Sn

Spectrum 35  
□ Cassiterite + minor magnetite  
75.07%Sn

10µm

# 887085 Electron Image 12

Cassiterite + minor magnetite  
Spectrum 36 68.34%Sn

Cassiterite + minor magnetite  
Spectrum 37 73.57%Sn

Spectrum 38  
Cassiterite + minor magnetite  
69.27%Sn

Spectrum 40  
Magnetite  
0.0%Sn

Spectrum 39  
Cassiterite + minor magnetite  
73.69%Sn

25µm

# 887085 Electron Image 13

Spectrum 41

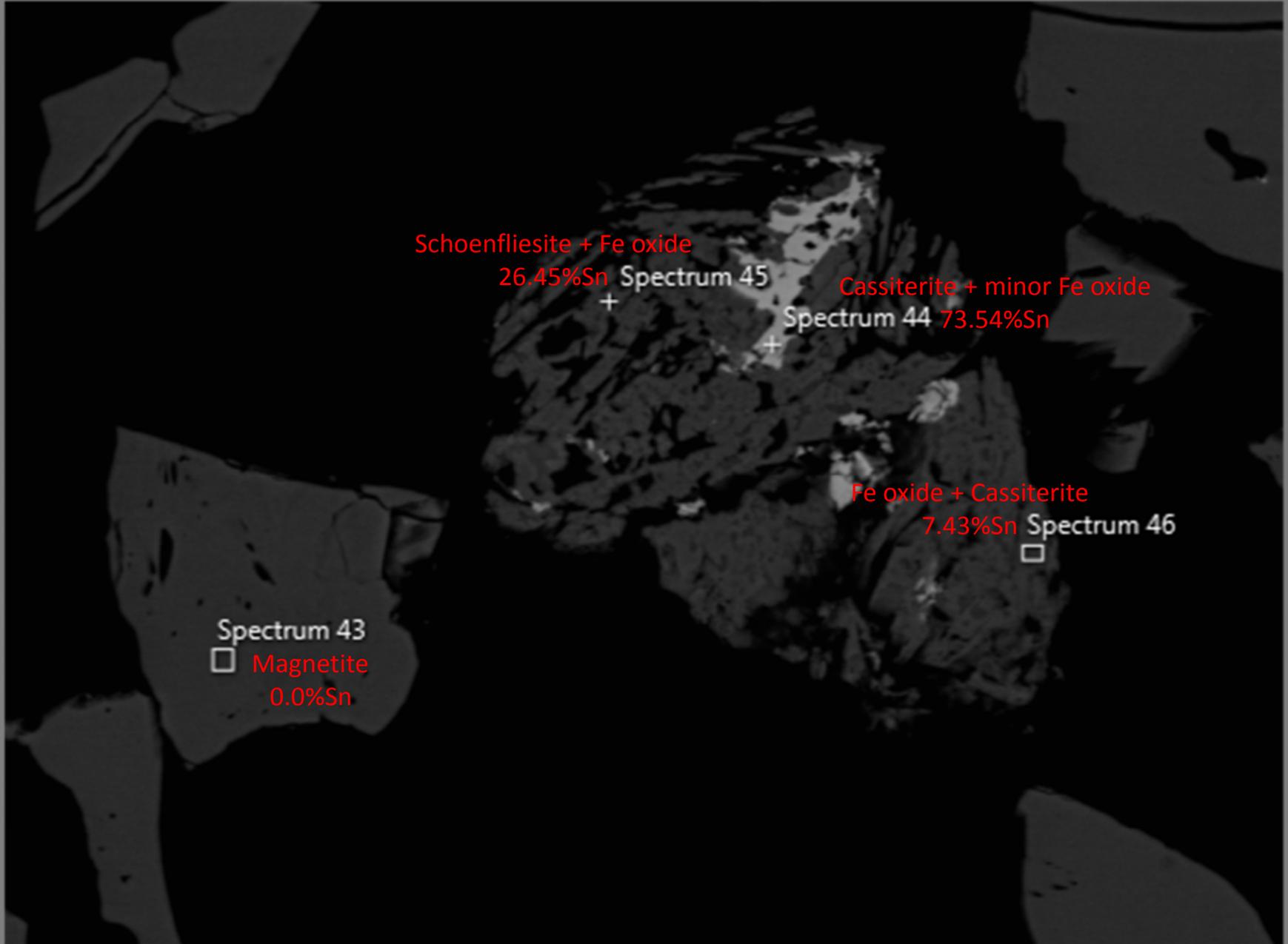
Cassiterite + minor Fe oxide  
75.09%Sn

Spectrum 42

Fe oxide + minor Cassiterite  
1.22%Sn

25µm

# 887085 Electron Image 14



25µm

# 887085 Electron Image 15

Fe oxide + minor Cassiterite  
2.64%Sn Spectrum 48



Schoenfliesite + Fe oxide  
22.47%Sn Spectrum 49



Spectrum 47  
Schoenfliesite + Fe oxide  
39.05%Sn



Schoenfliesite + Fe oxide  
12.88%Sn Spectrum 50



Schoenfliesite + Fe oxide  
13.23%Sn

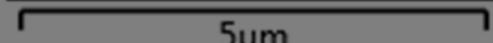
Fe oxide + minor Cassiterite  
2.56%Sn Spectrum 51



Spectrum 52



5μm



# 887085 Electron Image 16

Spectrum 57

▣ Fe oxide + minor Silicate  
0.0%Sn

Fe oxide + minor Silicate

0.0%Sn

Spectrum 55



Spectrum 53



Fe oxide + minor Silicate  
0.0%Sn

Schoenfliesite + Fe oxide

29.18%Sn

Spectrum 54



Spectrum 56



Schoenfliesite + Fe oxide  
29.29%Sn

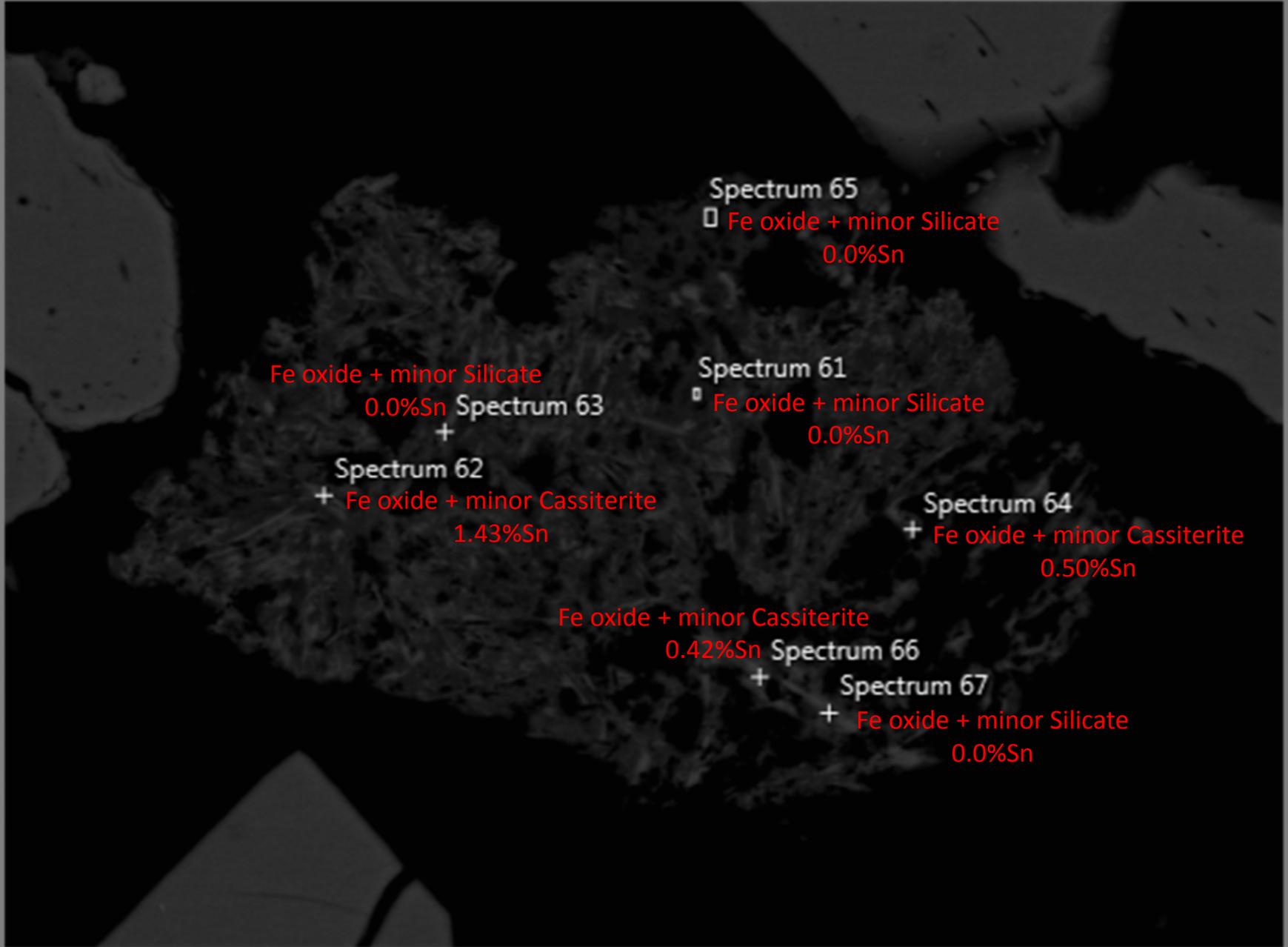
10μm

# 887085 Electron Image 17



25µm

# 887085 Electron Image 18



Spectrum 65

□ Fe oxide + minor Silicate  
0.0%Sn

Fe oxide + minor Silicate  
0.0%Sn Spectrum 63  
+

Spectrum 61

□ Fe oxide + minor Silicate  
0.0%Sn

Spectrum 62

+ Fe oxide + minor Cassiterite  
1.43%Sn

Spectrum 64

+ Fe oxide + minor Cassiterite  
0.50%Sn

Fe oxide + minor Cassiterite

0.42%Sn Spectrum 66

+ Spectrum 67

+ Fe oxide + minor Silicate  
0.0%Sn

10μm

**MINERALOGICAL REPORT ON CASSITERITE  
MAG AND NON-MAG CON SAMPLES SUPPLIED  
BY ALS METALLURGY BURNIE**

**Attn:** John Glen - Manager

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S W McKnight

**SITE**

**Mount Helen Campus**

Ph 0353279262

Fax 0353279144

[s.mcknight@ballarat.edu.au](mailto:s.mcknight@ballarat.edu.au)

**27<sup>th</sup> July 2014**

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**Samples Supplied:**

**Mag Cons**

887133	T11 Mag 1 - 1500 Gauss
887134	Mag 2 - 5000 Gauss
887135	Non Mag - 5000 Gauss

## QXRD Results – semiquantitative wt%

Phase	887133	887134	887135
Cassiterite	5.9	7.3	23.3
Pyrite	14.9	5.7	10.4
Pyrrhotite	0	0	0
Siderite	39.2	62.6	12.3
Arsenopyrite	1.5	0.8	1.6
Goethite	1.6	10.1	21.9
Quartz	1	1.8	4.9
Marcasite	10.8	5.9	10
Topaz	0.1	0.6	0
Zircon	0.1	0.1	0.8
Diopside (pyrox)	0	0.6	5.5
Forsterite (ol)?	0.7	1.8	4
Fluorite	0.1	0	0
Phlogopite	0	0	0
Dravite (tourm)	0	0.1	3.3
Galena	0.1	0	0
Microcline	0	0	0.9
Magnetite	21.7	0.5	0.3
Chlorite	0.3	0.4	0
Dolomite	1.9	1.7	0.9

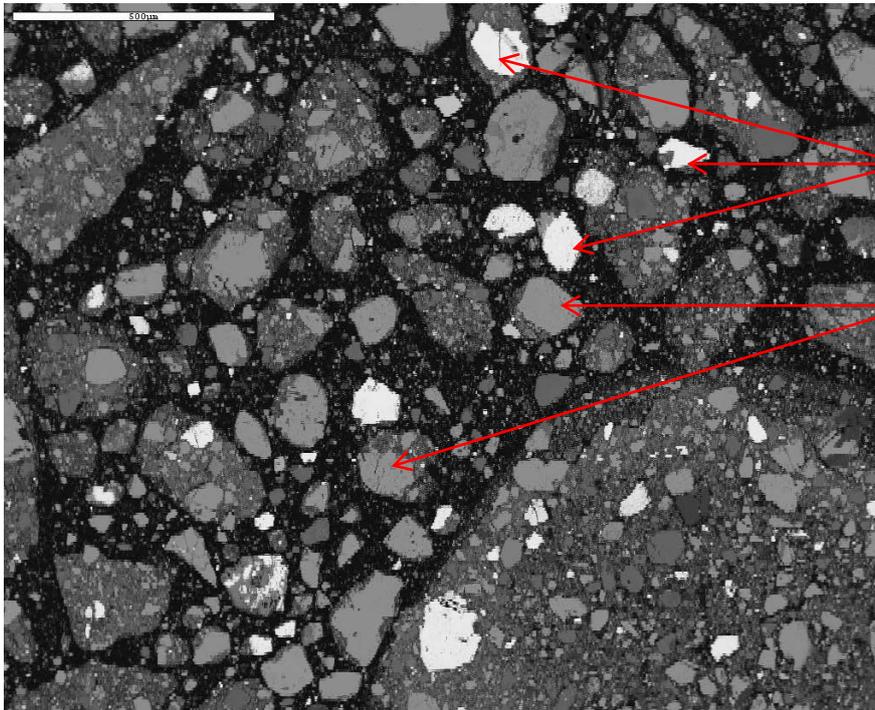
## Observation

Cassiterite is present at greatest levels in the non-mag fraction, however, it is present in both mag fractions at similar lower levels.

SEM observations do not appear to indicate any significant different characters of the cassiterite in the mag or non mag fractions.

## SEM Analyses

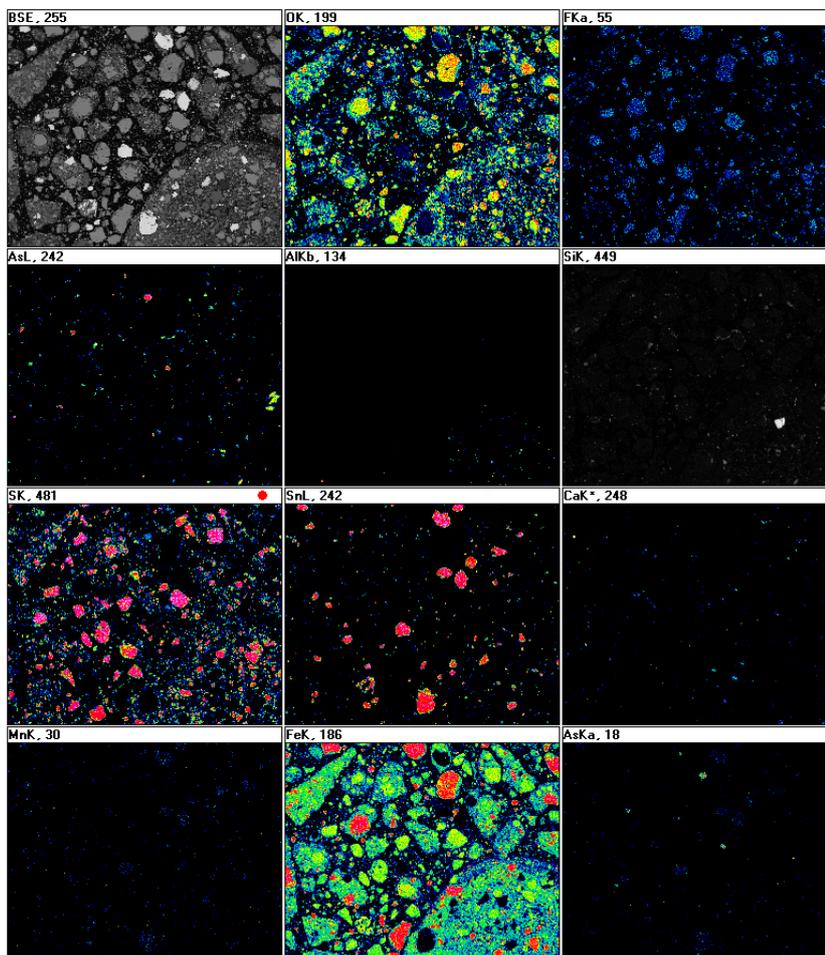
#887133 Mag 1 - 1500 Gauss



cassiterite

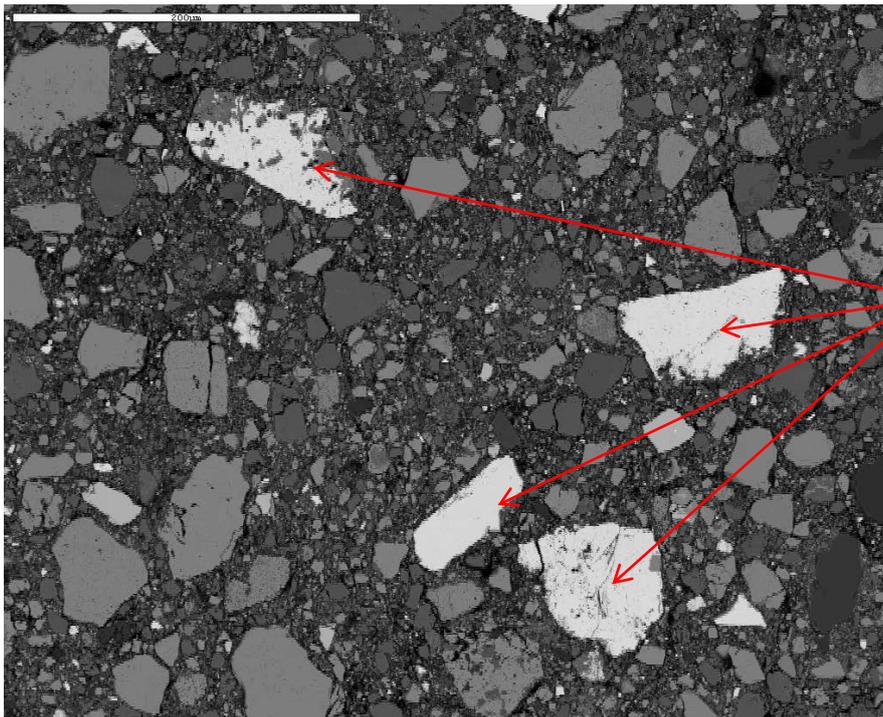
pyrite and marcasite

SEM BSE Image



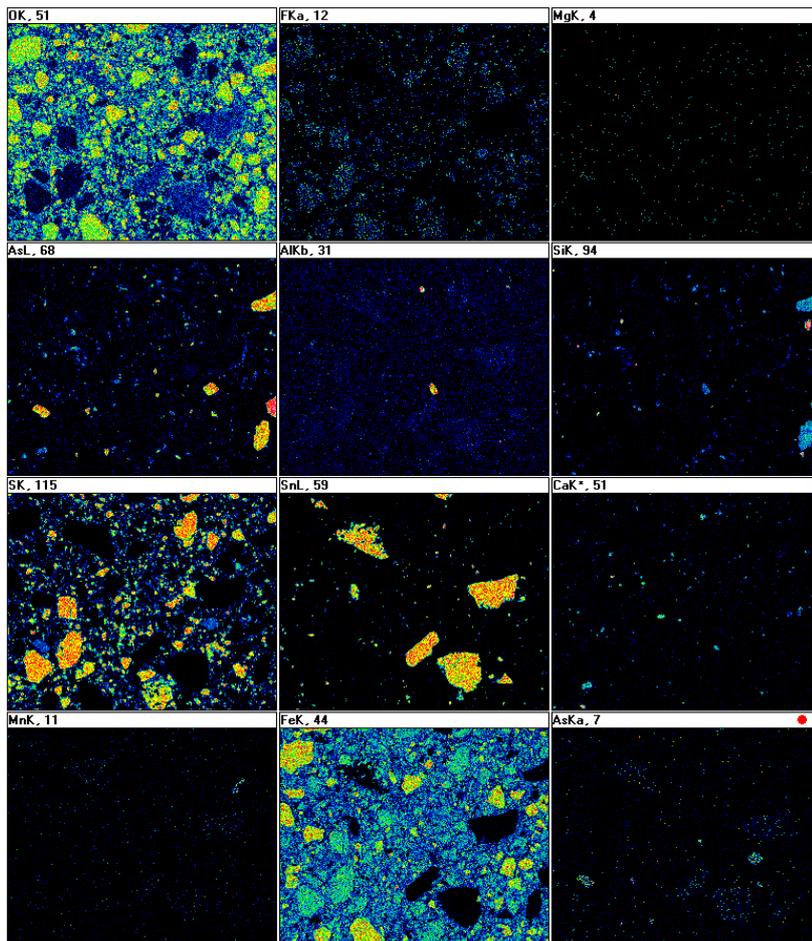
Element x-ray maps obtained from the same field as shown in the SEM BSE image above – phases present can be recognised in the BSE image by inspection of the element map panels

#887133



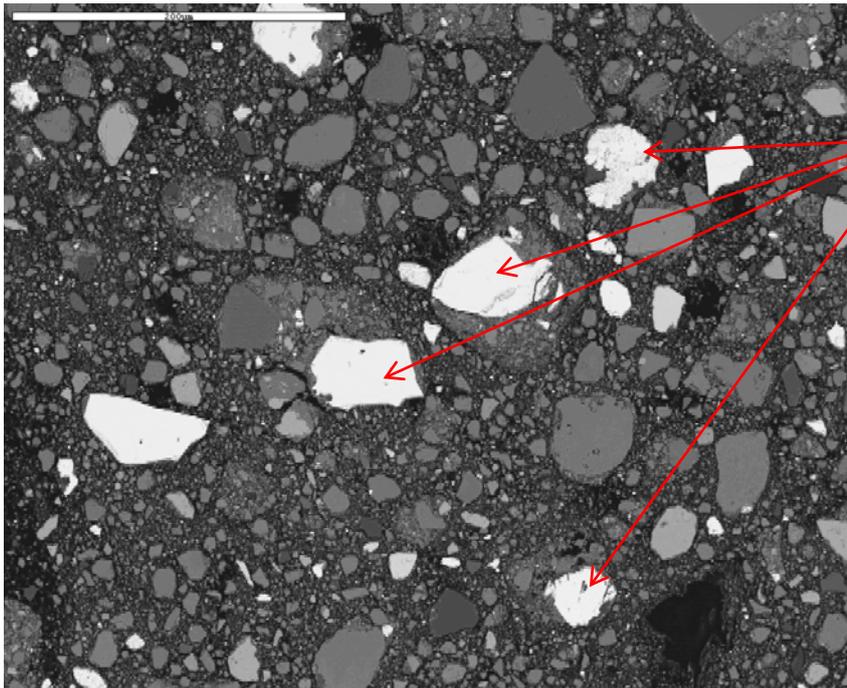
Cassiterite – note composite nature

SEM BSE Image



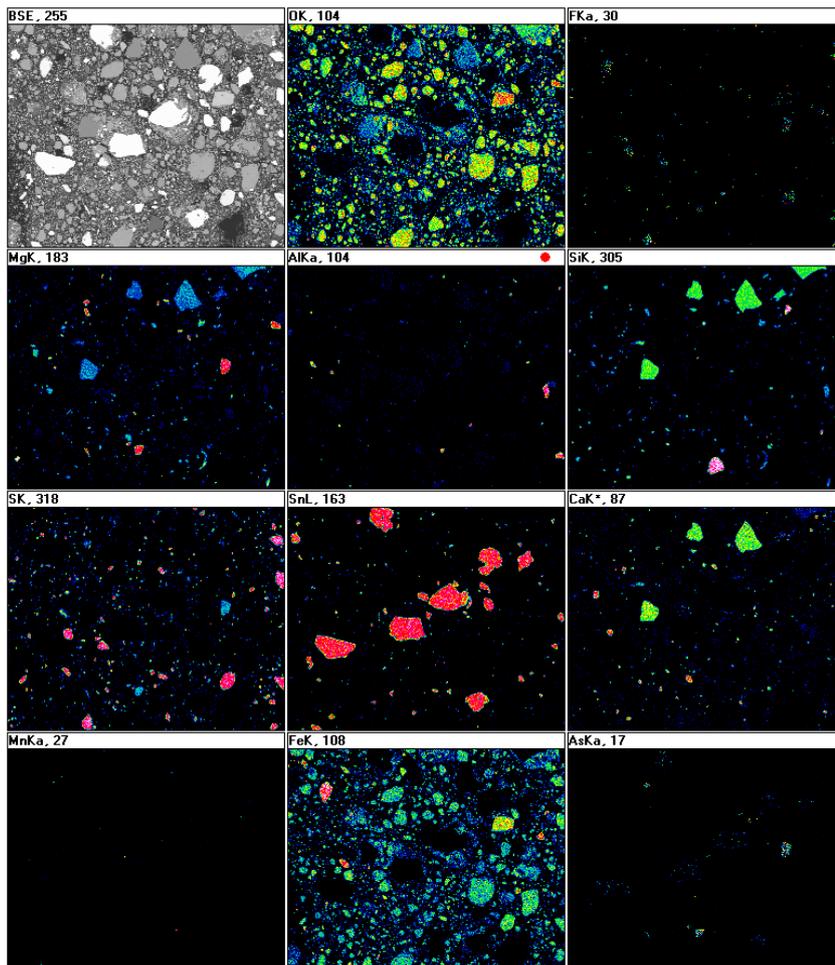
Element x-ray maps obtained from the same field as shown in the SEM BSE image above. Arsenopyrite grains are green in the AsKa panel other phases present can be recognised in the BSE image by inspection of the element map panels

#887134 Mag 2 - 5000 Gauss



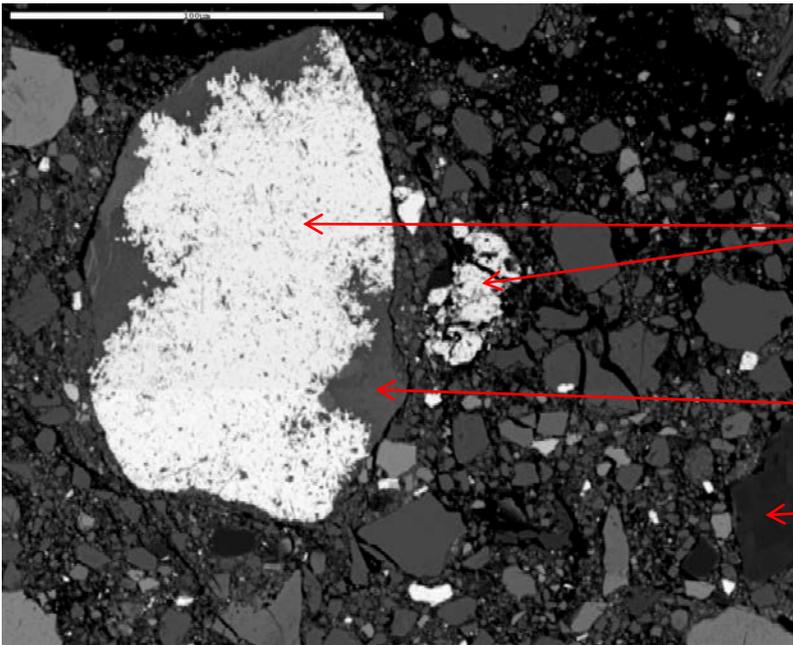
cassiterite

SEM BSE Image



Element x-ray maps obtained from the same field as shown in the SEM BSE image above. Arsenopyrite grains are green in the As K map panel (red in the Mg panel) – other phases present can be recognised in the BSE image by inspection of the element map panels

#887134 Mag 2 - 5000 Gauss

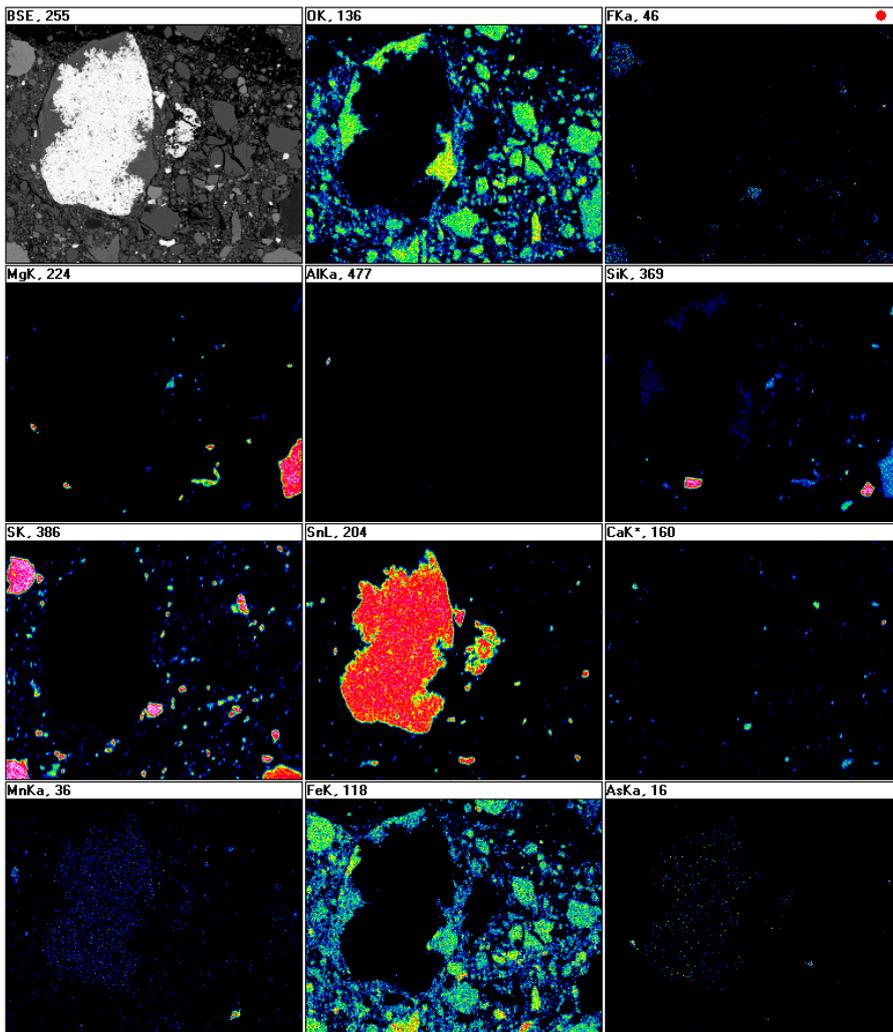


Note the large irregular composite (porous?) grains of cassiterite

Fe oxide or carbonate

olivine

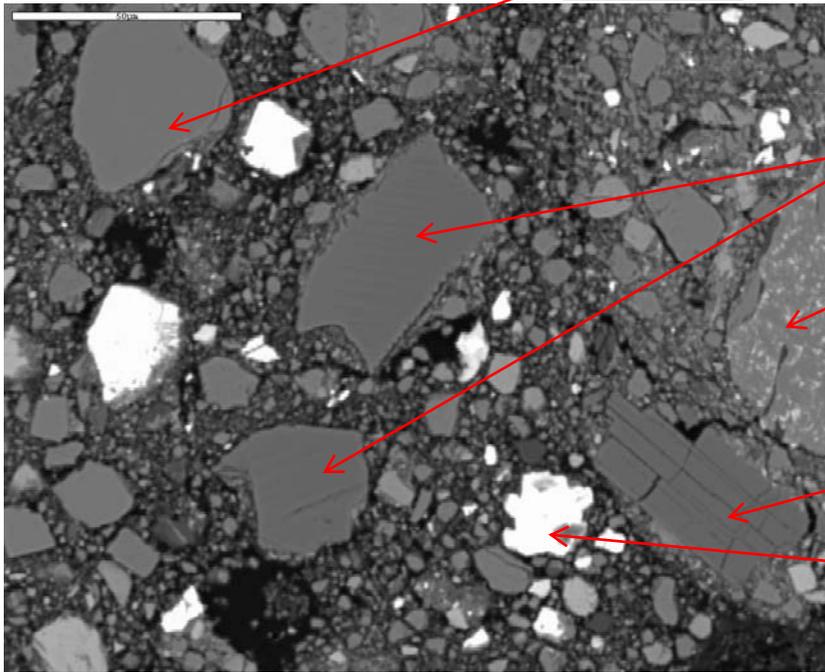
SEM BSE Image



Element x-ray maps obtained from the same field as shown in the SEM BSE image above – various phases present can be identified in the BSE image by inspection of the maps

#887135 Non Mag - 5000 Gauss

siderite



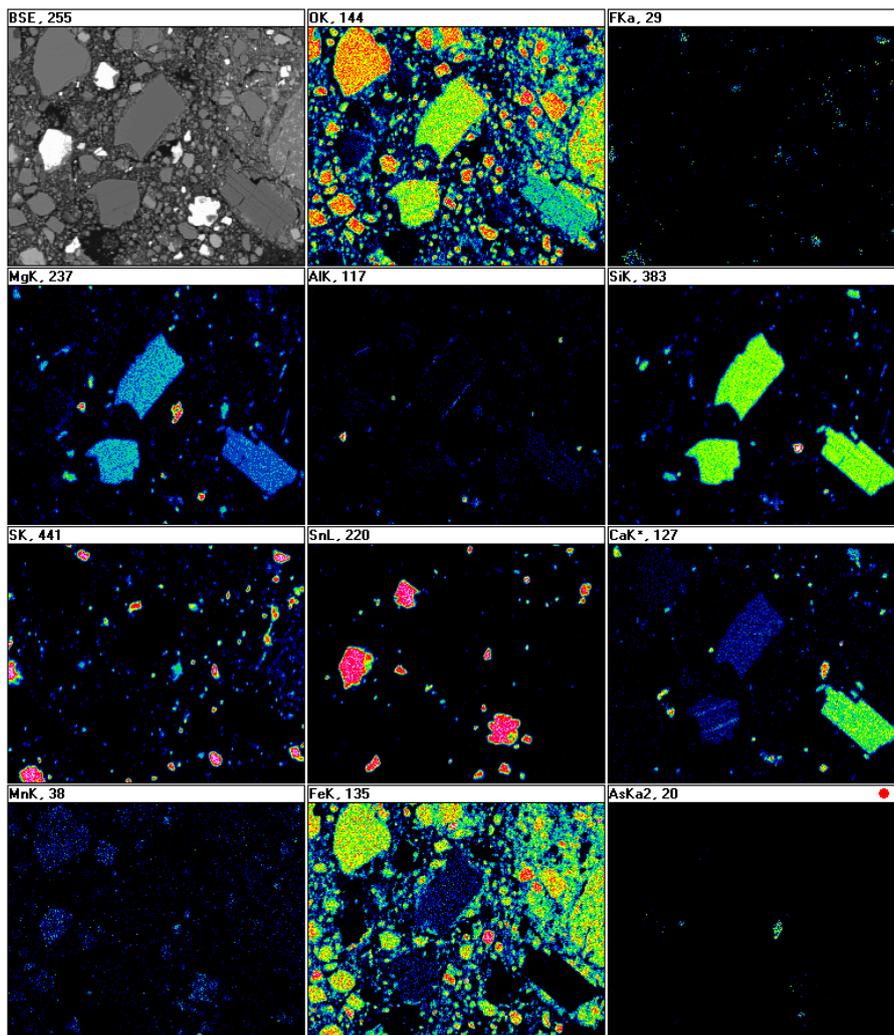
Olivine (forsterite)

goethite

diopside (pyrox)

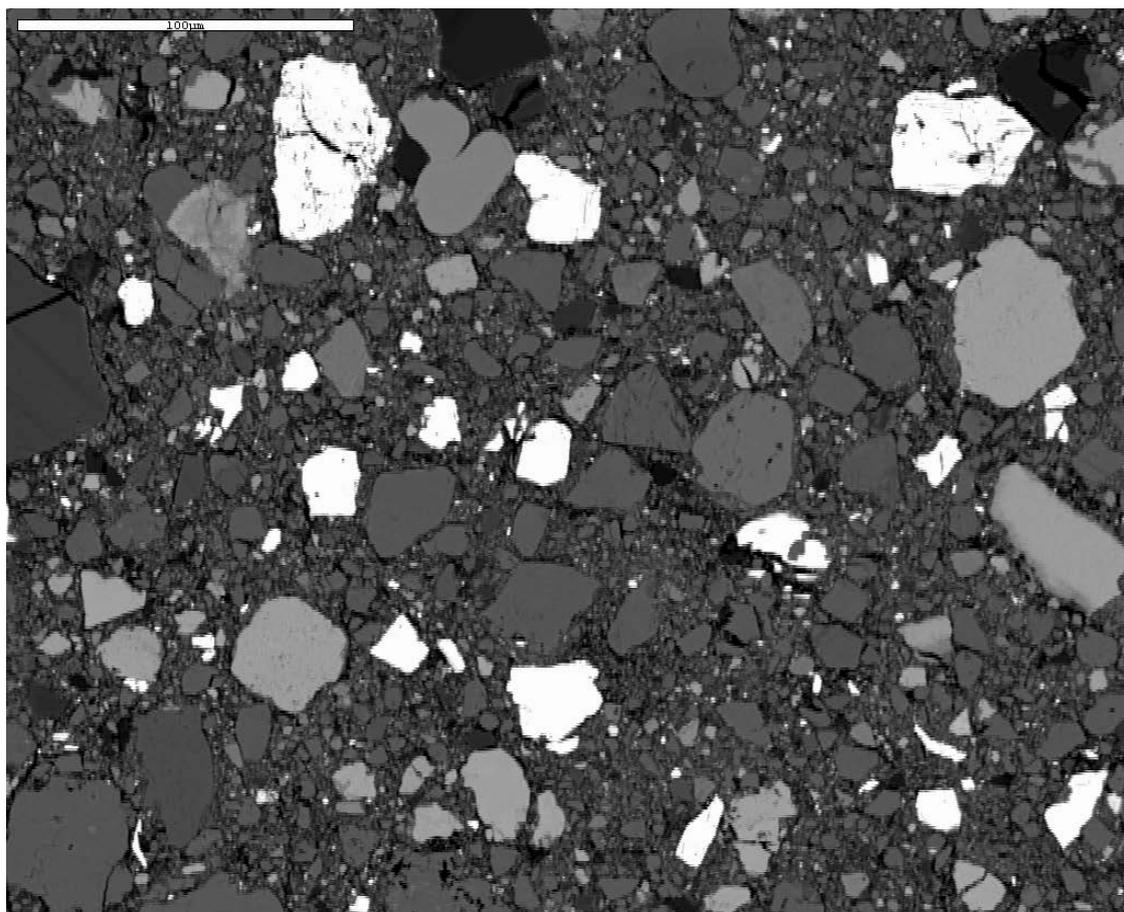
cassiterite with attached phases

SEM BSE Image



Element x-ray maps obtained from the same field as shown in the SEM BSE image above. Arsenopyrite grains are green in the As K map panel

#887135 Non Mag - 5000 Gauss



SEM BSE Image

All bright grains are cassiterite, mid grey grains are sulphides



**WorleyParsons**

resources & energy

EcoNomics™

STELLAR RESOURCES LIMITED  
SAINT DIZIER METALLURGICAL TESTWORK  
2014 PROGRESS REPORT

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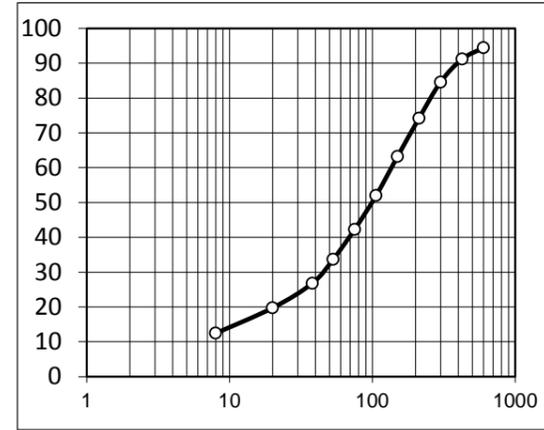
## Appendix 3 – Bulk Composite Davis Tube Results

PROJECT	T0887
SAMPLE	St Dizier Composite
FROM TEST NO	
DATE	230514
TECHNICIAN	ID

## DAVIS TUBE RECOVERY ON FRACTIONS

## SIZING

SIZE um	WEIGHTS	
	(%)	%PASS
212	25.78	100
106	22.25	77.8
53	18.34	59.4
20	13.91	45.5
8	7.27	38.2
<8	12.46	25.8
TOTAL	100.00	



## SEPARATIONS

Products	WT %	WT %	Fraction		Fraction		Fraction		Fraction		Fraction		% sol Sn	% of total Sn as Insol Sn
			%Sn	dist	%Insol Sn	dist	%Fe	dist	%SiO2	dist	%S	dist		
Mags+212	53.25	13.73	0.76	65.8	0.54	59.8	49.70	82.4	10.20	20.3	1.22	42.9	0.22	71%
Non Mags+212	46.75	12.05	0.45	34.2	0.42	40.2	12.05	17.6	45.60	79.7	1.85	57.1	0.04	92%
Calc +212 Total	100.00	25.78	0.62	100.0	0.48	100.0	32.10	100.0	26.75	100.0	1.51	100.0	0.13	79%
Mags+106	56.54	12.58	0.58	45.9	0.41	39.0	61.70	84.4	3.95	11.0	0.56	23.5	0.17	71%
Non Mags+106	43.46	9.67	0.89	54.1	0.84	61.0	14.80	15.6	41.50	89.0	2.37	76.5	0.05	94%
Calc +106 Total	100.00	22.25	0.71	100.0	0.60	100.0	41.32	100.0	20.27	100.0	1.35	100.0	0.12	84%
Mags+53	51.40	9.42	0.46	30.5	0.30	23.6	64.90	82.2	2.75	7.0	0.38	15.6	0.16	66%
Non Mags+53	48.60	8.91	1.11	69.5	1.04	76.4	14.90	17.8	38.40	93.0	2.17	84.4	0.07	93%
Calc +53 Total	100.00	18.34	0.78	100.0	0.66	100.0	40.60	100.0	20.08	100.0	1.25	100.0	0.12	85%
Mags+20	40.32	5.61	0.38	16.0	0.21	10.1	66.60	75.2	2.08	3.8	0.24	7.3	0.18	54%
Non Mags+20	59.68	8.30	1.35	84.0	1.23	89.9	14.80	24.8	35.40	96.2	2.07	92.7	0.12	91%
Calc +20 Total	100.00	13.91	0.96	100.0	0.82	100.0	35.69	100.0	21.97	100.0	1.33	100.0	0.14	85%
Mags+CS5	35.50	2.58	0.41	11.2	0.18	5.6	66.30	72.4	1.67	3.4	0.28	6.8	0.23	44%
Non Mags+CS5	64.50	4.69	2.06	83.4	1.90	88.0	17.10	27.6	32.30	96.6	2.58	93.2	0.16	92%
Calc +CS5 Total	100.00	7.27	1.47	94.6	1.29	93.6	36.94	100.0	19.95	100.0	1.65	100.0	0.19	87%
-CS5		12.46	1.02		0.56		34.00		24.40		1.22		0.46	55%
CALC FEED		100.00	0.83		0.66		32.56		19.59		1.22		0.17	79%

## SUMMARY

FRACTIONS	Picno SG	WT %	Overall		Overall		Overall		Overall		Overall		% sol Sn	% of total Sn as Insol Sn
			%Sn	dist	%Insol Sn	dist	%Fe	dist	%SiO2	dist	%S	dist		
Mags+212		13.73	0.76	13.45	0.54	12.31	49.70	18.63	10.20	6.16	1.22	12.09	0.22	71%
Mags+106		12.58	0.58	9.40	0.41	8.58	61.70	21.19	3.95	2.19	0.56	5.09	0.17	71%
Mags+53		9.42	0.46	5.59	0.30	4.72	64.90	16.70	2.75	1.14	0.38	2.59	0.16	66%
Mags+20		5.61	0.38	2.75	0.21	1.90	66.60	10.20	2.08	0.51	0.24	0.97	0.18	54%
Mags+CS5		2.58	0.41	1.36	0.18	0.76	66.30	4.67	1.67	0.19	0.28	0.52	0.23	44%
Non Mags+212		12.05	0.45	6.99	0.42	8.26	12.05	3.97	45.60	24.17	1.85	16.10	0.04	92%
Non Mags+106		9.67	0.89	11.09	0.84	13.40	14.80	3.91	41.50	17.65	2.37	16.55	0.05	94%
Non Mags+53		8.91	1.11	12.75	1.04	15.27	14.90	3.63	38.40	15.05	2.17	13.97	0.07	93%
Non Mags+20		8.30	1.35	14.45	1.23	16.90	14.80	3.36	35.40	12.93	2.07	12.41	0.12	91%
Non Mags+CS5		4.69	0.96	5.79	0.82	6.33	17.10	2.19	32.30	6.66	2.58	8.73	0.14	85%
Total Mags		43.92	0.57	32.55	0.39	28.27	59.53	71.39	5.27	10.18	0.67	21.26	0.19	68%
Total Non Mags		43.62	0.91	51.07	0.83	60.16	14.31	17.04	39.85	76.45	2.15	67.76	0.07	92%
-CS5		12.46	1.02	16.38	0.56	11.57	34.00	11.57	24.40	13.37	1.22	10.98	0.46	55%
CALC FEED		100.00	0.78	100.00	0.61	100.00	36.62	100.00	22.74	100.00	1.38	100.00	0.17	78%

PROJECT	T0730
TEST NO	T01
DATE	160514
TECHNICIAN	TF

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	10.01
Magnetic Sample (gms)	5.33
Non-magnetic sample(gms)	4.68
Magnetics Mass (%)	53.25

SAMPLE TESTED

St Dizier Composite +212um
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MAGNETIC SEPARATION RESULTS

PRODUCT	Wt (%)	Sn (%)	Dist (%)	SolSn (%)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	53.25	0.76	65.8	0.22	87.6	49.70	82.4	10.20	20.3	1.22	42.9
Non Magnetics	46.75	0.45	34.2	0.04	12.4	12.05	17.6	45.60	79.7	1.85	57.1
Total	100.00	0.62	100.0	0.13	100.0	32.10	100.0	26.75	100.0	1.51	100.0
Head		0.62		0.14		30.40		27.70		1.32	

PROJECT	T0730
TEST NO	T02
DATE	160514
TECHNICIAN	TF

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	10.01
Magnetic Sample (gms)	5.66
Non-magnetic sample(gms)	4.35
Magnetics Mass (%)	56.54

SAMPLE TESTED

St Dizier Composite +106um
----------------------------

MAGNETIC SEPARATION RESULTS

PRODUCT	Wt (%)	Sn (%)	Dist (%)	SoISn (%)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	56.54	0.58	45.9	0.17	81.0	61.70	84.4	3.95	11.0	0.56	23.5
Non Magnetics	43.46	0.89	54.1	0.05	19.0	14.80	15.6	41.50	89.0	2.37	76.5
Total	100.00	0.71	100.0	0.12	100.0	41.32	100.0	20.27	100.0	1.35	100.0
Head		0.74		0.13		40.90		21.00		1.38	

PROJECT	T0730
TEST NO	T03
DATE	160514
TECHNICIAN	TF

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	10.02
Magnetic Sample (gms)	5.15
Non-magnetic sample(gms)	4.87
Magnetics Mass (%)	51.40

SAMPLE TESTED

St Dizier Composite +53um
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MAGNETIC SEPARATION RESULTS

PRODUCT	Wt (%)	Sn (%)	Dist (%)	SoISn (%)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	51.40	0.46	30.5	0.16	69.5	64.90	82.2	2.75	7.0	0.38	15.6
Non Magnetics	48.60	1.11	69.5	0.07	30.5	14.90	17.8	38.40	93.0	2.17	84.4
Total	100.00	0.78	100.0	0.12	100.0	40.60	100.0	20.08	100.0	1.25	100.0
Head		0.78		0.13		41.00		19.35		1.20	

PROJECT	T0730
TEST NO	T04
DATE	160514
TECHNICIAN	TF

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	10.02
Magnetic Sample (gms)	4.04
Non-magnetic sample(gms)	5.98
Magnetics Mass (%)	40.32

SAMPLE TESTED

St Dizier Composite +20um
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MAGNETIC SEPARATION RESULTS

PRODUCT	Wt (%)	Sn (%)	Dist (%)	SolSn (%)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	40.32	0.38	16.0	0.18	50.0	66.60	75.2	2.08	3.8	0.24	7.3
Non Magnetics	59.68	1.35	84.0	0.12	50.0	14.80	24.8	35.40	96.2	2.07	92.7
Total	100.00	0.96	100.0	0.14	100.0	35.69	100.0	21.97	100.0	1.33	100.0
Head		0.95		0.16		36.70		21.60		1.30	

PROJECT	T0730
TEST NO	T05
DATE	160514
TECHNICIAN	TF

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	10.00
Magnetic Sample (gms)	3.55
Non-magnetic sample(gms)	6.45
Magnetics Mass (%)	35.50

SAMPLE TESTED
St Dizier Composite +CS5

MAGNETIC SEPARATION RESULTS											
PRODUCT	Wt (%)	Sn (%)	Dist (%)	SolSn (%)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	35.50	0.41	9.9	0.23	44.1	66.30	68.1	1.67	2.8	0.28	5.6
Non Magnetics	64.50	2.06	90.1	0.16	55.9	17.10	31.9	32.30	97.2	2.58	94.4
Total	100.00	1.47	100.0	0.19	100.0	34.57	100.0	21.43	100.0	1.76	100.0
Head		1.45		0.20		35.00		20.50		1.67	



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## **Appendix 4 – Bulk Composite Comminution Results**

## BOND ABRASION INDEX DETERMINATION

<b>SAMPLE IDENTITY</b>	T0887 Costean Lump Ore
<b>CLIENT</b>	Stellar Resources
<b>PROJECT No</b>	P0608 St Dizier Project
<b>DATE</b>	May-14

### SIZE ANALYSIS : ABRASION INDEX PRODUCT

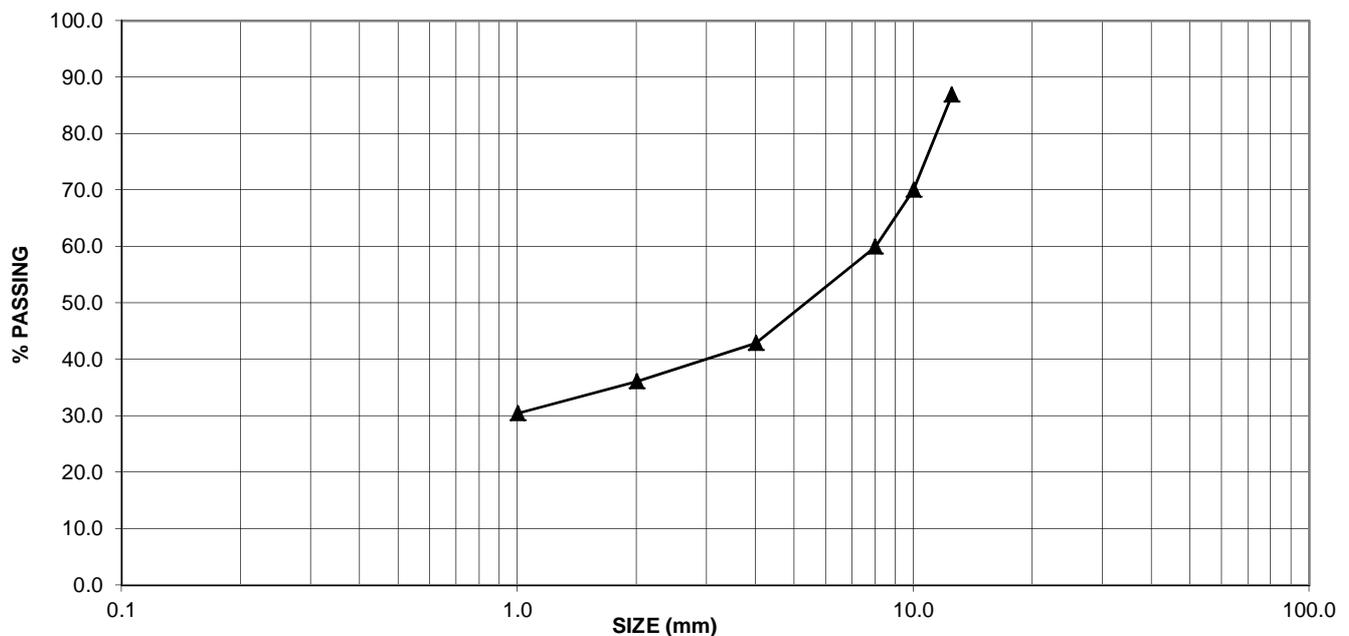
Operation	Size (mm)	Weight (g)	Weight (%)	Weight % <
Screening	12.5	209.2	13.1	86.9
	10.0	269.8	16.9	70.1
	8.0	160.7	10.0	60.0
	4.0	273.9	17.1	42.9
	2.0	108.0	6.8	36.1
	1.0	91.0	5.7	30.4
	-1.0	486.9	30.4	
Total		1599.4	100.00	

**PADDLE WEIGHT BEFORE TEST (g) : 88.8398**

**PADDLE WEIGHT AFTER TEST (g) : 88.7230**

**BOND ABRASION INDEX (Ai) : 0.1168**

### BOND ABRASION PRODUCT SIZE ANALYSIS





**BOND ROD MILL CLOSED CIRCUIT GRINDABILITY :      1180 MICROMETERS**

<b>SAMPLE IDENTITY</b>	<b>T0887 Costean Lump Ore</b>
<b>CLIENT</b>	Stellar Resources
<b>PROJECT No</b>	P0608 St Dizier Project
<b>DATE</b>	27-May

PERIOD	REVS OF MILL	WT OF 1250 mls (g)	WT OF NEW FEED (g)	WT OF O/SIZE (g)*	WT OF U/SIZE (g)*	NET WT OF U/SIZE (g)*	NET WT OF U/SIZE PER REV (g)	CIRC'TING LOAD (%)	WT OF FRESH FEED ADDED TO NEXT CYCLE (g)	WT OF U/SIZE IN FEED TO NEXT CYCLE (g)
1	100	2246.1	2246.1	1092.1	1154.1	663.7	6.637	95	1154.1	251.9
2	131	2246.1	1154.1	1198.0	1048.1	796.2	6.078	114	1048.1	228.8
3	147	2246.1	1048.1	1161.8	1084.3	855.5	5.820	107	1084.3	236.7
4	152	2246.1	1084.3	1122.8	1123.3	886.6	5.833	100	1123.3	245.2
5	151	2246.1	1123.3	1117.5	1128.6	883.4	5.850	99	1128.6	246.4
6	150	2246.1	1128.6	1123.6	1122.5	876.1	5.841	100	1122.5	245.0

Note : \* = Ex grinding mill

<b>PRODUCT IN THE FEED</b>	<b>21.83 (%)</b>
<b>BULK DENSITY</b>	<b>1.7969 (t/m<sup>3</sup>)</b>
<b>IDEAL POTENTIAL PRODUCT</b>	<b>1123.1 (g)</b>
<b>AVERAGE EQUILIBRIUM CIRC LOAD</b>	<b>100 (%)</b>
<b>AVERAGE PRODUCT</b>	<b>5.846 (g/rev)</b>
<b>80 % PASSING FEED SIZE</b>	<b>8811 (µm)</b>
<b>80 % PASSING PRODUCT SIZE</b>	<b>859 (µm)</b>

<b>BOND ROD MILL WORK INDEX ( Kilowatt hours / dry tonne ) :</b>	<b>19.0</b>
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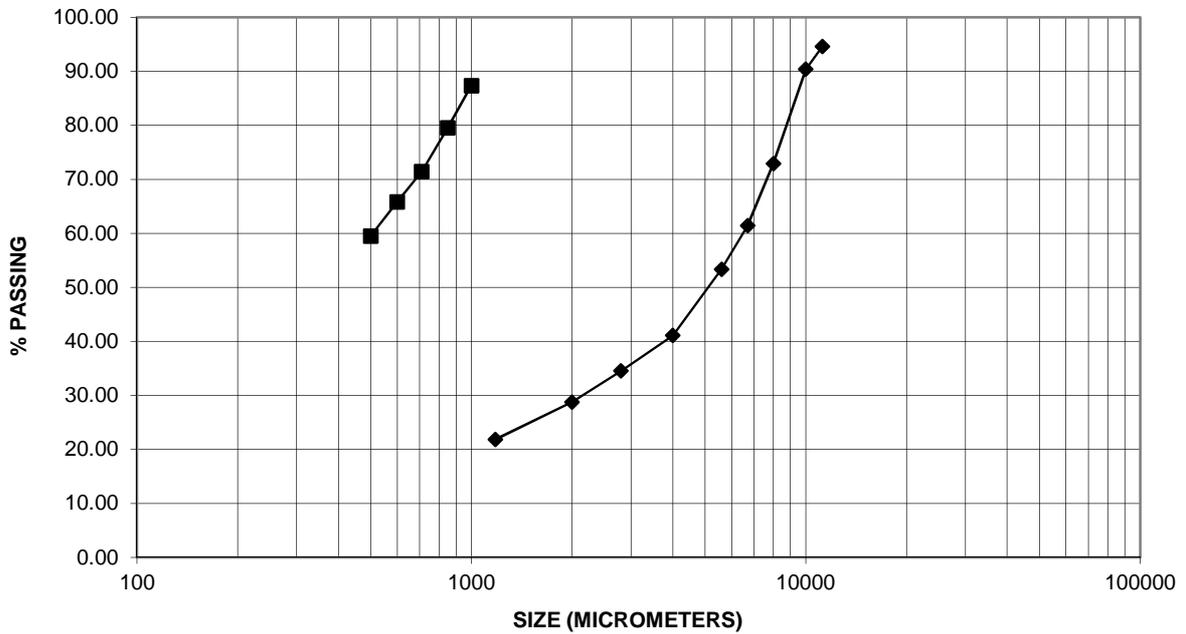
**BOND ROD MILL GRINDABILITY TEST FEED AND PRODUCT SIZINGS**

**T0887 Costean Lump Ore**  
**P0608 St Dizier Project**

<b>FEED TO PERIOD No. 1</b>			
<b>Size (mm)</b>	<b>Weight (g)</b>	<b>Retained (%)</b>	<b>Passing (%)</b>
11.200	54.3	5.42	94.58
10.000	42.0	4.20	90.38
8.000	174.6	17.46	72.92
6.700	115.1	11.51	61.41
5.600	80.7	8.06	53.35
4.000	122.8	12.27	41.07
2.800	65.7	6.56	34.51
2.000	57.7	5.76	28.75
1.180	69.2	6.92	21.83
-1.180	218.3	21.83	
<b>TOTAL</b>	<b>1000.2</b>	<b>100.00</b>	
<b>F 80 (µm) :</b>		<b>8811</b>	

<b>EQUILIBRIUM PRODUCTS</b>			
<b>Size (mm)</b>	<b>Weight (g)</b>	<b>Retained (%)</b>	<b>Passing (%)</b>
1.000	142.2	12.66	87.34
0.850	87.8	7.81	79.53
0.710	90.7	8.08	71.45
0.600	63.3	5.64	65.81
0.500	71.0	6.32	59.49
-0.500	668.1	59.49	
<b>TOTAL</b>	<b>1123.1</b>	<b>100.00</b>	
<b>P 80 (µm) :</b>		<b>859</b>	

**BOND ROD MILL GRINDABILITY : FEED & PRODUCT SIZE DISTRIBUTION**



**BOND BALL MILL CLOSED CIRCUIT GRINDABILITY :****150 MICROMETERS**

<b>SAMPLE IDENTITY</b>	T0887 Costean Lump Ore
<b>CLIENT</b>	Stellar Resources
<b>PROJECT No</b>	P0608 St Dizier Project
<b>DATE</b>	

PERIOD	REVS OF MILL	WT OF 700 mls (g)	WT OF NEW FEED (g)	WT OF O/SIZE (g)*	WT OF U/SIZE (g)*	NET WT OF U/SIZE (g)*	NET WT OF U/SIZE PER REV (g)	CIRC'TING LOAD (%)	WT OF FRESH FEED ADDED TO NEXT CYCLE (g)	WT OF U/SIZE IN FEED TO NEXT CYCLE (g)
1	150	1221.1	1221.1	857.7	363.4	197.4	1.316	236	363.4	49.4
2	228	1221.1	363.4	876.1	345.0	295.6	1.296	254	345.0	46.9
3	233	1221.1	345.0	875.5	345.6	298.7	1.282	253	345.6	47.0
4	236	1221.1	345.6	885.2	335.9	288.9	1.224	264	335.9	45.7
5	248	1221.1	335.9	855.4	365.6	320.0	1.290	234	365.6	49.7
6	232	1221.1	365.6	874.1	346.9	297.2	1.281	252	346.9	47.2
7	235	1221.1	346.9	874.0	347.1	299.9	1.276	252	347.1	47.2

Note : \* = Ex grinding mill

<b>PRODUCT IN THE FEED</b>	<b>13.59 (%)</b>
<b>BULK DENSITY</b>	<b>1.7444 (t/m<sup>3</sup>)</b>
<b>IDEAL POTENTIAL PRODUCT</b>	<b>348.9 (g)</b>
<b>AVERAGE EQUILIBRIUM CIRC LOAD</b>	<b>252 (%)</b>
<b>AVERAGE PRODUCT</b>	<b>1.279 (g/rev)</b>
<b>80 % PASSING FEED SIZE</b>	<b>2351 (µm)</b>
<b>80 % PASSING PRODUCT SIZE</b>	<b>118 (µm)</b>

<b>BOND BALL MILL WORK INDEX ( Kilowatt hours / dry tonne ) :</b>	<b>17.7</b>
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**BOND BALL MILL GRINDABILITY TEST FEED AND PRODUCT SIZINGS**

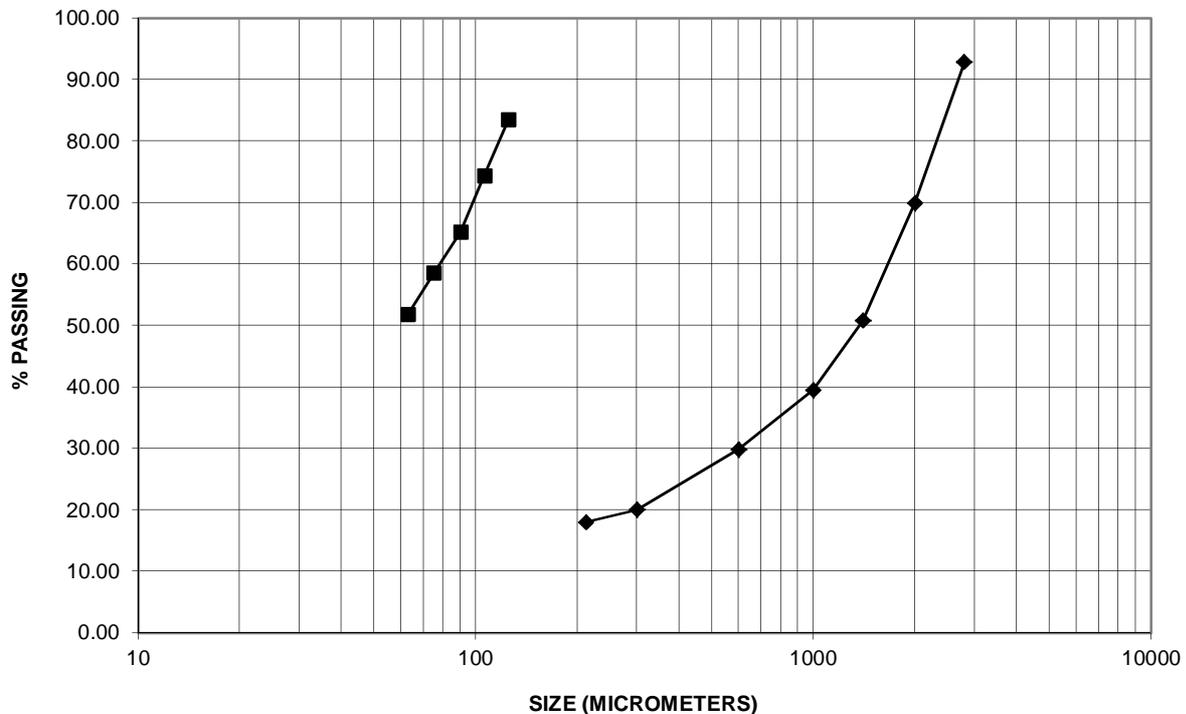
**T0887 Costean Lump Ore**

**P0608 St Dizier Project**

<b>FEED TO PERIOD No. 1</b>			
<b>Size (mm)</b>	<b>Weight (g)</b>	<b>Retained (%)</b>	<b>Passing (%)</b>
2.800	71.8	7.17	92.83
2.000	228.9	22.86	69.97
1.400	192.0	19.18	50.78
1.000	112.8	11.27	39.51
0.600	96.9	9.68	29.83
0.300	98.3	9.82	20.01
0.212	20.0	2.00	18.02
0.150	44.3	4.42	13.59
-0.150	136.1	13.59	
<b>TOTAL</b>	<b>1001.1</b>	<b>100.00</b>	
<b>F 80 (µm) :</b>		<b>2351</b>	

<b>EQUILIBRIUM PRODUCTS</b>			
<b>Size (mm)</b>	<b>Weight (g)</b>	<b>Retained (%)</b>	<b>Passing (%)</b>
0.125	57.4	16.46	83.54
0.106	31.9	9.14	74.39
0.090	32.0	9.16	65.23
0.075	23.3	6.68	58.55
0.063	23.4	6.69	51.85
0.045	30.4	8.71	43.14
-0.045	150.5	43.14	0.00
<b>TOTAL</b>	<b>348.9</b>	<b>100.00</b>	
<b>P 80 (µm) :</b>		<b>118</b>	

**BOND BALL MILL GRINDABILITY : FEED & PRODUCT SIZE DISTRIBUTION**





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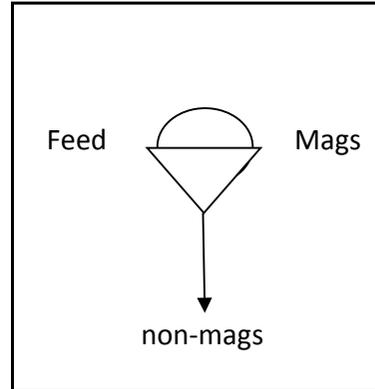
## **Appendix 5 – Bulk Composite Magnetic Separation Results**



BURNIE LABORATORY: MAGNETIC SEPARATION REPORT SHEET

PROJECT	T0001
TEST NO	LC01
DATE	230511
TECH	ID

TEST TYPE	SALA Wet Drum
Feed Solids (g)	9769.3
Feed Water (L)	90.0
Pump Flow Rate (lpm)	2.0
Density (%)	8.0
Time (min)	45.0
Pump 01 Output (%)	62.0
Pump 02 Output (%)	62.0
Comments	



FEED MATERIAL LC01 -212	
FROM TEST NO	LC01
START WT (gm)	9769.3

MAGNETIC SEPARATION RESULTS

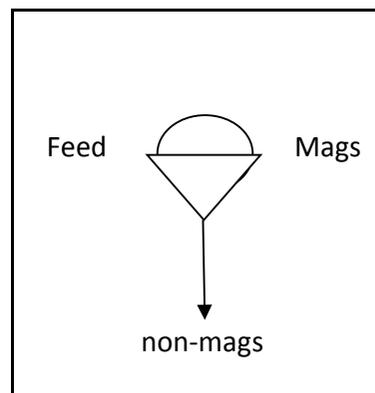
NAME	Wt (gm)	Calc(gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)		
Magnetics	4622	4622	47.31	0.62	37.0	57.50	78.4	6.90	13.5	0.70	25.4		
Non Magnetics	5147	5147	52.69	0.95	63.0	14.20	21.6	39.80	86.5	1.85	74.6		
TOTAL	9769.00		100.00	0.79	100.0	34.69	100.0	24.23	100.0	1.31	100.0		

Cal dry mass

BURNIE LABORATORY: MAGNETIC SEPARATION REPORT SHEET

PROJECT	T0001
TEST NO	LC02
DATE	280511
TECH	ID

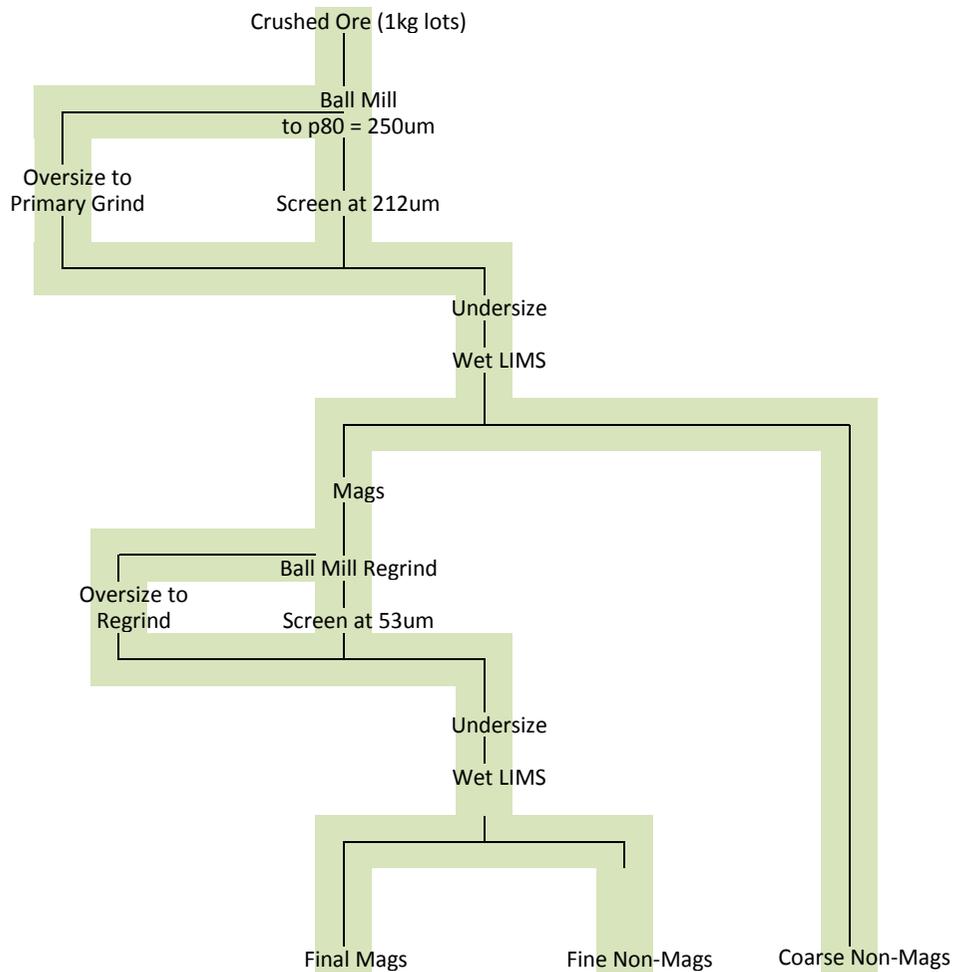
TEST TYPE	SALA Wet Drum
Feed Solids (g)	4498.0
Feed Water (L)	50.0
Pump Flow Rate (lpm)	2.0
Density (%)	8.0
Time (min)	25.0
Pump 01 Output (%)	62.0
Pump 02 Output (%)	62.0
Comments	



FEED MATERIAL LC02 -53	
FROM TEST NO	LC01
START WT (gm)	4498

MAGNETIC SEPARATION RESULTS

PRODUCT			Tin		Iron		Silica		Sulphur				
NAME	Wt (gm)	Calc(gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)		
Magnetics	3815.7	3815.7	87.23	0.46	64.8	62.20	96.4	3.94	47.5	0.47	55.5		
Non Magnetics	558.4	558.4	12.77	1.71	35.2	16.10	3.6	29.80	52.5	2.58	44.5		
TOTAL	4374.10		100.00	0.62	100.0	56.31	100.0	7.24	100.0	0.74	100.0		



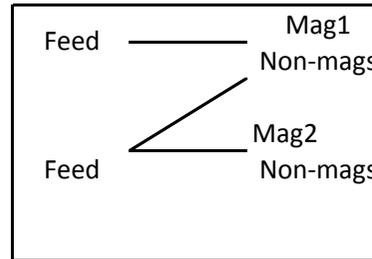
Sample Description	Weight (gm)	SAMPLE DESCRIPTION	ME-XRF15d	ME-XRF15d	ME-XRF15d	ME-XRF15d
			Sn	Fe	S	SiO2
LC01 -212 Mags	4622.0	887028	0.62	57.5	0.7	6.9
-212 Non Mags	4935.0	887029	0.95	14.2	1.85	39.8
LC02 -53 Mags	3815.7	887030	0.46	62.2	0.47	3.94
-53 Non Mags	558.4	887031	1.71	16.1	2.58	29.8
Calc Feed	9309.10		0.79	33.99	1.33	24.50
-212 Non Mags	53.01		63.4	22.1	73.8	86.1
LC02 -53 Mags	40.99		23.7	75.0	14.5	6.6
-53 Non Mags	6.00		12.9	2.8	11.7	7.3
Rec to Non-Mags	59.01		76.3	25.0	85.5	93.4

Sample Description	Weight (gm)	% Sn	% Fe	% S	% SiO2
Coarse Non Mags	4935.0	0.95	14.2	1.85	39.8
<b>Fine Mags</b>	<b>3815.7</b>	<b>0.46</b>	<b>62.2</b>	<b>0.47</b>	<b>3.94</b>
Fine Non Mags	558.4	1.71	16.1	2.58	29.8
Distributions:	Weight	Sn	Fe	S	SiO2
Coarse Non Mags	53.01	63.4	22.1	73.8	86.1
Fine Non Mags	6.00	12.9	2.8	11.7	7.3
<b>Rec to Non-Mags</b>	<b>59.01</b>	<b>76.3</b>	<b>25.0</b>	<b>85.5</b>	<b>93.4</b>
<b>Fine Mags</b>	<b>40.99</b>	<b>23.7</b>	<b>75.0</b>	<b>14.5</b>	<b>6.6</b>
<b>Calc Feed</b>	9309.10	0.79	33.99	1.33	24.50

BURNIE LABORATORY: MAGNETIC SEPARATION REPORT SHEET

PROJECT	T0887
TEST NO	T11
DATE	030714
TECH	ID

TEST TYPE	Rapid Magnetic Sep
Feed Solids (g)	134.2
Current (A)	0.1, 0.6
Magnetic intense1 (G)	1500
Magnetic intense2 (G)	5000
Comments	



FEED MATERIAL	
Ro Tail + CI Tail	
FROM TEST NO	T10
START WT (gm)	134.2

QXRD 27 July 14

MAGNETIC SEPARATION RESULTS

NAME	Wt (gm)	Calc(gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)		
Magnetics 1 (1500 gauss)	48.2	48.2	35.92	4.87	15.7	44.90	45.1	2.31	12.4	14.95	51.1		
Magnetics 2 (5000 gauss)	26.7	26.7	19.90	6.25	11.2	37.50	20.9	5.54	16.5	6.13	11.6		
Non Magnetics	59.3	59.3	44.19	18.45	73.1	27.60	34.1	10.75	71.1	8.85	37.2		
TOTAL	134.20		100.00	11.15	100.0	35.78	100.0	6.68	100.0	10.50	100.0		

NAME	Wt (gm)	Calc(gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)		
Magnetics 1+2	74.9	74.9	55.81	5.36	26.9	42.26	65.9	3.46	28.9	11.81	62.8		
Non Magnetics	59.3	59.3	44.19	18.45	73.1	27.60	34.1	10.75	71.1	8.85	37.2		
TOTAL	134.20		100.00	11.15	100.0	35.78	100.0	6.68	100.0	10.50	100.0		



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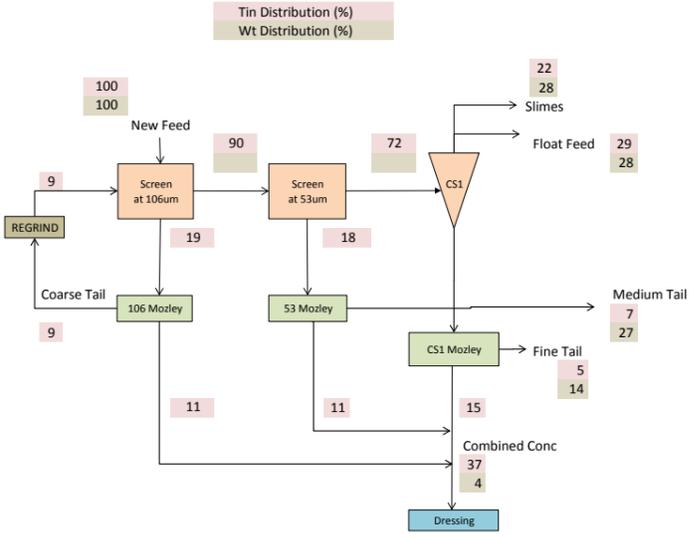
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## **Appendix 6      – Bulk Composite Gravity Separation Results**

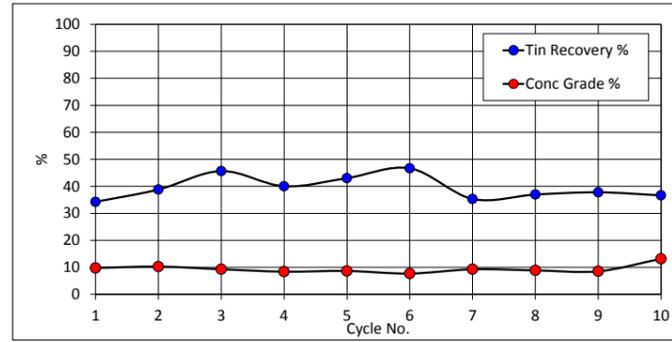
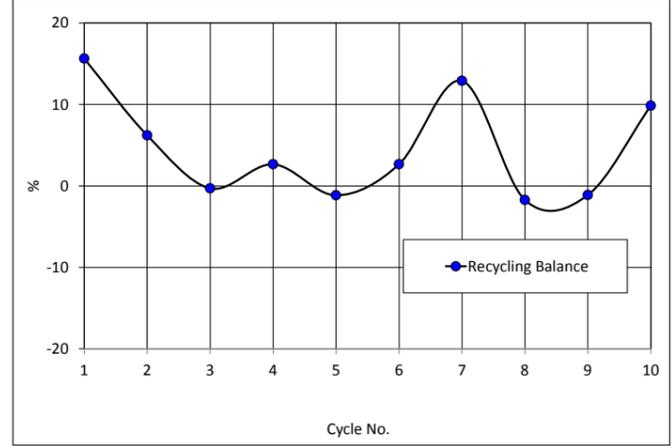
EXIT STREAMS		1	2	3	4	5	6	7	8	9	10	AV(8-9)	
1	Gravity final conc 1 (+150/106 Conc)	gm	3.01	3.18	3.87	3.39	3.50	4.48	8.08	10.61	10.53	6.47	10.57
	dry wt and assays	%Sn	4.91	4.95	4.46	4.91	4.99	4.27	6.11	5.13	5.15	7.03	5.14
		%Fe	41.80	41.40	40.40	39.40	40.90	40.60	37.30	36.10	37.10	36.40	36.60
		%S	24.40	24.20	21.60	23.30	24.00	20.90	19.40	17.40	18.05	10.40	17.73
2	Gravity final conc 2 (+53 Conc)	gm	10.19	10.16	12.31	12.70	12.28	16.93	5.02	5.87	7.02	4.01	6.45
	dry wt and assays	%Sn	8.03	8.44	7.36	7.19	7.48	6.28	10.35	9.30	8.94	14.70	9.12
		%Fe	37.70	35.70	36.80	38.00	37.40	37.0	36.70	37.60	37.70	34.90	37.65
		%S	22.50	20.00	18.10	20.30	19.20	17.1	22.00	20.70	19.95	8.92	20.33
3	Gravity final conc 3 (+CS2 Conc)	gm	4.89	6.14	9.19	8.50	9.85	9.87	6.53	5.00	5.31	3.89	5.16
	dry wt and assays	%Sn	16.40	16.10	13.90	11.60	11.45	11.7	12.40	16.35	14.70	21.80	15.53
		%Fe	33.10	34.30	33.90	36.30	36.00	35.8	36.40	34.10	35.90	32.60	35.00
		%S	19.40	23.10	17.65	18.55	18.00	17.05	18.60	23.30	20.50	8.50	21.90
4	Gravity Final Tail (+53 Medium Tails)	gm	132.80	168.60	182.00	168.70	180.80	163.30	112.30	129.30	140.90	126.50	135.10
	dry wt and assays	%Sn	0.27	0.28	0.27	0.26	0.27	0.29	0.35	0.26	0.27	0.23	0.265
		%Fe	10.70	11.90	11.60	11.30	11.30	10.5	14.80	10.90	11.45	10.15	11.18
		%S	0.37	0.57	0.48	0.46	0.47	0.39	0.96	0.37	0.45	0.26	0.41
5	Gravity Final Tail (+CS2/CS1 Tails)	gm	66.20	68.40	78.60	72.90	80.60	71.10	51.40	70.80	65.50	53.10	68.15
	dry wt and assays	%Sn	0.59	0.45	0.47	0.54	0.47	0.51	0.37	0.35	0.36	0.33	0.36
		%Fe	13.70	13.40	14.30	14.55	14.15	14.4	12.70	13.10	13.25	12.80	13.18
		%S	1.01	0.95	0.98	1.20	0.99	0.91	0.83	0.60	0.81	0.41	0.71
6	CS3/CS2-CS5 (Tin Float Feed)	gm	88.26	92.94	95.59	97.14	96.78	96.25	120.76	144.84	132.54	124.86	138.69
	dry wt and assays	%Sn	1.10	1.09	1.07	1.02	1.08	1.06	1.24	1.04	1.13	1.16	1.09
		%Fe	14.30	14.40	14.50	14.20	14.60	14.6	15.90	15.45	15.60	15.00	15.53
		%S	1.63	1.69	1.61	1.63	1.64	1.69	2.03	1.80	1.83	0.59	1.82
7	<CS5 (Slime)	gm	112.80	115.50	115.60	119.20	117.60	120.60	127.60	137.80	139.40	128.00	138.60
	dry wt and assays	%Sn	0.96	0.97	0.94	0.90	0.91	0.91	0.82	0.85	0.85	0.87	0.84
		%Fe	14.30	14.50	14.70	14.25	14.50	14.6	14.45	15.00	14.15	14.45	14.58
		%S	0.93	0.95	0.99	1.34	1.27	1.43	1.19	1.22	1.27	1.06	1.25
COMBINED CONCENTRATE		gm	18.09	19.48	25.37	24.59	25.63	31.28	19.63	21.48	22.86	14.37	22.17
	%Sn	9.77	10.28	9.29	8.40	8.67	7.70	9.29	8.88	8.53	13.17	8.71	
	%Fe	37.14	36.19	36.30	37.61	37.34	37.14	36.85	36.04	37.01	34.95	36.52	
	%S	21.98	21.66	18.47	20.11	19.39	17.63	19.80	19.68	19.20	9.47	19.44	
	%SiO2	4.61	4.76	5.56	5.10	5.41	6.00	4.66	6.81	5.87	7.02	6.34	
			418.15	464.92	497.16	482.53	501.41	482.53	431.69	504.22	501.20	446.83	502.71

REGRIND DATA		1	2	3	4	5	6	7	8	9	10
New Feed (gm) (dry)		720	720	720	720	720	720	720	720	720	720
Regrind feed Damp Wt (gm)		70	94	98	103	91	96	196	192	195	188
Regrind Time (min.sec)		2.00	2.30	2.45	3.00	2.50	3.30	4.00	3.45	3.50	3.50
Regrind D/C +75 (%Wt)		21.0	23.0	23.0	14.6	18.0	26.0	22.0	32.0	43.0	27.0

INTERNAL STREAMS			GRIND D/C P80=93			NEW FEED			CALC			10
Medium Mids Recycle	Fine Mids Recycle	End Re grind Feed	gm	gm	gm	gm	gm	gm	gm	gm	gm	188.0
%Sn	%Sn	%Sn	0.96	1.03	0.26	4957	4957	1.04	1.04	14.55	14.35	1.04
%Fe	%Fe	%Fe	34.60	34.50	10.50	1.80	1.92	1.80	1.92	39.46	38.10	1.80
%S	%S	%S	3.41	2.15	0.43	39.46	38.10	39.46	38.10			
%SiO2	%SiO2	%SiO2	15.45	14.15	50.00							



DISTRIBUTIONS	AV (8-9)	FROM NEW FEED (%)										
		Cyc 1	Cyc 2	Cyc 3	Cyc 4	Cyc 5	Cyc 6	Cyc 7	Cyc 8	Cyc 9	Cyc 10	
MASS	Conc 1	2.13	0.61	0.64	0.78	0.68	0.71	0.90	1.63	2.14	2.12	1.31
	Conc 2	1.30	2.06	2.05	2.48	2.56	2.48	3.42	1.01	1.18	1.42	0.81
	Conc 3	1.04	0.99	1.24	1.85	1.71	1.99	1.99	1.32	1.01	1.07	0.78
	53 Tail	27.25	26.79	34.01	36.72	34.03	36.47	32.94	22.65	26.08	28.42	25.52
	CS2/CS1 Tail	13.75	13.35	13.80	15.86	14.71	16.26	14.34	14.28	13.21	13.21	10.71
	CS3/CS2-CS5	27.98	17.80	18.75	19.28	19.60	19.52	19.42	24.36	29.22	26.74	25.19
TIN	<CS5 Slimes	27.96	22.76	23.30	23.32	24.05	23.72	24.33	25.74	27.80	28.12	25.82
	Calc Recycle	-1.41	15.65	6.21	-0.29	2.66	-1.15	2.66	12.91	-1.72	-1.11	9.86
	Conc 1	10.53	2.86	3.05	3.34	3.23	3.38	3.71	9.57	10.55	10.51	8.81
	Conc 2	11.37	15.86	16.62	17.56	17.69	17.80	20.60	10.07	10.58	12.16	11.42
	Conc 3	15.48	15.54	19.15	24.75	19.11	21.85	22.38	15.69	15.84	15.12	16.43
	53 Tail	6.94	6.95	9.15	9.52	8.50	9.46	9.18	7.62	6.51	7.37	5.64
TIN REC OA (%)	CS2/CS1 Tail	4.69	7.57	5.96	7.16	7.63	7.34	7.03	3.69	4.80	4.57	3.40
	CS3/CS2-CS5	29.10	18.81	19.63	19.82	19.20	20.25	19.77	29.02	29.19	29.02	28.06
	<CS5 Slimes	22.43	20.98	21.71	21.06	20.79	20.74	21.97	22.50	21.89	22.96	21.58
	Calc Recycle	-0.54	11.43	4.73	-3.21	3.86	-0.83	-4.62	1.86	0.64	-1.72	4.66
	TIN REC GRAVITY (%)	76.28	70.24	71.98	73.24	71.28	71.92	74.24	75.76	76.56	75.99	80.23
	IRON	Conc 1	5.36	1.74	1.83	2.17	1.85	1.98	2.52	4.18	5.31	5.42
Conc 2		3.36	5.33	5.03	6.28	6.69	6.37	8.68	2.55	3.06	3.67	1.94
Conc 3		2.50	2.24	2.92	4.32	4.28	4.92	4.90	3.30	2.36	2.64	1.76
53 Tail		20.95	19.70	27.82	29.27	26.43	28.33	23.77	23.04	19.54	22.37	17.80
CS2/CS1 Tail		12.45	12.57	12.71	15.58	14.71	15.81	14.20	9.05	12.86	12.03	9.42
CS3/CS2-CS5		29.85	17.50	18.56	19.22	19.13	19.59	19.48	26.62	31.03	28.67	25.97
SULPHUR	<CS5 Slimes	28.00	22.36	23.22	23.56	23.55	23.64	24.41	25.56	28.66	27.35	25.64
	Calc Recycle	-2.48	18.55	7.93	-0.40	3.37	-0.64	2.03	5.69	-2.82	-2.14	14.20
	Conc 1	21.00	8.23	8.62	9.37	8.85	9.41	10.49	17.57	20.69	21.30	7.54
	Conc 2	14.66	25.69	22.77	24.97	28.89	26.42	32.44	12.38	13.62	15.70	4.01
	Conc 3	12.63	10.63	15.90	18.18	17.67	19.87	18.86	13.61	13.06	12.20	3.71
	53 Tail	6.23	5.51	10.77	9.79	8.70	9.52	7.14	12.08	5.36	7.11	3.69
SILICA	CS2/CS1 Tail	5.35	7.49	7.28	8.63	9.80	8.94	7.25	4.78	4.76	5.95	2.44
	CS3/CS2-CS5	28.20	16.12	17.60	17.25	17.75	17.79	18.23	27.47	29.22	27.18	8.26
	<CS5 Slimes	19.34	11.76	12.30	12.83	17.90	16.74	19.33	17.02	18.84	19.84	15.21
	Calc Recycle	-7.41	14.56	4.76	-1.01	-9.56	-8.70	-13.74	-4.91	-5.55	-9.27	55.16
	Conc 1	0.52	0.06	0.07	0.10	0.12	0.09	0.13	0.28	0.57	0.48	0.35
	Conc 2	0.13	0.26	0.31	0.40	0.35	0.38	0.61	0.09	0.12	0.14	0.11
Conc 3	0.06	0.10	0.09	0.22	0.17	0.24	0.22	0.09	0.06	0.06	0.06	
53 Tail	32.68	32.32	40.25	43.73	41.31	44.83	41.16	24.06	31.14	34.22	32.34	
CS2/CS1 Tail	14.65	13.30	13.78	15.67	14.76	16.24	14.39	10.70	15.31	14.00	11.94	
CS3/CS2-CS5	26.89	16.65	17.68	18.47	18.92	18.80	18.85	21.92	28.36	25.41	24.83	
<CS5 Slimes	25.33	21.11	21.38	21.69	21.57	21.94	22.32	22.90	24.94	25.73	23.75	
Calc Recycle	-0.27	16.20	6.44	-0.29	2.79	-2.52	2.32	19.97	-0.49	-0.04	6.62	





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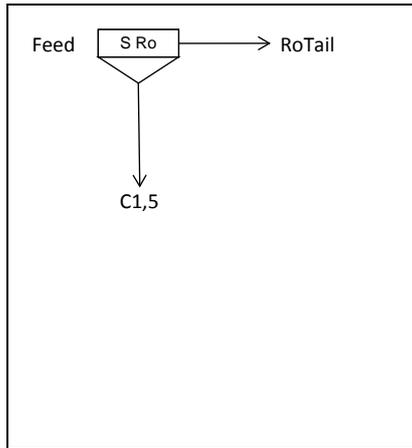
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## **Appendix 7 – Bulk Composite Sulfide Flotation Results**

Milling		Primary	Regrind
Mill	type	0	0
Media	type	0	0
Media	kg	0	0
Solids	g	0	0
Water	g	0	0
Time	min/sec	0	0
Speed	rpm	0	0
Lime	g	0	0
End pH	pH	0	0
End p80	µm	0	0

Float Cell	Volume	Regrind	Power
Rougher	1.5	Start	
Cleaner		Finish	
0		W/h	
Speed	800	kWh/t	



PROJECT	T0887
TEST NO	T06
DATE	300514
TECHNICIAN	MJR

PRODUCT FLOATED
St Dizier
LC03 Feed Non Mags

NOTES
Sulphide Rougher

	pH	0.5 GUAR g/t	98 H2SO4 g/t	0.5 CuSO4 g/t	0 PAX g/t	0.5 MIBC g/t			Cond Time min	Air L/min	Float Time min	Cum Float Time	Wet Wt g	Con % Solids
Condition	5.0		2807						4					
Condition		48		58					4					
Condition					39				1					
Sulphide Ro C1	5.1					48				2-4	1.0	1.0	40	8
Condition		48		29					2					
Condition					29				1					
Sulphide Ro C2	5.2					10				3-4	1.5	2.5	70	3
Condition		48		29					2					
Condition					10				1					
Sulphide Ro C3	5.4					10				4-5	1.5	4.0	70	2
Condition		48							2					
Condition					10				1					
Sulphide Ro C4						10				4-5	1.5	5.5	80	1
Condition		48							2					
Condition					10				1					
Sulphide Ro C5						10				4-5	2.0	7.5	100	1
REAGENT TOTALS (g/t)		242	2807	116	97	86								

PRODUCTS	WT g	WT %	Sn %	DIST	Fe %	DIST	S %	DIST	SiO2 %	DIST
T06 RoC1	12.6	2.4	0.24	0.6	31.3	5.8	30.6	39.1	16.0	0.9
RoC2	7.2	1.4	0.45	0.7	22.1	2.3	17.3	12.6	29.2	1.0
RoC3	5.0	1.0	0.59	0.6	20.3	1.5	13.9	7.1	31.4	0.7
RoC4	4.5	0.9	0.71	0.7	17.3	1.1	8.61	3.9	34.8	0.7
RoC5	4.8	0.9	0.85	0.8	15.6	1.1	5.06	2.5	37.0	0.8
Ro Tail	482.6	93.4	0.98	96.6	12.5	88.2	0.71	34.8	42.5	95.8
CALC	516.7	100.0	0.95	100.0	13.2	100.0	1.91	100.0	41.4	100.0
ASSAY HEAD			0.00		0.00		0.00		0.00	

CUM PRODUCTS	CUM Wt	WT %	Sn %	CUM	Fe %	CUM	S %	DIST	SiO2 %	DIST
T06 RoC1	12.6	2.4	0.24	0.6	31.3	5.8	30.6	39.1	16.0	0.9
RoC2	19.8	3.8	0.32	1.3	28.0	8.1	25.8	51.8	20.8	1.9
RoC3	24.8	4.8	0.37	1.9	26.4	9.6	23.4	58.8	22.9	2.7
RoC4	29.3	5.7	0.42	2.5	25.0	10.7	21.1	62.8	24.8	3.4
RoC5	34.1	6.6	0.48	3.4	23.7	11.8	18.8	65.2	26.5	4.2
FEED	516.7	100.0	0.95	100.0	13.2	100.0	1.91	100.0	41.4	100.0



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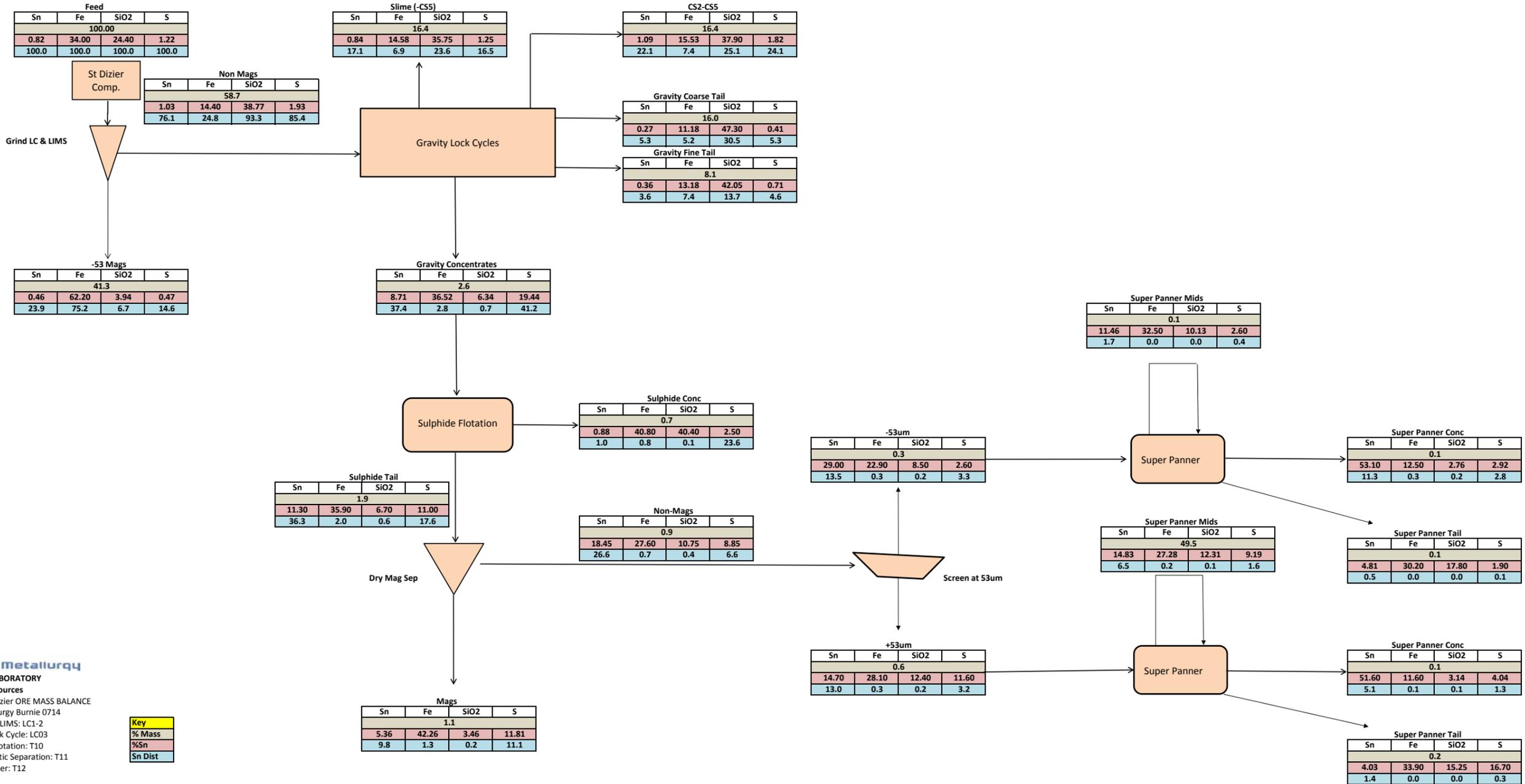
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## Appendix 8 – Bulk Composite Overall Balance





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## **Appendix 9 – Drill Hole Composites Mineralogy**

# ALS Metallurgy

## Stellar Resources Limited St Dizier Project Drillhole Composite Mineralogy

August 2014



McArthur Ore Deposit Assessments Pty Ltd

Gary J McArthur PhD FAusIMM MMICA MSEG

Suite 6, 1st Floor, Brownell Place, 11 Wilson St (P.O. Box 1303) Burnie TAS 7320 AUSTRALIA  
Tel (03) 6431 1701 Fax (03) 6431 1278 Mobile 0419 367240 email gary@modapl.com.au

## ALS METALLURGY

### Stellar Resources – St Dizier Drillhole Composites Mineralogy August 2014

#### Method

Three drillhole composites (Comp 2, Comp3, Comp 4) from drillhole ST06 at the Stellar Resources' St Dizier prospect were submitted for mineralogical assessment. The samples were sized into 5 fractions (+212 $\mu$ m, +106 $\mu$ m, +53 $\mu$ m, +20 $\mu$  and +7 $\mu$ m) and these were mounted on two polished mounts for each sample by Australian Petrographics (Queanbeyan, NSW).

The standard MODA technique was adopted to quantify the mineralogy.

In a first scan, for each fraction, 100 grains were selected at random and the area % of each mineral present was visually estimated. The minerals logged were: *pyrite* (Py), *pyrrhotite* (Po), *arsenopyrite* (As), *cassiterite* (Cs), *chalcopyrite* (Cp), *goethite+hematite* (GoHe), *magnetite* (Mt) and *gangue* (*quartz, silicates, fluorite, carbonates, etc*, Ga). This allowed calculation of an overall mineralogical composition.

In a second scan, for each fraction, 25-100 grains containing Sn (exclusively *cassiterite*) were selected at random and logged as per the first scan.

The normal liberation and association parameters were calculated.

Photomicrographs were taken of the +106 $\mu$ m fraction and annotated using PowerPoint.

#### Results

##### **Composition**

The following minerals were identified, in approximate descending order:

- Gangue (*quartz, silicates, carbonate, fluorite, talc, carbonaceous matter, etc.*)
- *Magnetite*
- *Pyrite (crystalline and melnikovite varieties)*
- *Pyrrhotite*
- *Arsenopyrite*
- *Cassiterite*
- *Chalcopyrite*
- *Sphalerite*
- *Bismuthinite (rare)*
- *Native bismuth (rare)*
- *Molybdenite (very rare)*

The overall composition of each composite is summarised below:

**St Dizier Comp 2 Composition Vol% (from total scan)**

Fraction	Wt%	Py	Po	As	Cs <sup>#</sup>	Cp	GoHe	Mt	Ga
+212µm	18.4	4.2	1.0	0	0.1	Tr	0	12.2	82.5
+106µm	19.2	12.6	0.8	0.1	0.1	0.9	0	25.6	60.0
+53µm	18.7	9.0	1.9	0	0.2	0	0	13.8	75.2
+20µm	17.5	6.8	2.8	0.9	0.1	1.0	0	34.4	54.1
+7µm	10.0	12.3	5.9	1.0	Tr	0	0	26.7	54.2
<b>TOTAL</b>	<b>83.8</b>	<b>8.7</b>	<b>2.1</b>	<b>0.3</b>	<b>0.1</b>	<b>0.4</b>	<b>0</b>	<b>22.0</b>	<b>66.4</b>

Py=pyrite, Po=pyrrhotite, As=arsenopyrite, Cs=cassiterite, Cp=chalcopyrite, GoHe=goethite+hematite, Mt=magnetite, Ga=gangue  
# count statistics very poor for the scarce cassiterite

**St Dizier Comp 3 Composition Vol% (from total scan)**

Fraction	Wt%	Py	Po	As	Cs <sup>#</sup>	Cp	GoHe	Mt	Ga
+212µm	19.2	3.5	3.1	0	0.2	Tr	0	21.8	71.5
+106µm	20.9	4.5	6.2	1.0	0.2	0	0	44.1	44.1
+53µm	19.6	1.9	7.1	1.0	0.6	Tr	Tr	34.4	55.1
+20µm	17.7	3.8	14.2	0	1.0	0	0.1	40.3	40.7
+7µm	8.9	2.7	8.1	0	1.0	0	0	32.1	56.3
<b>TOTAL</b>	<b>86.3</b>	<b>3.4</b>	<b>7.6</b>	<b>0.5</b>	<b>0.5</b>	<b>Tr</b>	<b>Tr</b>	<b>34.9</b>	<b>53.3</b>

**St Dizier Comp 4 Composition Vol% (from total scan)**

Fraction	Wt%	Py	Po	As	Cs <sup>#</sup>	Cp	GoHe	Mt	Ga
+212µm	23.6	0.1	0.2	0.3	Tr	0	0	54.0	45.5
+106µm	24.0	0	0	1.4	0.2	0	0	68.7	29.8
+53µm	18.4	0.2	Tr	2.0	Tr	0	0	58.8	39.1
+20µm	15.7	0	1.0	3.0	Tr	0	0	54.4	41.7
+7µm	7.7	0	0.2	1.0	Tr	0	0	54.3	44.5
<b>TOTAL</b>	<b>89.4</b>	<b>0.1</b>	<b>0.2</b>	<b>1.5</b>	<b>0.1</b>	<b>0</b>	<b>0</b>	<b>59.0</b>	<b>39.2</b>

## Cassiterite Liberation

An essential summary of the liberation parameters for *cassiterite* is:

**St Dizier Comp 2 Cassiterite liberation distribution%**

Fraction	Sn Wt%	Free	Binary with					Ternary
			Py	Po	As	Mt	Ga	
+212µm	15.8	0	0	0	0	0	26	74
+106µm	19.1	0	0	0	0	0	41	59
+53µm	17.9	21	1	0	0	5	51	22
+20µm	18.4	37	6	0	0	0	44	13
+7µm	17.4	84	2	0	1	1	9	3
<b>TOTAL</b>	<b>88.6</b>	<b>28</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>35</b>	<b>34</b>

**St Dizier Comp 3 Cassiterite liberation distribution%**

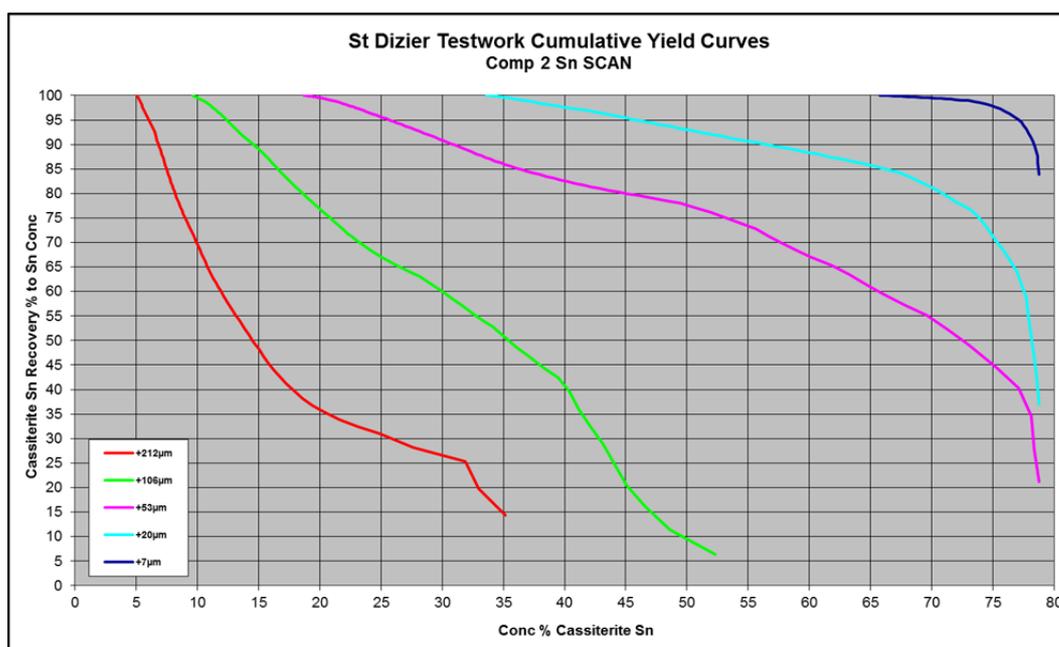
Fraction	Sn Wt%	Free	Binary with					Ternary
			Py	Po	As	Mt	Ga	
+212µm	15.6	0	0	0	0	0	18	82
+106µm	22.6	16	3	7	0	0	38	36
+53µm	21.6	31	0	7	0	4	45	14
+20µm	21.0	60	0	5	0	7	21	7
+7µm	14.2	85	0	1	0	4	8	1
<b>TOTAL</b>	<b>95.0</b>	<b>37</b>	<b>1</b>	<b>5</b>	<b>0</b>	<b>3</b>	<b>28</b>	<b>27</b>

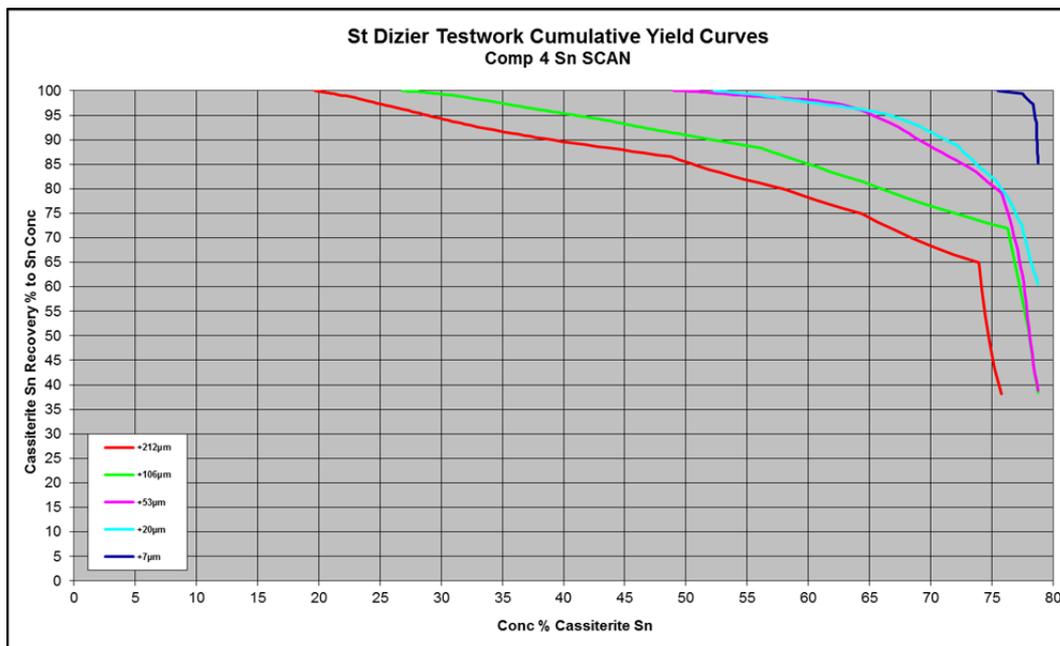
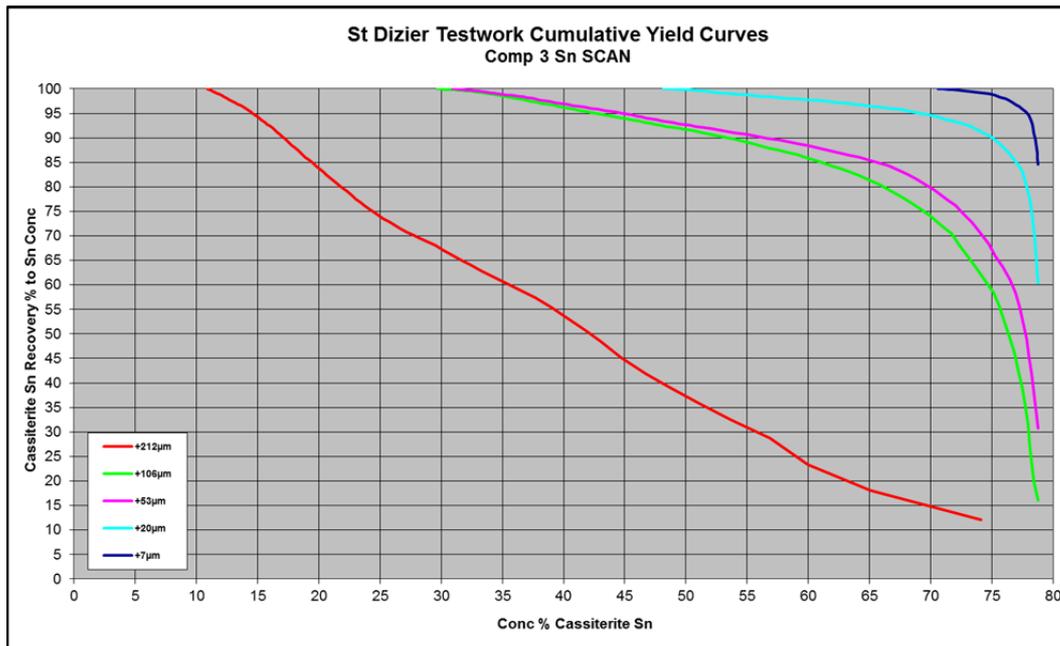
**St Dizier Comp 4 Cassiterite liberation distribution%**

Fraction	Sn Wt%	Free	Binary with					Ternary
			Py	Po	As	Mt	Ga	
+212µm	14.1	0	0	0	0	38	48	13
+106µm	23.6	38	0	0	0	15	24	23
+53µm	19.5	39	0	0	0	37	15	10
+20µm	17.1	61	0	0	0	7	31	1
+7µm	12.0	85	0	0	0	4	8	2
<b>TOTAL</b>	<b>86.3</b>	<b>43</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>21</b>	<b>25</b>	<b>11</b>

**Cumulative Yield (Grade-Recovery) Curves**

Cumulative yield curves for *cassiterite* Sn have been calculated from the quantitative mineralogy for each fraction of each sample. These indicate the maximum possible recovery achievable – actual plant recoveries will be much lower. They are presented for comparative purposes only.





**Comments**

There appears to be insufficient identifiable Sn minerals to account for the Sn grades (especially in Composite 4), but no sulphide or hydroxide (acid soluble) Sn was identified.

The author suggests caution be exercised when using the results from Composite 4, due to the difficulty experienced distinguishing carbonate from *cassiterite*.

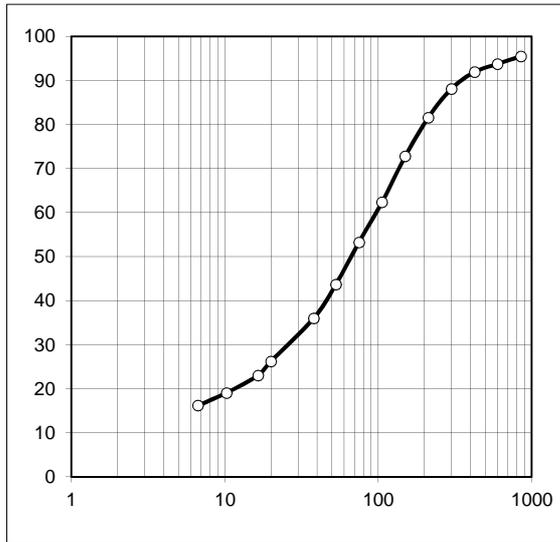
G.J.McArthur PhD FAusIMM MMICA MSEG  
Principal Mineralogist 15.8.14



BURNIE LABORATORY  
Mineralogy sizing sheet

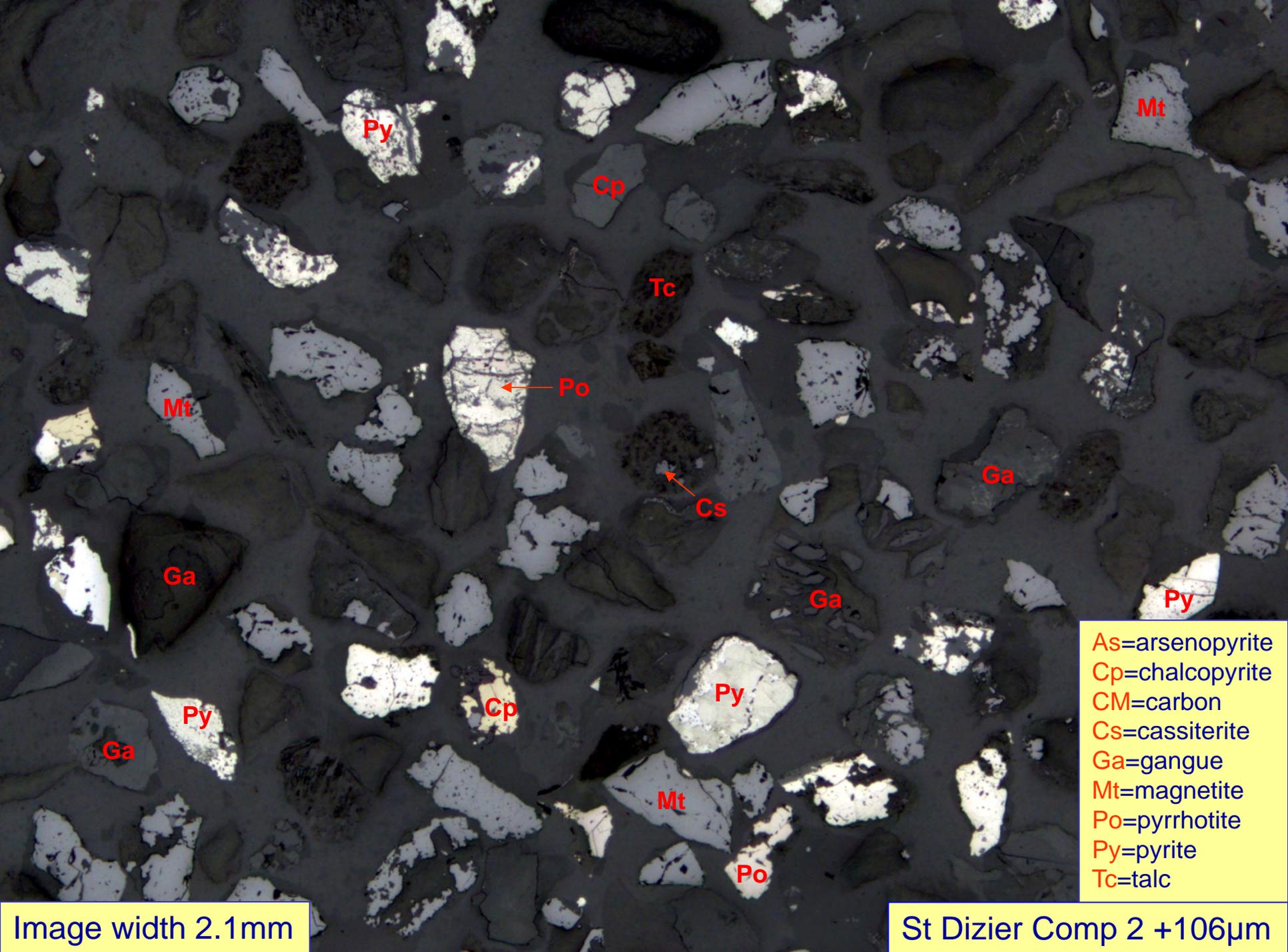
PROJECT	T0887
SAMPLE	St Dizier Comp 2
FROM TEST NO	
DATE	50814
TECHNICIAN	MS

St Dizier Comp 2		SIZE um	WEIGHTS			
			gm	(%)	%PASS	
P80	201	850	8.07	4.54	95.5	
		600	3.03	1.71	93.8	
		425	3.25	1.83	91.9	
		300	6.73	3.79	88.1	
		212	11.63	6.55	81.6	
		150	15.60	8.78	72.8	
		106	18.49	10.41	62.4	
		75	16.20	9.12	53.3	
		53	17.02	9.58	43.7	
		38	13.62	7.67	36.0	
20	17.38	9.78	26.2			
TEMP	21	CS3	17	5.63	3.17	23.1
SG	3.00	CS4	10	7.09	3.99	19.1
MINS	20	CS5	7	5.08	2.86	16.2
SUB			28.83	16.23		
TOTAL			177.65	100.00		



ANALYSES

SIZE um	WT %	Sn		Fe		S		SiO2		Mount Number
		%	dist	%	dist	%	dist	%	dist	
212	18.4	0.71	15.8	21.30	14.7	3.22	10.4	29.20	21.3	887148
106	19.2	0.82	19.1	28.60	20.6	6.76	22.8	23.30	17.7	887149
53	18.7	0.79	17.9	30.90	21.7	7.10	23.3	21.80	16.1	887150
20	17.5	0.87	18.4	31.30	20.5	6.47	19.8	21.80	15.0	887151
7	10.0	1.43	17.4	34.00	12.8	8.39	14.7	18.60	7.4	887152
<7	16.2	0.58	11.4	15.80	9.6	3.16	9.0	35.10	22.5	
CALC	100.0	0.83	100.0	26.62	100.0	5.70	100.0	25.29	100.0	
ASSAY		0.82		26.20		6.02		25.00		



As=arsenopyrite  
Cp=chalcopyrite  
CM=carbon  
Cs=cassiterite  
Ga=gangue  
Mt=magnetite  
Po=pyrrhotite  
Py=pyrite  
Tc=talc

Image width 2.1mm

St Dizier Comp 2 +106µm



**PARTICLE MINERALOGY REPORT**

**St Dizier Comp 2  
August 2014**

**A +212µm 18 % by weight**

**GJMcA 11.8.14  
B +106µm 19 % by weight**

**C +53µm 19 % by weight**

**D +20µm 18 % by weight**

**E +7µm 10 % by weight**

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
4.2	1.0	0.0	0.1	0.0	0.0	12.2	82.5	100
47	10	0	3	1	0	41	85	

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
12.6	0.8	0.1	0.1	0.9	0.0	25.6	60.0	100
63	16	5	7	21	0	66	71	

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
9.0	1.9	0.0	0.2	0.0	0.0	13.8	75.2	100
53	26	0	14	0	0	55	83	

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
6.8	2.8	0.9	0.1	1.0	0.0	34.4	54.1	100
97	93	90	30	100	0	91	86	

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
12.3	5.9	1.0	0.0	0.0	0.0	26.7	54.2	100
95	97	100	75	0	0	89	90	

ASSAYS

Calc'd	SG	Cu	Sn	As	S	Fe
3.25	0.00	0.15		0.0	4.1	22.7
Actual			0.71		3.2	21.3

ASSAYS

Calc'd	SG	Cu	Sn	As	S	Fe
3.74	0.33	0.10		0.0	9.7	37.3
Actual			0.82		6.8	28.6

ASSAYS

Calc'd	SG	Cu	Sn	As	S	Fe
3.40	0.00	0.32		0.0	8.0	27.0
Actual			0.79		7.1	30.9

ASSAYS

Calc'd	SG	Cu	Sn	As	S	Fe
3.88	0.37	0.07		0.7	6.7	42.6
Actual			0.87		6.5	31.3

ASSAYS

Calc'd	SG	Cu	Sn	As	S	Fe
3.87	0.00	0.00		0.7	11.6	40.6
Actual			1.43		8.4	34.0

COMPOSITE PROPORTIONS

Mono	Py	Po	As	Cs	GoHe	Mt	Ga	n
0	0	0	0	0	0	25	65	
Binary	95	34	0	26	0	74	29	
Ternary	5	39	0	49	0	1	5	
Quat.y+	0	26	0	25	0	0	1	
#Grains	9	10	0	3	0	30	97	1.50

COMPOSITE PROPORTIONS

Mono	Py	Po	As	Cs	GoHe	Mt	Ga	n
0	0	0	0	0	0	39	65	
Binary	57	85	100	41	0	58	29	
Ternary	15	6	0	48	0	1	5	
Quat.y+	4	9	0	11	0	2	1	
#Grains	20	5	1	4	0	39	84	1.57

COMPOSITE PROPORTIONS

Mono	Py	Po	As	Cs	GoHe	Mt	Ga	n
0	22	0	0	21	0	51	72	
Binary	60	5	0	56	0	49	25	
Ternary	16	95	0	19	0	0	2	
Quat.y+	2	0	0	3	0	0	1	
#Grains	17	7	0	4	0	25	91	1.44

COMPOSITE PROPORTIONS

Mono	Py	Po	As	Cs	GoHe	Mt	Ga	n
0	74	71	0	37	0	84	93	
Binary	14	29	100	51	0	16	7	
Ternary	12	0	0	12	0	0	0	
Quat.y+	0	0	0	1	0	0	0	
#Grains	7	3	1	1	0	38	63	1.14

COMPOSITE PROPORTIONS

Mono	Py	Po	As	Cs	GoHe	Mt	Ga	n
0	81	85	100	84	0	90	92	
Binary	19	15	0	13	0	10	8	
Ternary	0	0	0	3	0	0	0	
Quat.y+	0	0	0	0	0	0	0	
#Grains	13	6	1	0	0	30	60	1.10

BINARY ASSOCIATION MATRIX

Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	100
Po	0	0	0	0	0	100
As	0	0	0	0	0	0
Cs	0	0	0	0	0	100
GoHe	0	0	0	0	0	0
Mt	0	0	0	0	0	100
Ga	13	20	0	0	0	68

BINARY ASSOCIATION MATRIX

Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	13	0	0	8	75
Po	0	0	0	0	0	100
As	100	0	0	0	0	0
Cs	0	0	0	0	0	100
GoHe	0	0	0	0	0	0
Mt	3	0	0	0	0	97
Ga	21	7	0	0	0	61

BINARY ASSOCIATION MATRIX

Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	100
Po	0	0	0	0	0	100
As	0	0	0	0	0	0
Cs	2	0	0	0	8	90
GoHe	0	0	0	0	0	0
Mt	0	0	0	0	0	100
Ga	20	10	0	15	0	55

BINARY ASSOCIATION MATRIX

Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	100
Po	0	0	0	0	0	100
As	0	0	0	0	0	100
Cs	12	0	0	0	1	87
GoHe	0	0	0	0	0	0
Mt	0	0	0	0	0	100
Ga	1	5	3	0	0	91

BINARY ASSOCIATION MATRIX

Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	100
Po	0	0	0	0	0	100
As	0	0	0	0	0	0
Cs	14	1	9	0	10	65
GoHe	0	0	0	0	0	0
Mt	0	0	0	0	0	100
Ga	17	4	0	0	0	80

TOTAL ASSOCIATION MATRIX

Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	5	0	100
Po	33	0	29	0	3	100
As	0	0	0	0	0	0
Cs	26	39	0	0	22	100
GoHe	0	0	0	0	0	0
Mt	0	1	0	0	0	75
Ga	5	11	0	3	0	22

TOTAL ASSOCIATION MATRIX

Py	Po	As	Cs	GoHe	Mt	Ga
Py	8	8	14	0	7	62
Po	10	0	4	0	5	100
As	100	0	0	0	0	0
Cs	36	15	0	0	13	100
GoHe	0	0	0	0	0	0
Mt	3	2	0	0	0	59
Ga	10	5	0	3	0	21

TOTAL ASSOCIATION MATRIX

Py	Po	As	Cs	GoHe	Mt	Ga
Py	16	0	2	0	2	78
Po	95	0	0	0	0	100
As	0	0	0	0	0	0
Cs	14	5	0	0	11	73
GoHe	0	0	0	0	0	0
Mt	0	0	0	0	0	49
Ga	8	5	0	5	0	15

TOTAL ASSOCIATION MATRIX

Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	12	0	0	26
Po	0	0	0	0	0	29
As	0	0	0	0	0	100
Cs	17	1	0	0	1	56
GoHe	0	0	0	0	0	0
Mt	0	0	0	0	0	16
Ga	0	0	0	0	0	7

TOTAL ASSOCIATION MATRIX

Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	19
Po	0	0	0	0	0	15
As	0	0	0	0	0	0
Cs	3	0	1	0	2	11
GoHe	0	0	0	0	0	0
Mt	0	0	0	0	0	10
Ga	1	0	0	0	0	6

DISTRIBUTION MATRIX

Free	Py	Po	As	Cs	GoHe	Mt	Ga	Tern	Quat
Py	0	0	0	0	0	0	95	5	0
Po	0	0	0	0	0	0	34	39	26
As	0	0	0	0	0	0	0	0	0
Cs	0	0	0	0	0	0	26	49	25
GoHe	0	0	0	0	0	0	0	0	0
Mt	25	0	0	0	0	0	74	1	0
Ga	65	4	6	0	0	0	19	5	1

DISTRIBUTION MATRIX

Free	Py	Po	As	Cs	GoHe	Mt	Ga	Tern	Quat
Py	24	0	8	0	0	4	43	15	4
Po	0	0	0	0	0	0	85	6	9
As	100	0	0	0	0	0	0	0	0
Cs	0	0	0	0	0	0	41	48	11
GoHe	0	0	0	0	0	0	0	0	0
Mt	39	2	0	0	0	0	56	1	2
Ga	65	6	2	0	0	0	18	5	1

DISTRIBUTION MATRIX

Free	Py	Po	As
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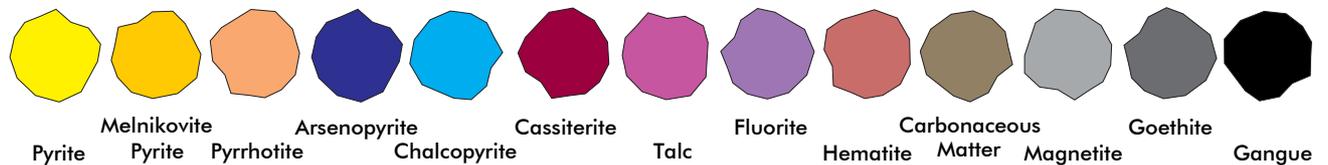
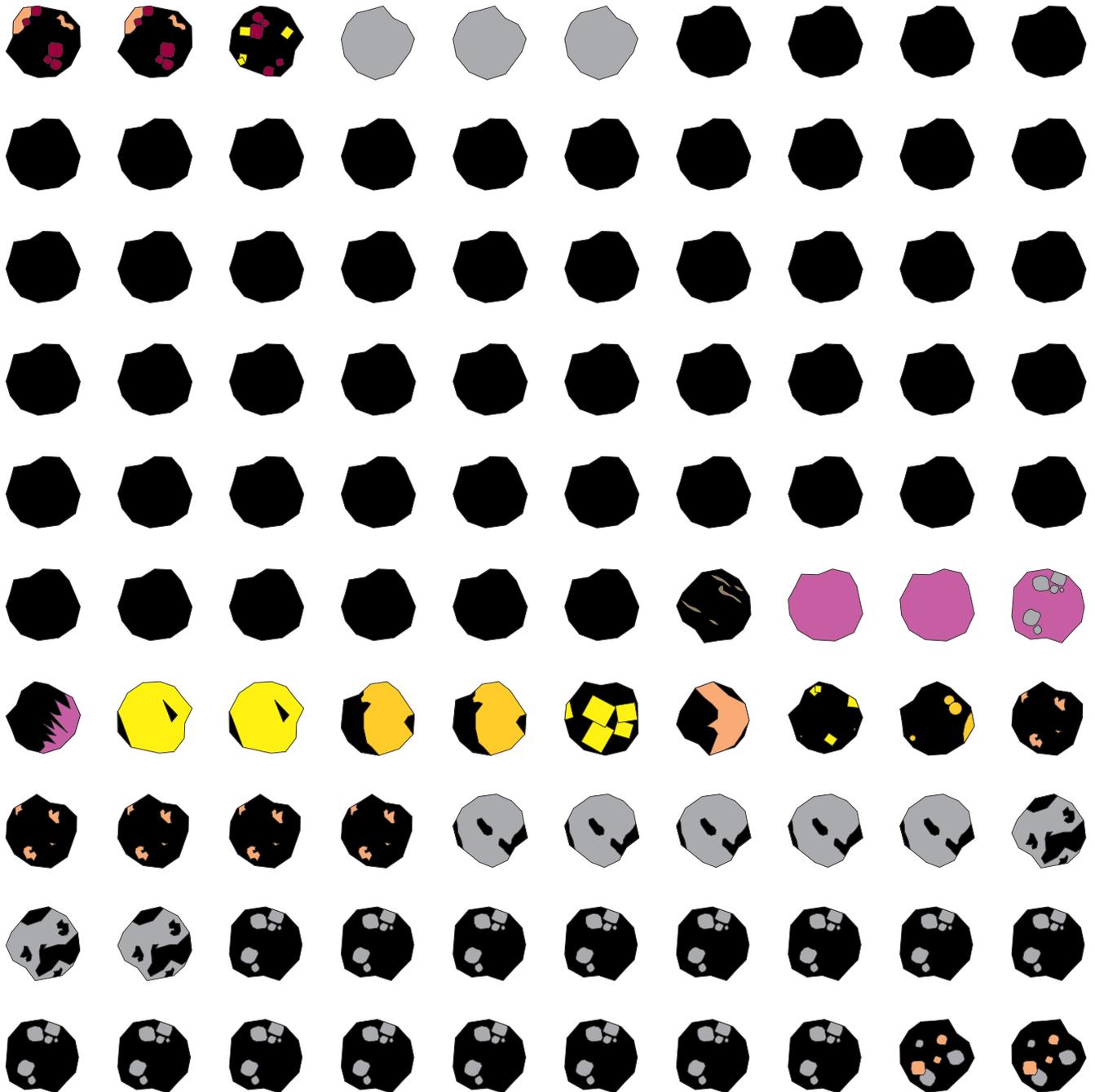
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 2

A +212µm

August

2014



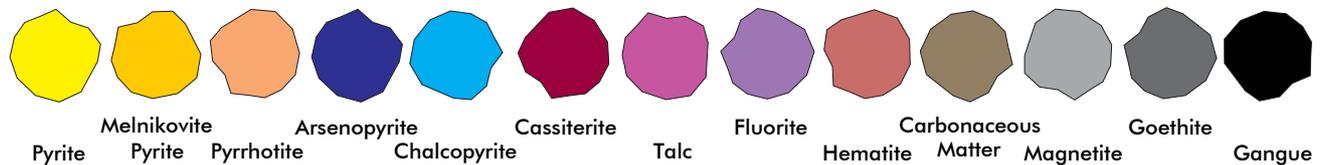
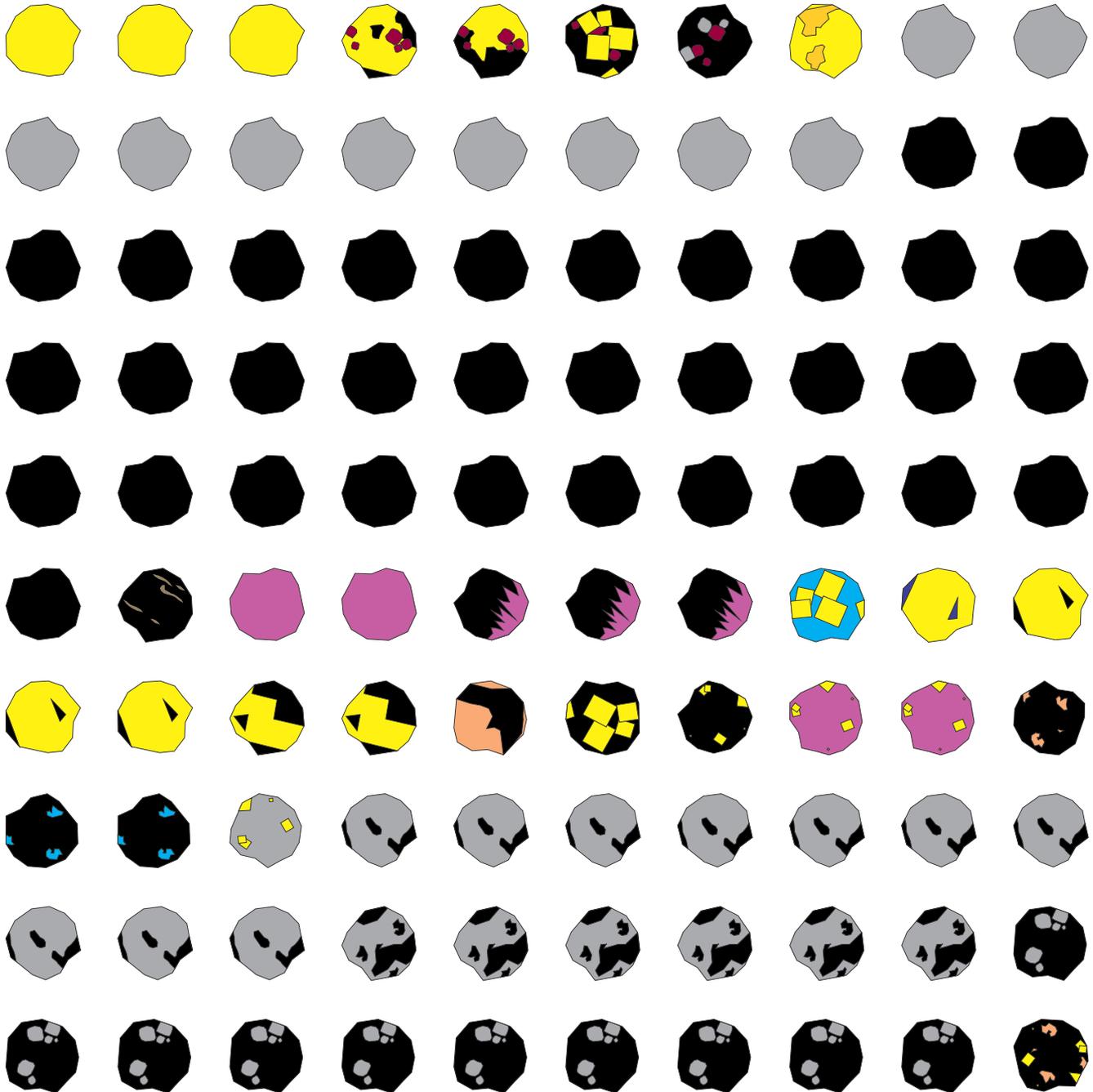
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 2

B + 106µm

August

2014



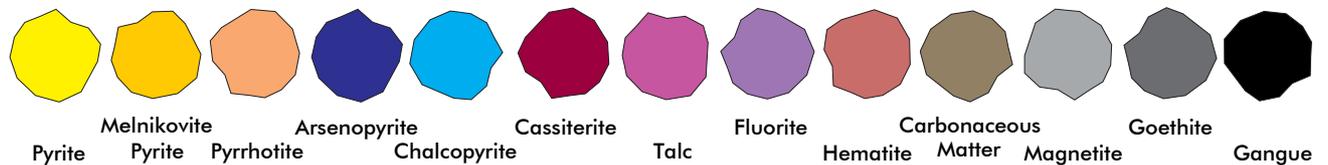
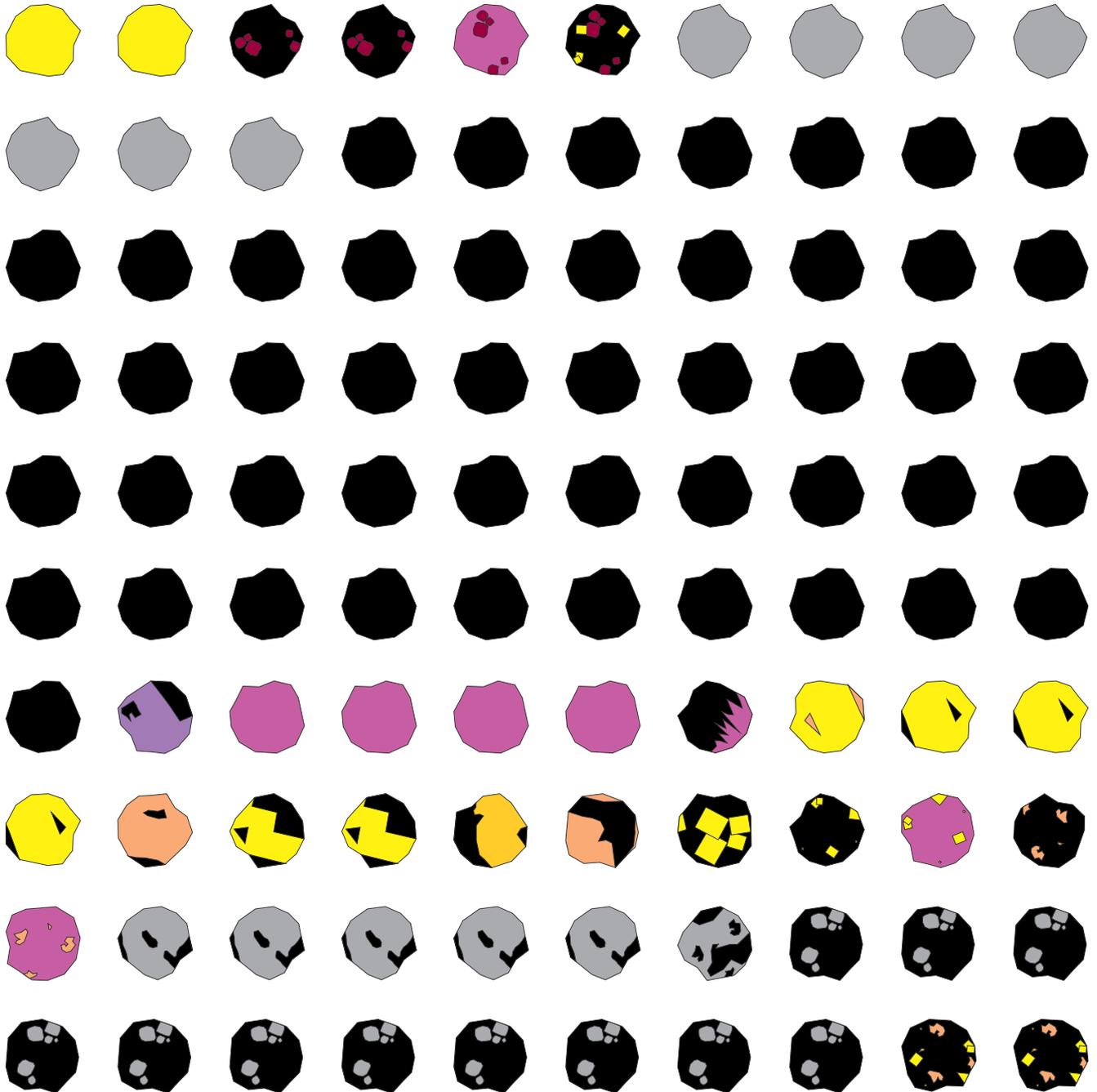
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 2

C +53µm

August

2014



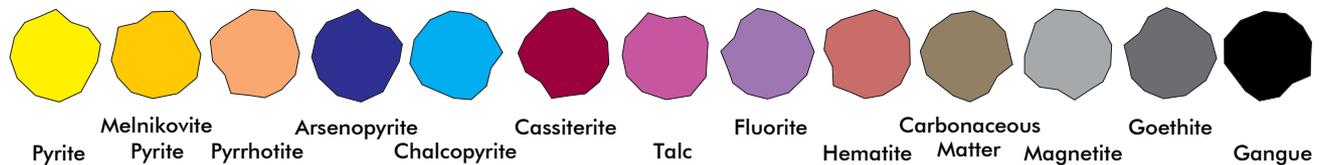
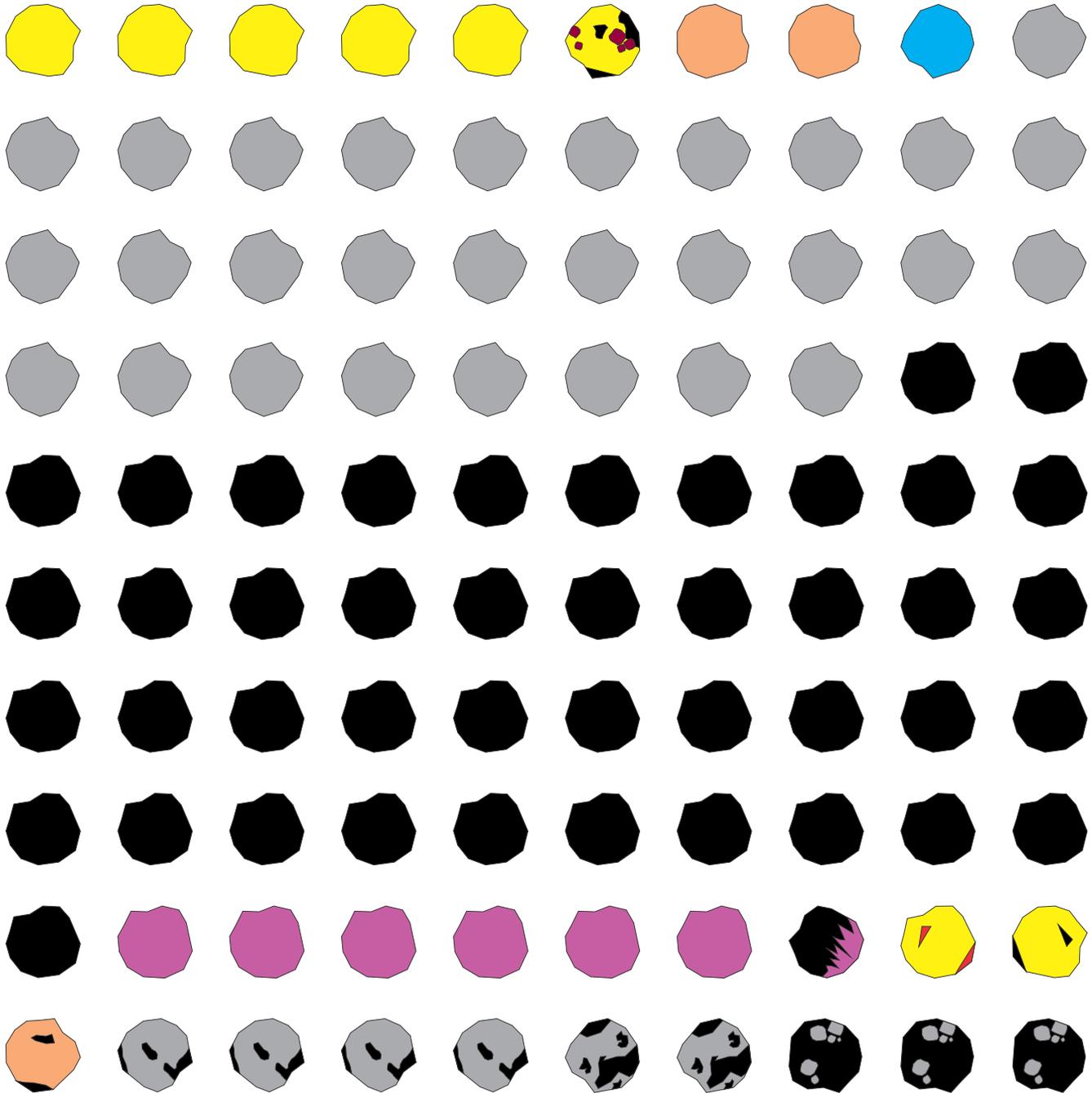
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 2

D +20µm

August

2014



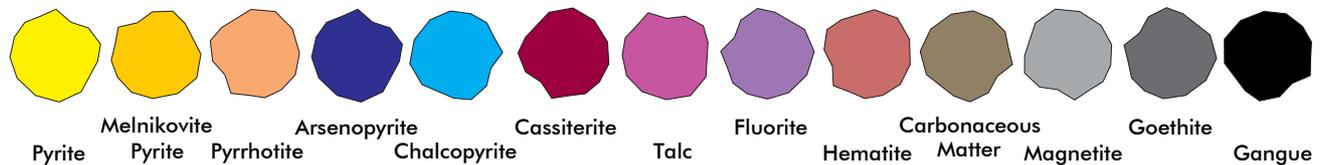
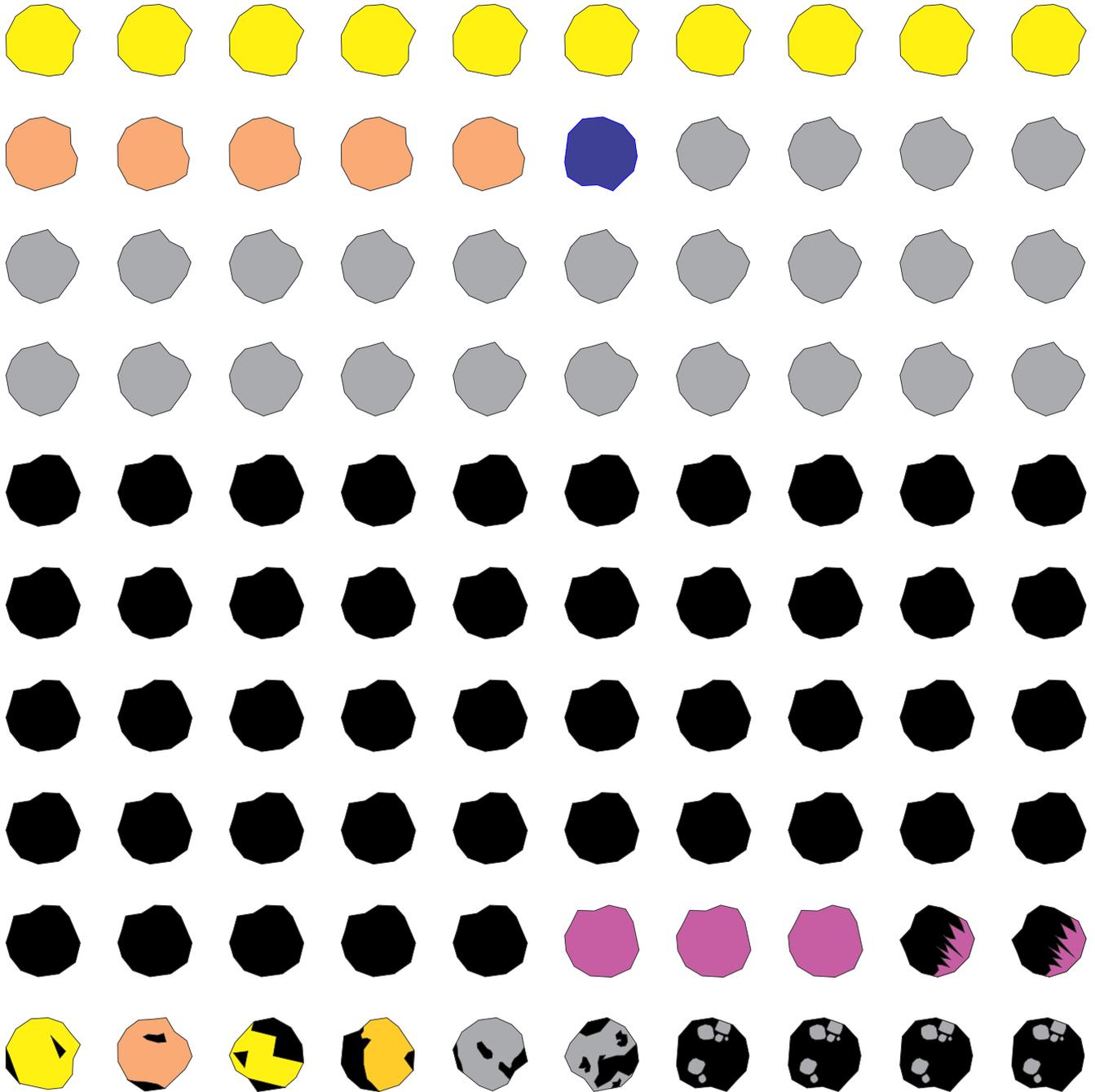
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 2

E +7 $\mu$ m

August

2014



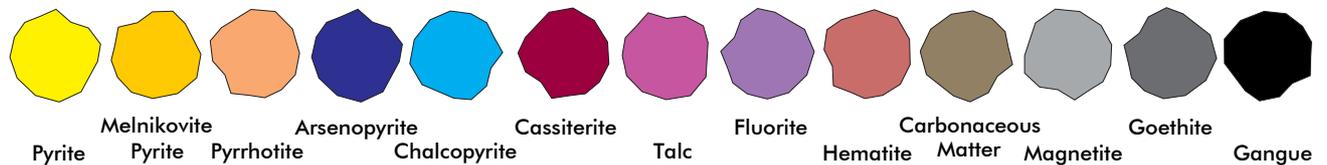
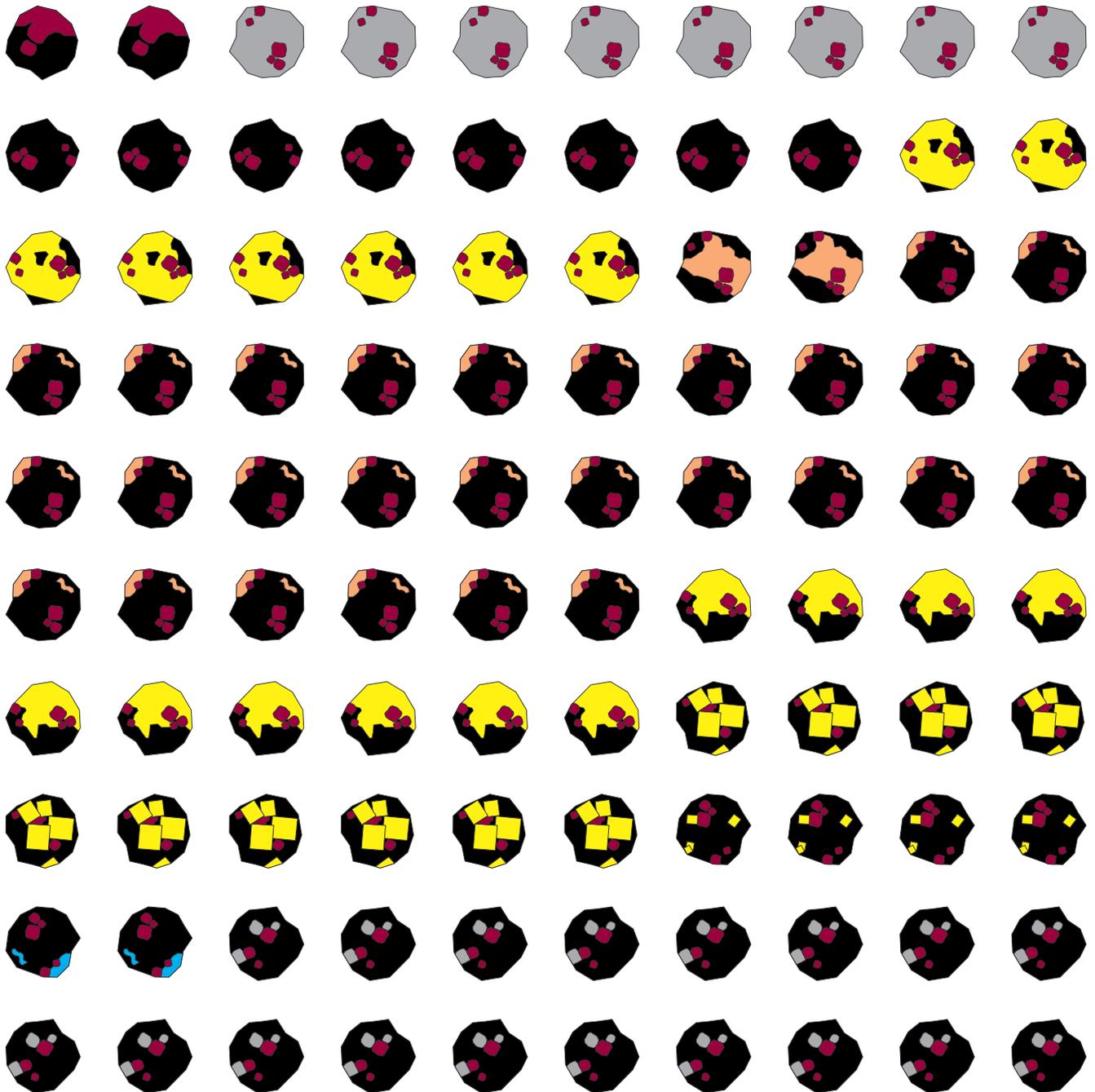
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 2 Sn  
SCAN

A +212µm

August

2014



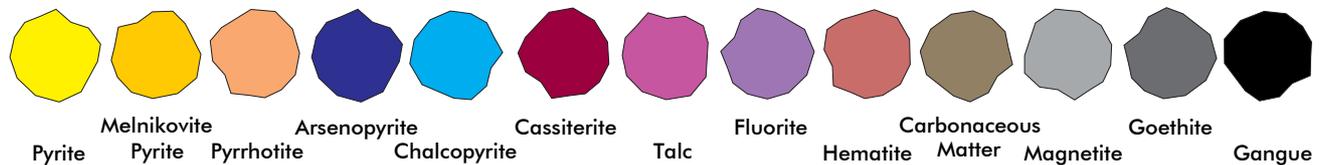
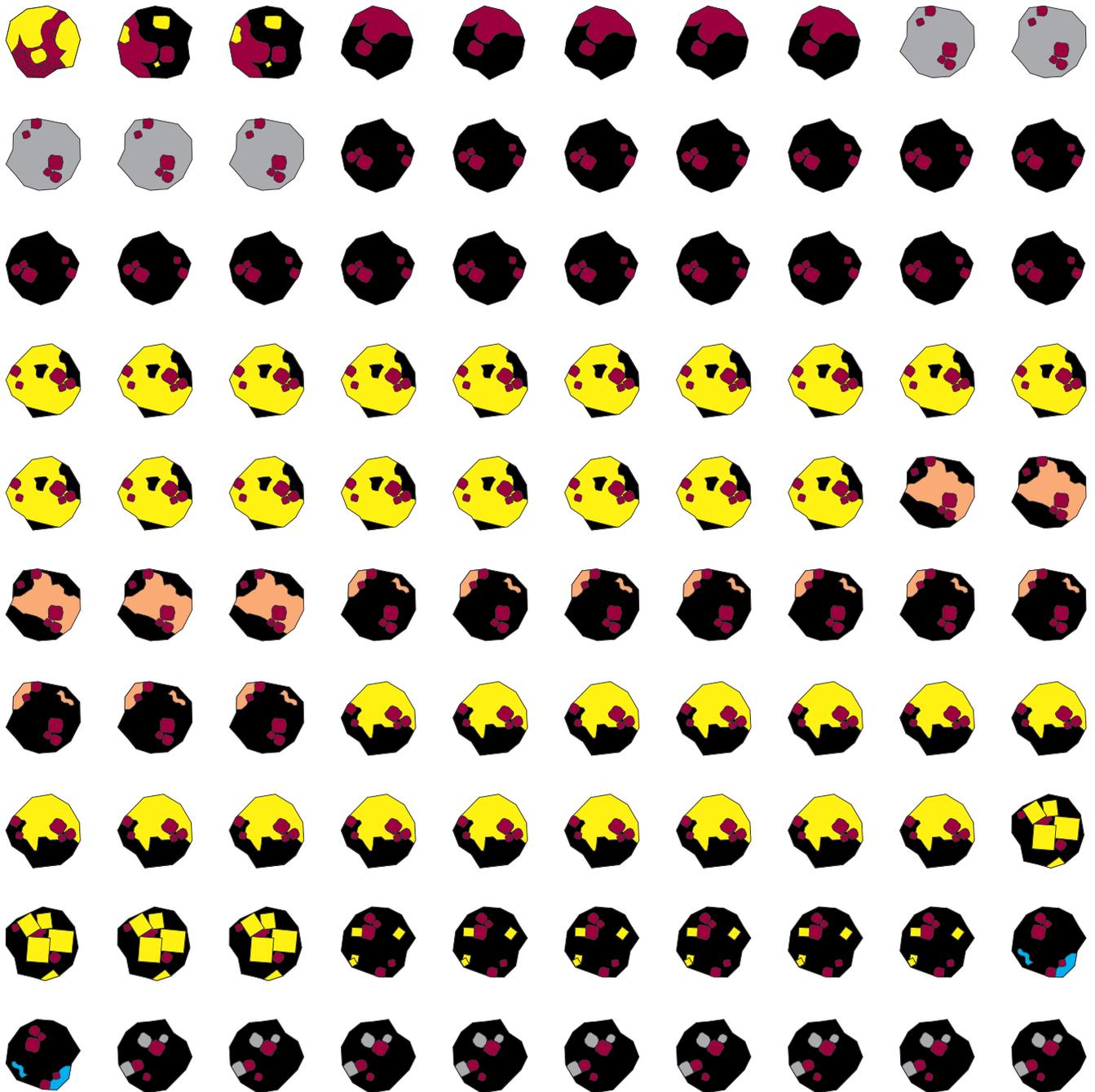
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 2 Sn  
SCAN

B + 106µm

August

2014



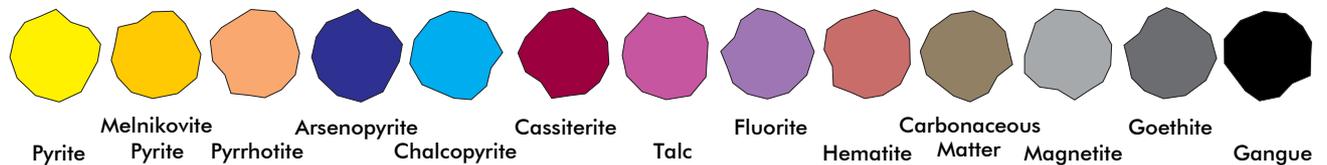
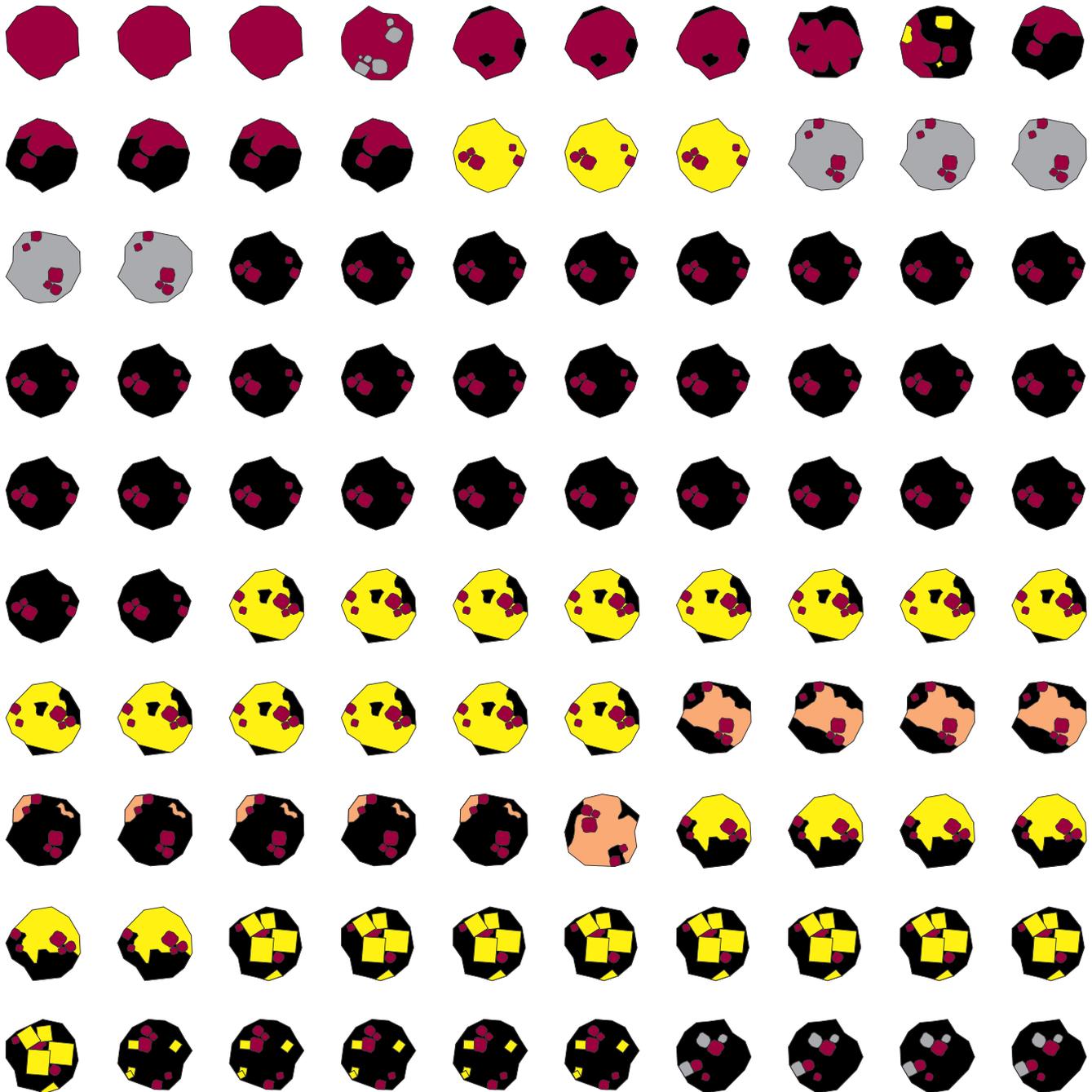
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 2 Sn  
SCAN

C +53µm

August

2014



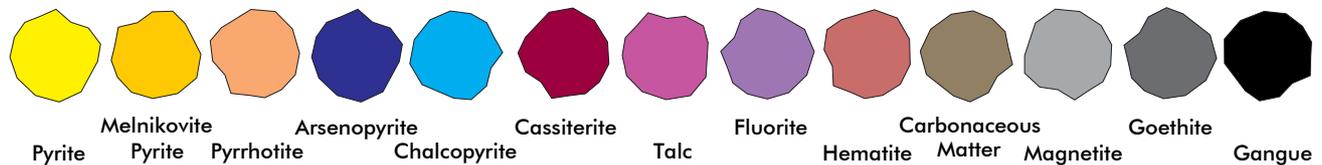
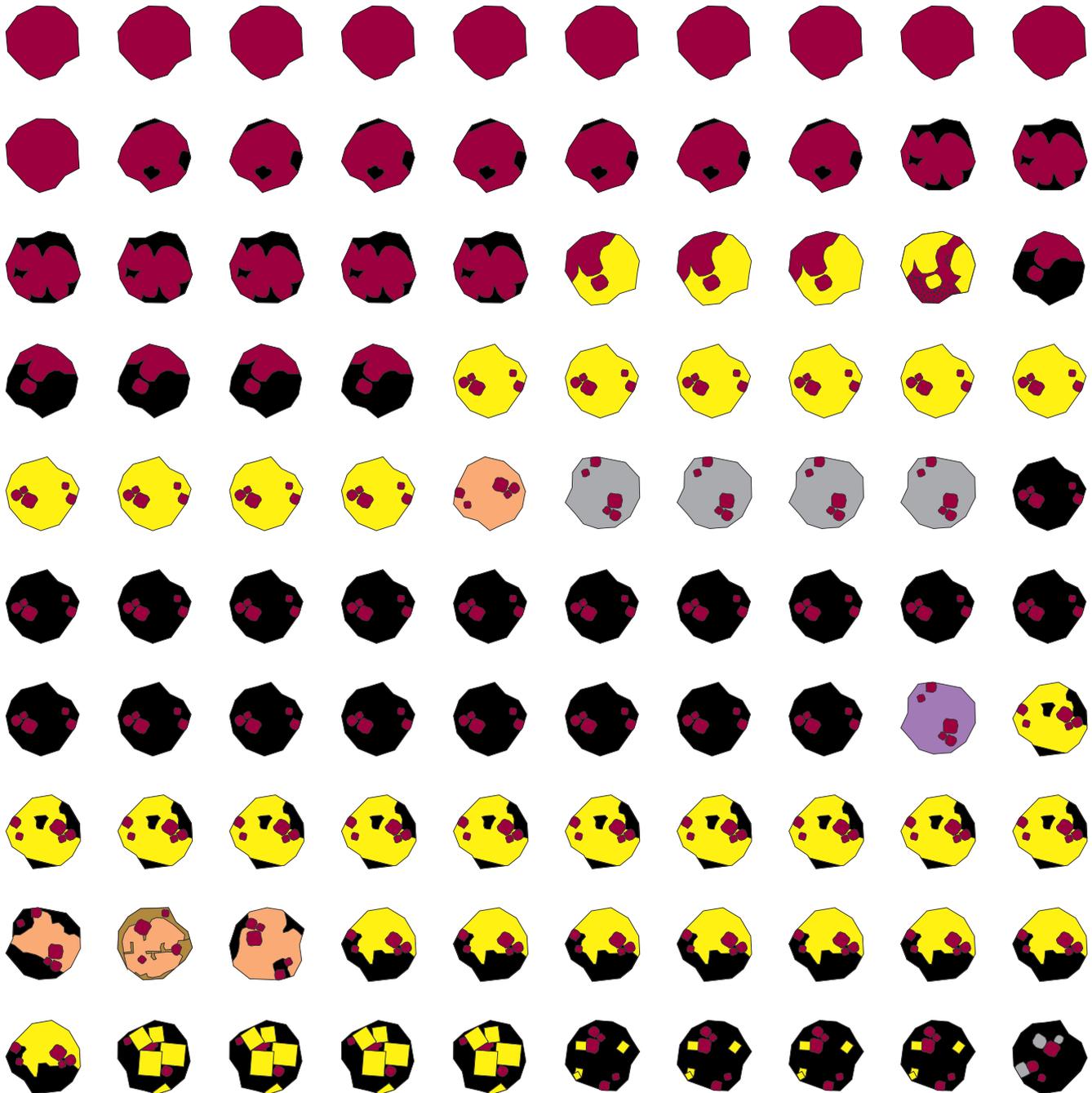
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 2 Sn  
SCAN

D +20µm

August

2014

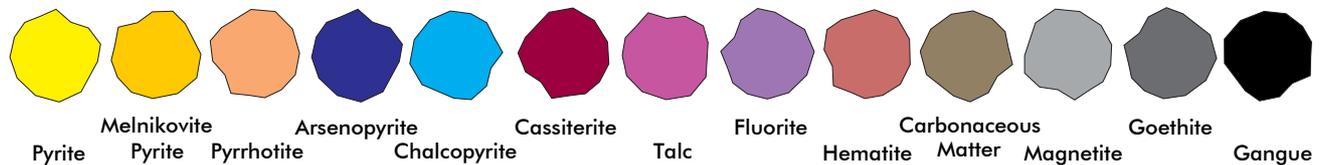
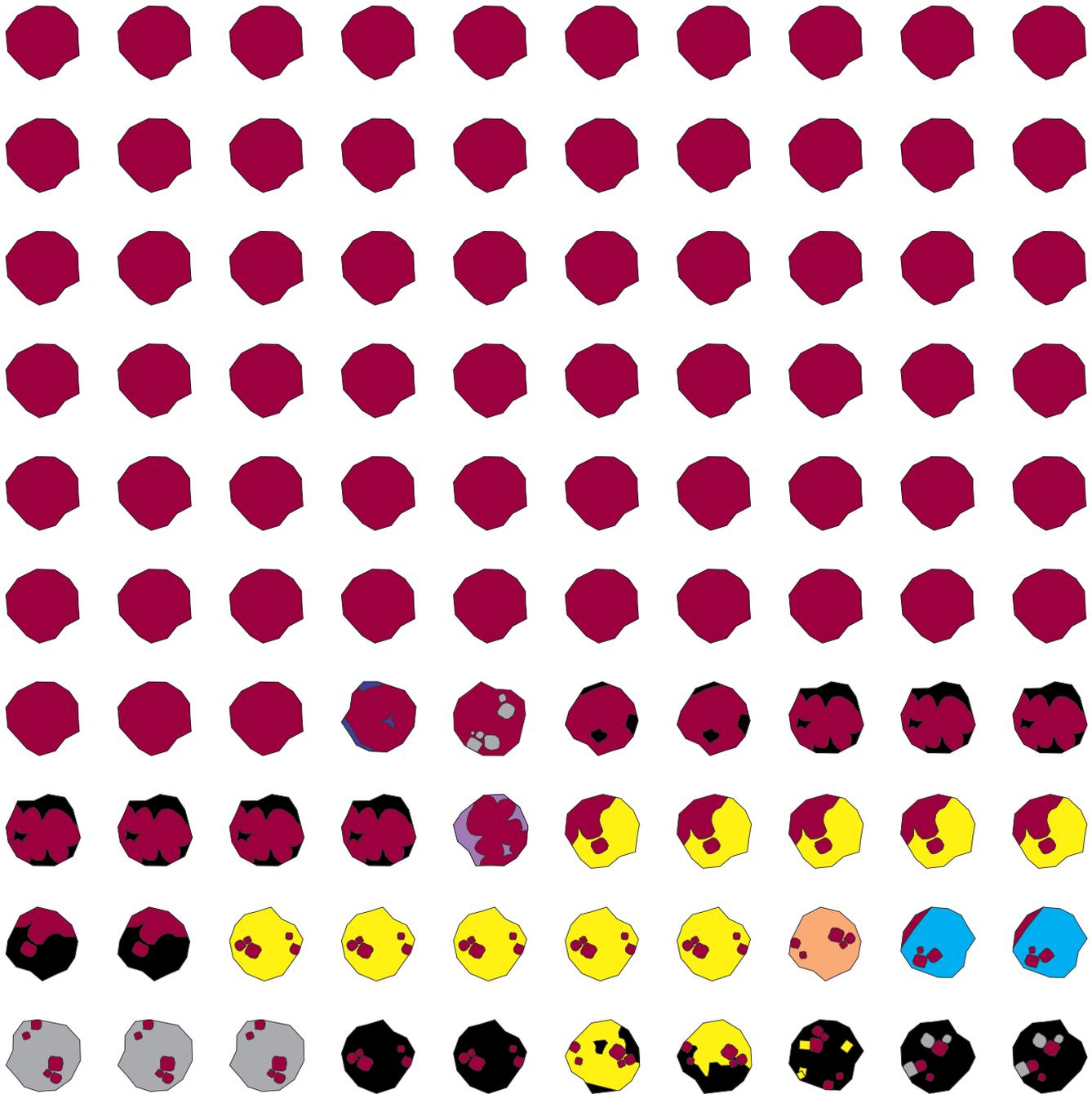


# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 2 Sn  
SCAN

E +7 $\mu$ m

August 2014

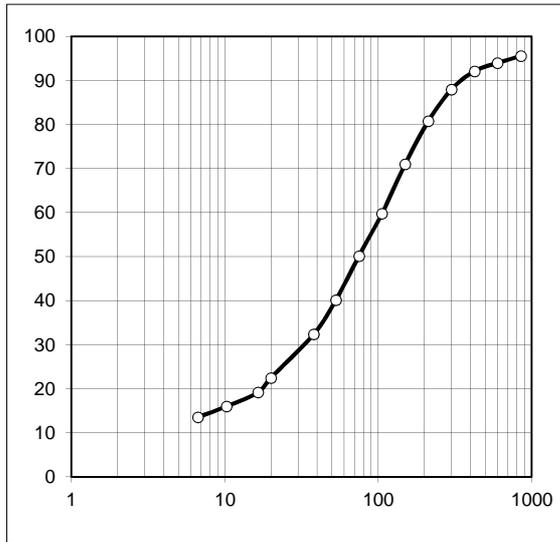




BURNIE LABORATORY  
Mineralogy sizing sheet

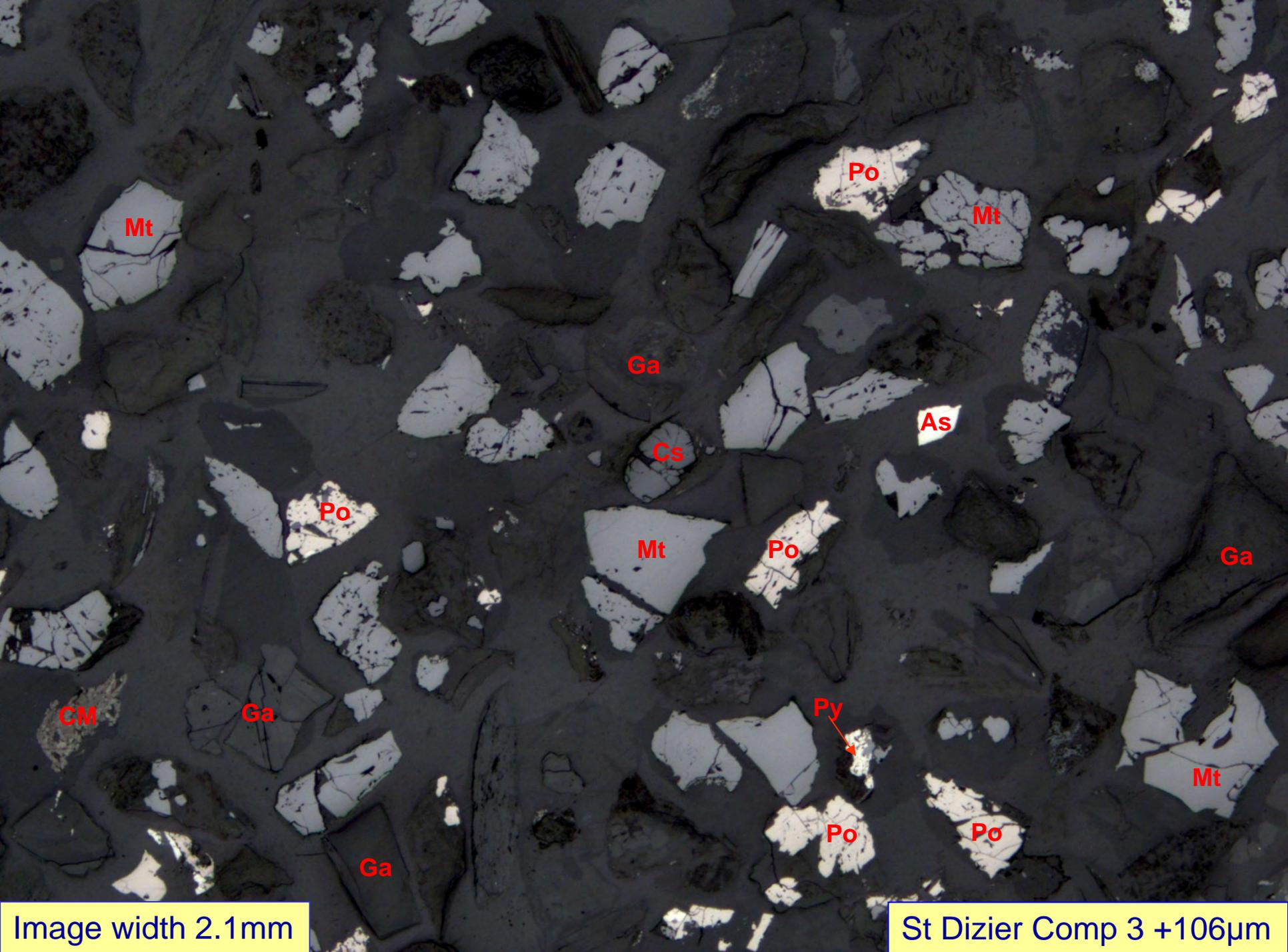
PROJECT	T0887
SAMPLE	St Dizier Comp 3
FROM TEST NO	
DATE	50814
TECHNICIAN	MS

St Dizier Comp 3		SIZE um	WEIGHTS			
			gm	(%)	%PASS	
P80	207	850	7.62	4.42	95.6	
		600	2.76	1.60	94.0	
		425	3.20	1.86	92.1	
		300	7.12	4.13	88.0	
		212	12.45	7.23	80.8	
		150	16.78	9.74	71.0	
		106	19.30	11.20	59.8	
		75	16.60	9.63	50.2	
		53	17.24	10.01	40.2	
		38	13.40	7.78	32.4	
20	17.05	9.90	22.5			
TEMP	21	CS3	17	5.69	3.30	19.2
SG	3.00	CS4	10	5.51	3.20	16.0
MINS	20	CS5	7	4.19	2.43	13.6
SUB			23.38	13.57		
TOTAL			172.29	100.00		



ANALYSES

SIZE um	WT %	Sn		Fe		S		SiO2		Mount Number
		%	dist	%	dist	%	dist	%	dist	
212	19.2	0.82	15.6	23.60	13.9	3.35	14.2	31.50	24.0	887155
106	20.9	1.09	22.6	37.20	23.8	4.68	21.5	22.00	18.3	887156
53	19.6	1.11	21.6	38.90	23.3	4.82	20.8	20.90	16.3	887157
20	17.7	1.20	21.0	38.40	20.7	5.80	22.5	20.60	14.4	887158
7	8.9	1.60	14.2	41.40	11.3	5.89	11.6	18.75	6.6	887159
<7	13.6	0.37	5.0	16.95	7.0	3.17	9.4	37.80	20.3	
CALC	100.0	1.01	100.0	32.76	100.0	4.55	100.0	25.22	100.0	
ASSAY		1.04		32.20		4.80		24.90		



Mt

Po

Mt

Ga

As

Po

Mt

Po

Ga

CM

Ga

Py

Mt

Ga

Po

Po

Image width 2.1mm

St Dizier Comp 3 +106µm



**PARTICLE MINERALOGY REPORT**

**St Dizier Comp 3  
August 2014**

**A +212µm 19 % by weight**

**B +106µm 21 % by weight**

**C +53µm 20 % by weight**

**D +20µm 18 % by weight**

**E +7µm 9 % by weight**

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
3.5	3.1	0.0	0.2	0.0	0.0	21.8	71.5	100
49	22	0	7	1	0	54	80	

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
4.5	6.2	1.0	0.2	0.0	0.0	44.1	44.1	100
56	56	100	25	0	0	80	69	

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
1.9	7.1	1.0	0.6	0.0	0.0	34.4	55.1	100
62	64	100	26	2	2	84	85	

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
3.8	14.2	0.0	1.0	0.0	0.1	40.3	40.7	100
48	89	0	48	0	4	94	88	

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
2.7	8.1	0.0	1.0	0.0	0.0	32.1	56.3	100
88	89	0	84	0	0	97	99	

ASSAYS

	SG	Cu	Sn	As	S	Fe
Calc'd	3.49	0.00	0.28		0.0	4.3
Actual			0.82		3.4	23.6

ASSAYS

	SG	Cu	Sn	As	S	Fe
Calc'd	4.11	0.00	0.24		0.7	6.0
Actual			1.09		4.7	37.2

ASSAYS

	SG	Cu	Sn	As	S	Fe
Calc'd	3.86	0.01	0.83		0.7	4.9
Actual			1.11		4.8	38.9

ASSAYS

	SG	Cu	Sn	As	S	Fe
Calc'd	4.15	0.00	1.32		0.0	8.7
Actual			1.20		5.8	38.4

ASSAYS

	SG	Cu	Sn	As	S	Fe
Calc'd	3.83	0.00	1.42		0.0	5.7
Actual			1.60		5.9	41.4

COMPOSITE PROPORTIONS

	Py	Po	As	Cs	GoHe	Mt	Ga
Mono	0	0	0	0	0	46	66
Binary	55	6	0	18	0	53	24
Ternary	39	83	0	60	0	1	8
Quat.+	6	11	0	22	0	0	2
#Grains	7	14	0	6	0	40	89

COMPOSITE PROPORTIONS

	Py	Po	As	Cs	GoHe	Mt	Ga
Mono	0	16	100	16	0	68	70
Binary	49	70	0	48	0	31	24
Ternary	51	13	0	28	0	1	5
Quat.+	0	0	0	8	0	0	0
#Grains	8	11	1	4	0	55	64

COMPOSITE PROPORTIONS

	Py	Po	As	Cs	GoHe	Mt	Ga
Mono	54	71	100	31	0	79	78
Binary	0	1	0	55	0	21	17
Ternary	24	8	0	12	0	0	5
Quat.+	22	21	0	2	100	0	0
#Grains	3	11	1	8	1	41	65

COMPOSITE PROPORTIONS

	Py	Po	As	Cs	GoHe	Mt	Ga
Mono	79	64	0	60	0	89	96
Binary	20	24	0	33	0	7	2
Ternary	1	12	0	7	62	1	2
Quat.+	0	0	0	0	37	2	0
#Grains	8	16	0	2	2	43	46

COMPOSITE PROPORTIONS

	Py	Po	As	Cs	GoHe	Mt	Ga
Mono	75	99	0	85	0	100	96
Binary	25	1	0	15	0	0	4
Ternary	0	0	0	1	0	0	0
Quat.+	0	0	0	0	0	0	0
#Grains	3	9	0	1	0	33	57

BINARY ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	50	0	0	0	0	0	50
Po	25	0	0	0	0	0	75
As	0	0	0	0	0	0	0
Cs	0	0	0	0	0	0	100
GoHe	0	0	0	0	0	0	0
Mt	0	0	0	0	0	0	100
Ga	0	17	0	6	0	78	

BINARY ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	18	0	0	0	0	0	82
Po	14	0	0	22	0	38	26
As	0	0	0	0	0	0	0
Cs	5	14	0	0	0	0	80
GoHe	0	0	0	0	0	0	0
Mt	0	3	0	0	0	0	97
Ga	20	17	0	0	0	62	

BINARY ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	0	0
Po	0	0	0	0	0	0	100
As	0	0	0	0	0	0	0
Cs	0	12	0	0	0	8	81
GoHe	0	0	0	0	0	0	0
Mt	0	0	0	0	0	0	100
Ga	0	10	0	39	0	51	

BINARY ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	13	0	0	0	0	0	87
Po	55	0	0	0	0	19	26
As	0	0	0	0	0	0	0
Cs	1	16	0	0	0	20	63
GoHe	0	0	0	0	0	0	0
Mt	0	12	0	0	0	0	87
Ga	35	10	0	0	0	55	

BINARY ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	0	100
Po	0	0	0	0	0	0	100
As	0	0	0	0	0	0	0
Cs	1	6	0	0	4	31	58
GoHe	0	0	0	0	0	0	0
Mt	0	0	0	0	0	0	100
Ga	16	42	0	0	0	42	

TOTAL ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	55	0	6	0	0	17	72
Po	37	0	52	0	8	98	
As	0	0	0	0	0	0	0
Cs	19	52	0	0	38	100	
GoHe	0	0	0	0	0	0	0
Mt	0	0	0	0	0	54	
Ga	3	12	0	6	0	24	

TOTAL ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	9	0	19	0	32	91	
Po	10	0	28	0	27	32	
As	0	0	0	0	0	0	0
Cs	6	25	0	1	25	67	
GoHe	0	0	0	0	0	0	0
Mt	0	2	0	0	0	31	
Ga	6	8	0	3	0	18	

TOTAL ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	46	0	22	24	22		
Po	15	0	14	8	7	22	
As	0	0	0	0	0	0	0
Cs	1	12	0	0	13	58	
GoHe	100	100	0	0	0	100	
Mt	0	0	0	0	0	21	
Ga	0	5	0	12	0	10	

TOTAL ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	4	0	0	2	0	17	
Po	20	0	0	6	10	12	
As	0	0	0	0	0	0	0
Cs	1	7	0	0	11	27	
GoHe	100	62	0	37	37	0	
Mt	2	2	0	2	2	7	
Ga	1	2	0	0	0	3	

TOTAL ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	0	25
Po	0	0	0	0	0	0	1
As	0	0	0	0	0	0	0
Cs	1	1	0	0	1	5	9
GoHe	0	0	0	0	0	0	0
Mt	0	0	0	0	0	0	0
Ga	1	2	0	0	0	2	

DISTRIBUTION MATRIX

Free	Binary							Tern	Quat
	Py	Po	As	Cs	GoHe	Mt	Ga		
Py	0	28	0	0	0	0	28	39	6
Po	0	2	0	0	0	0	5	83	11
As	0	0	0	0	0	0	0	0	0
Cs	0	0	0	0	0	0	18	60	22
GoHe	0	0	0	0	0	0	0	0	0
Mt	46	0	0	0	0	0	53	1	0
Ga	66	0	4	0	1	0	19	8	2

DISTRIBUTION MATRIX

Free	Binary							Tern	Quat
	Py	Po	As	Cs	GoHe	Mt	Ga		
Py	0	9	0	0	0	0	40	51	0
Po	16	10	0	15	0	27	19	13	0
As	100	0	0	0	0	0	0	0	0
Cs	16	3	7	0	0	0	38	28	8

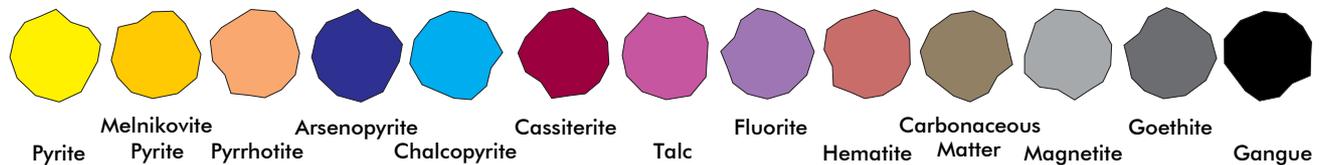
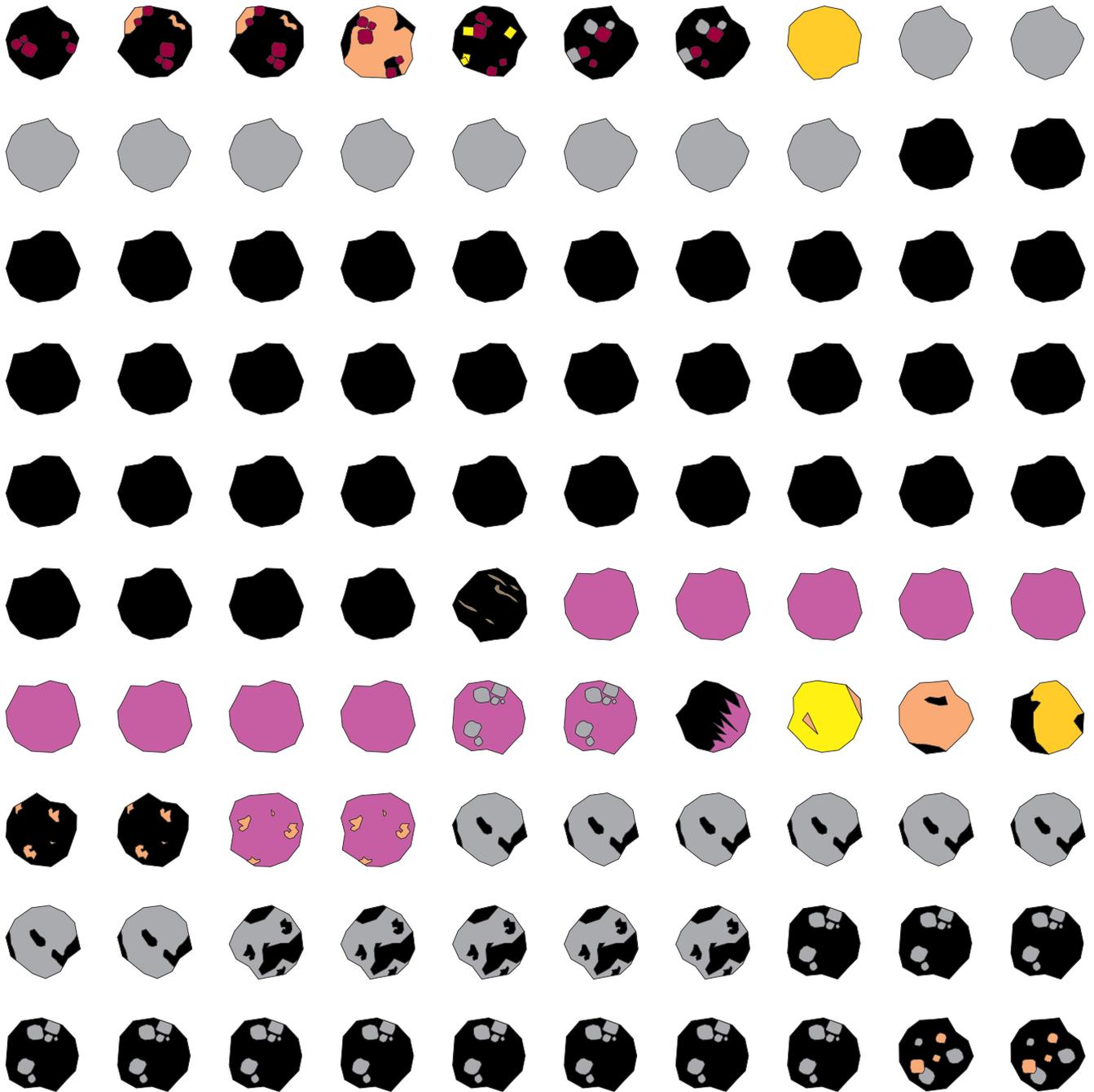
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 3

A +212µm

August

2014



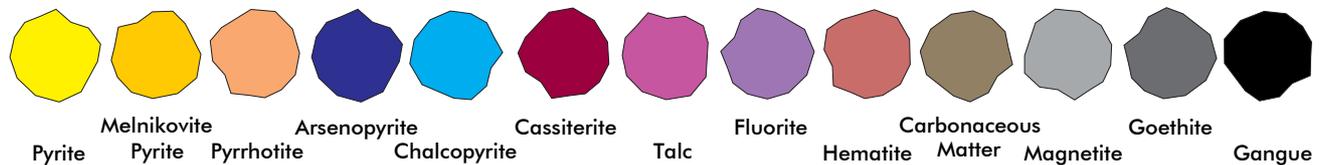
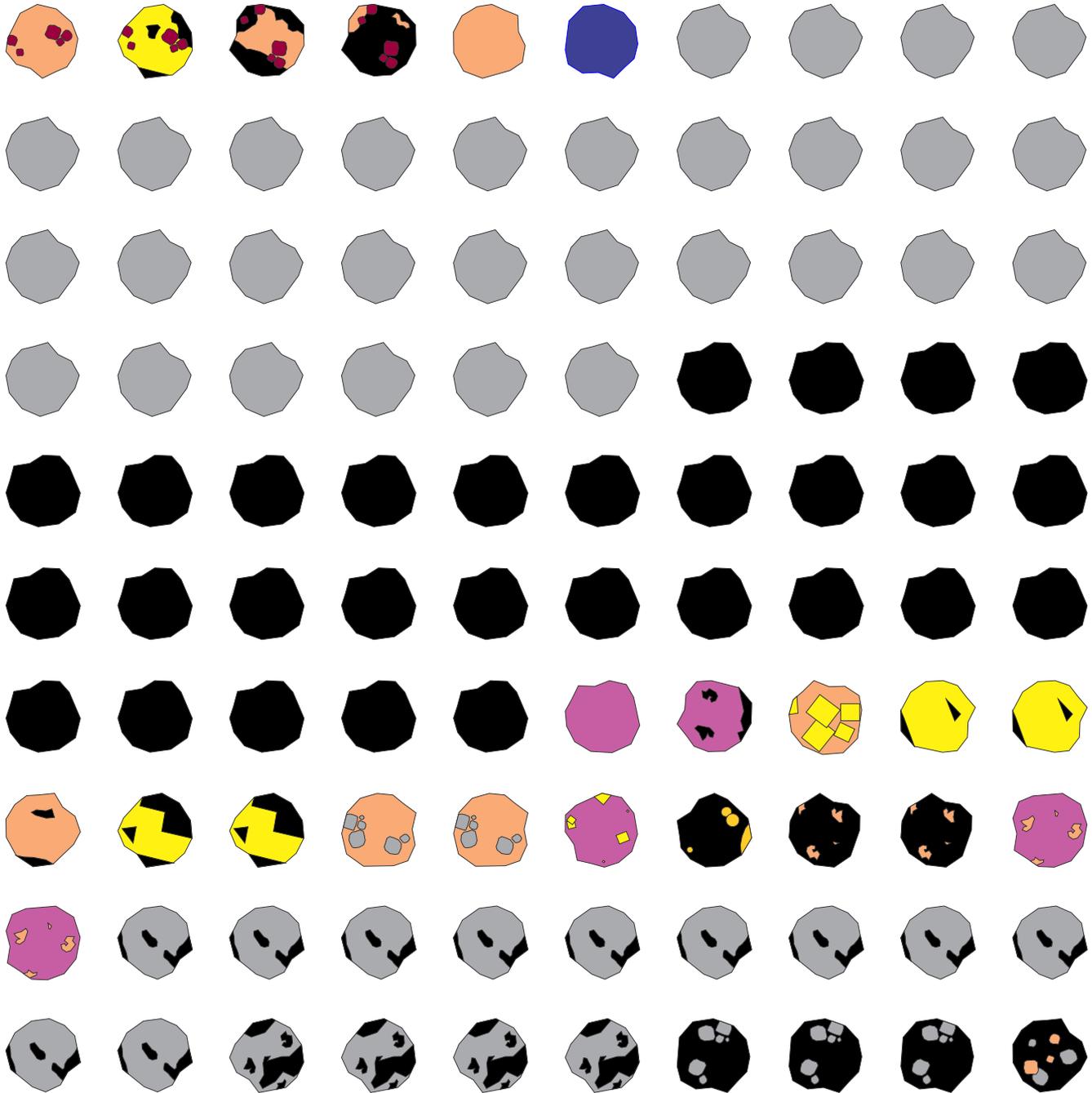
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 3

B + 106µm

August

2014



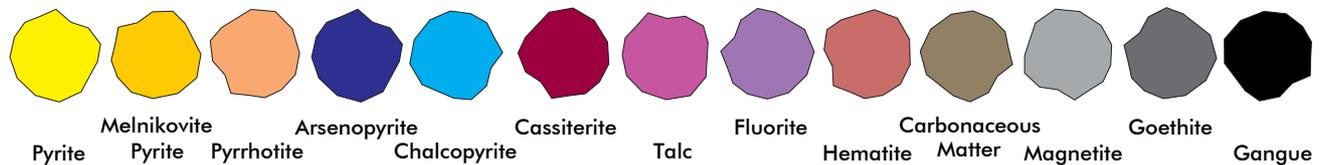
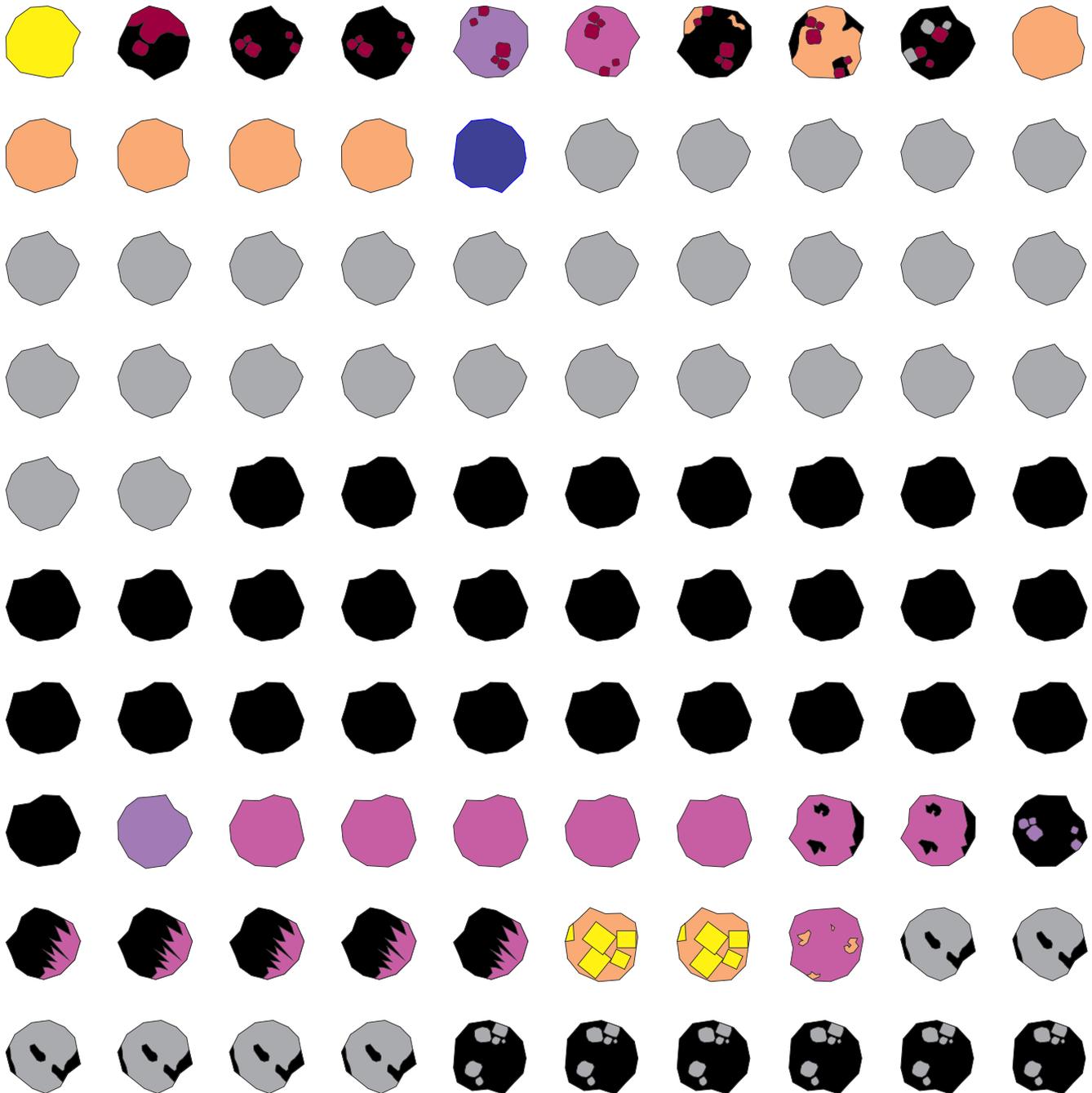
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 3

C +53µm

August

2014



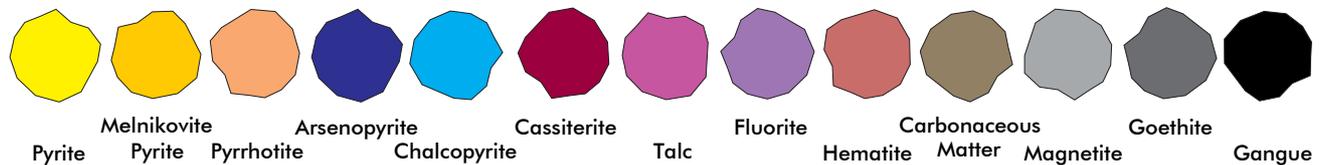
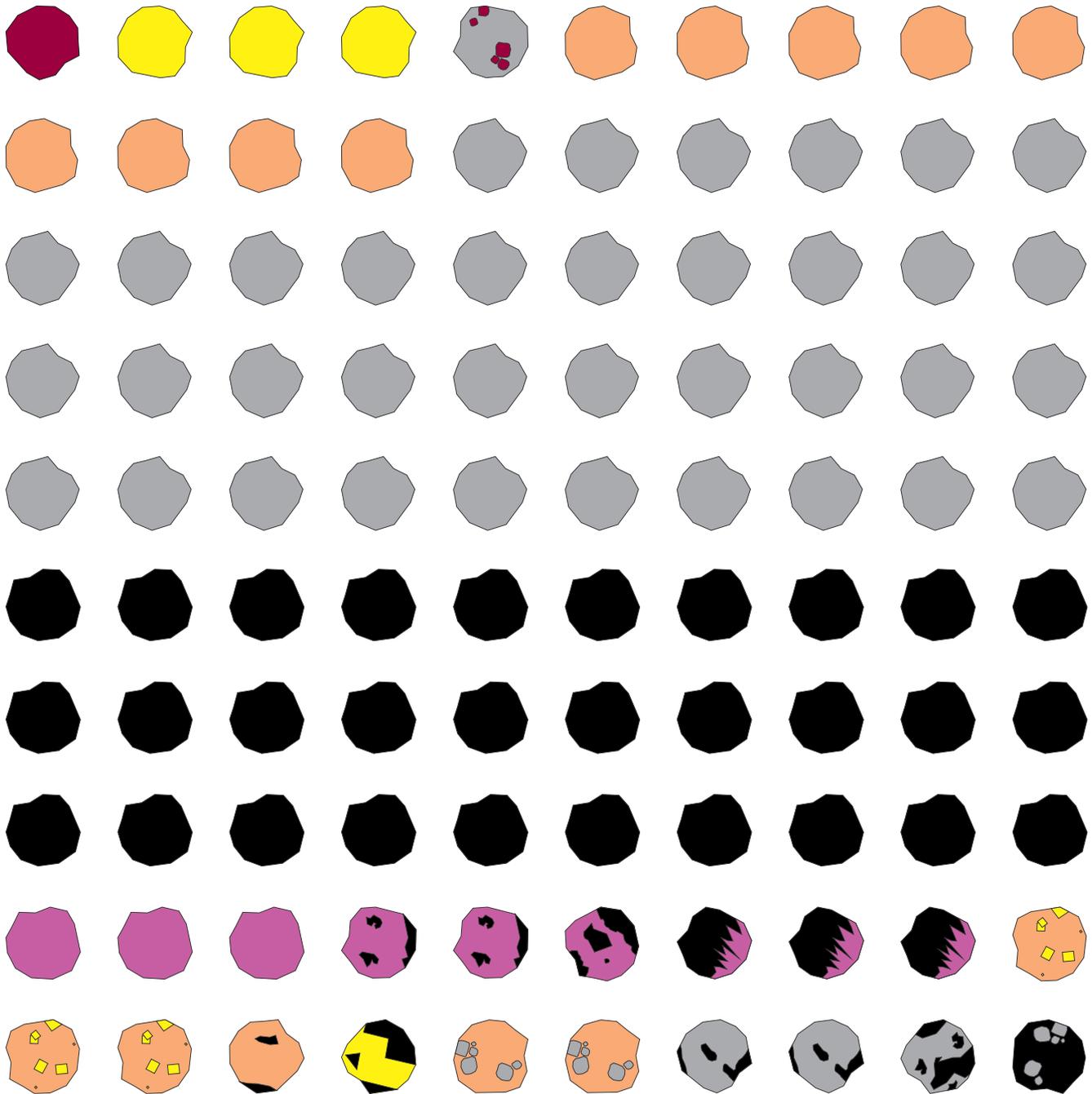
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 3

D +20µm

August

2014



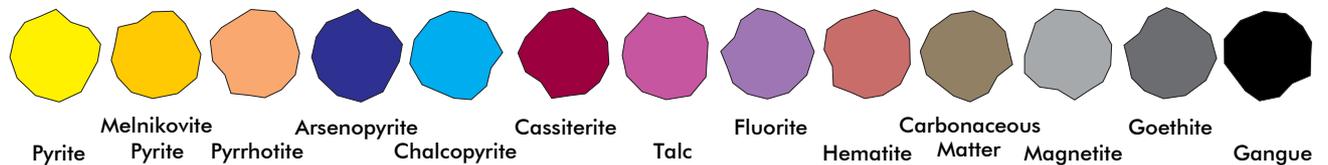
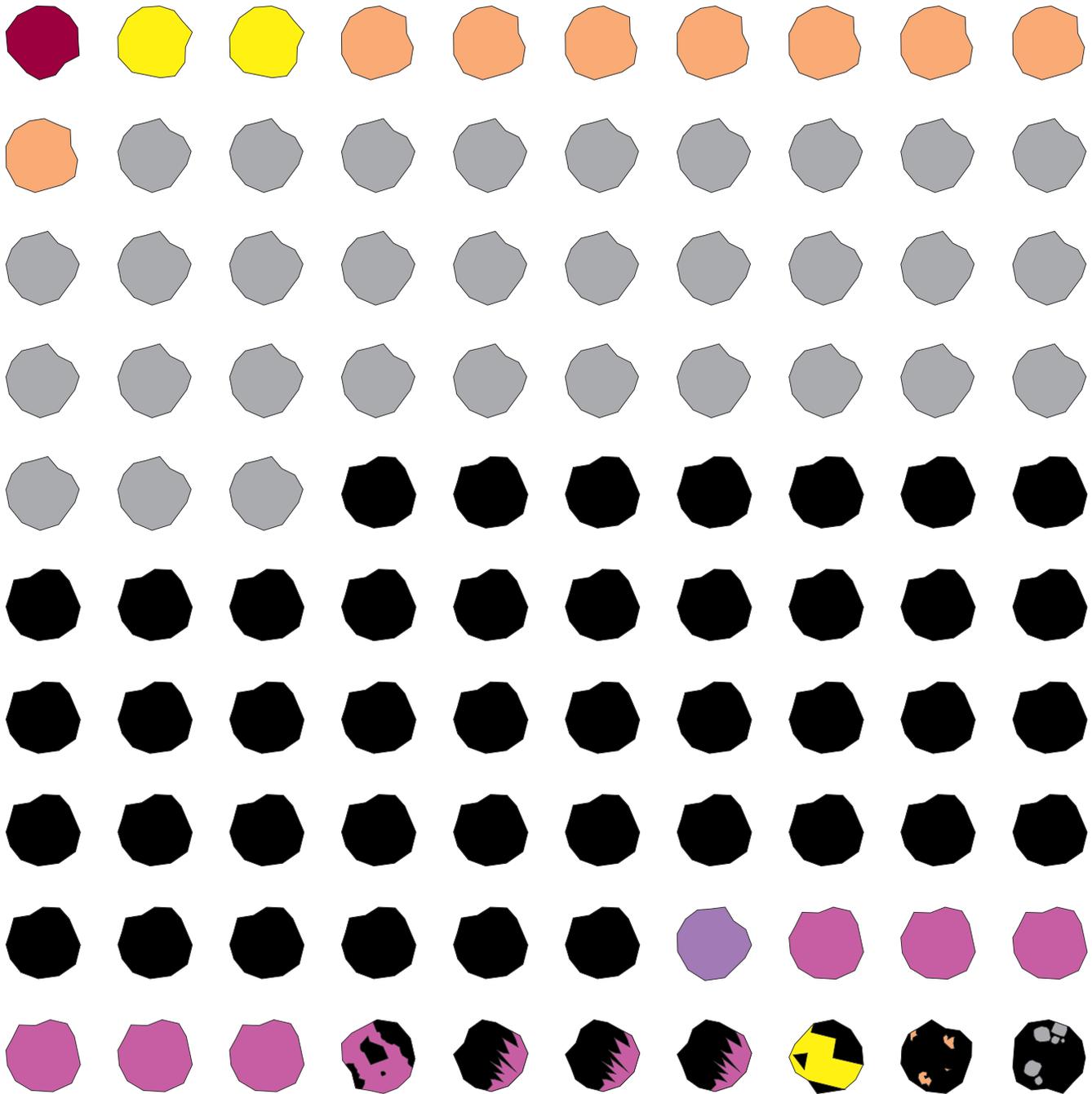
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 3

E +7 $\mu$ m

August

2014



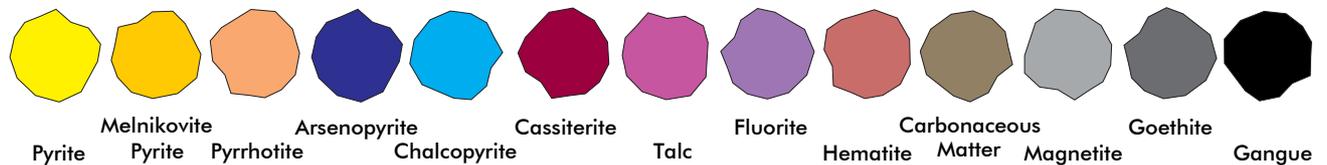
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 3 Sn  
SCAN

A +212µm

August

2014



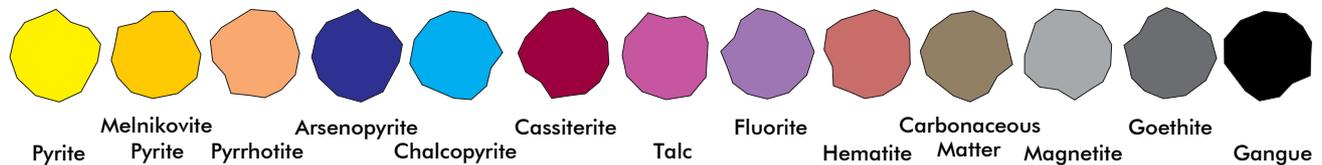
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 3 Sn  
SCAN

B + 106µm

August

2014



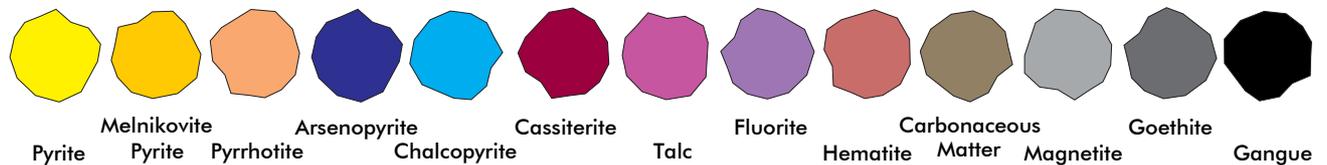
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 3 Sn  
SCAN

C + 53µm

August

2014



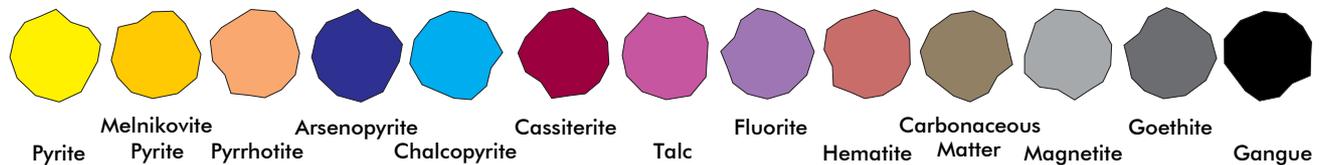
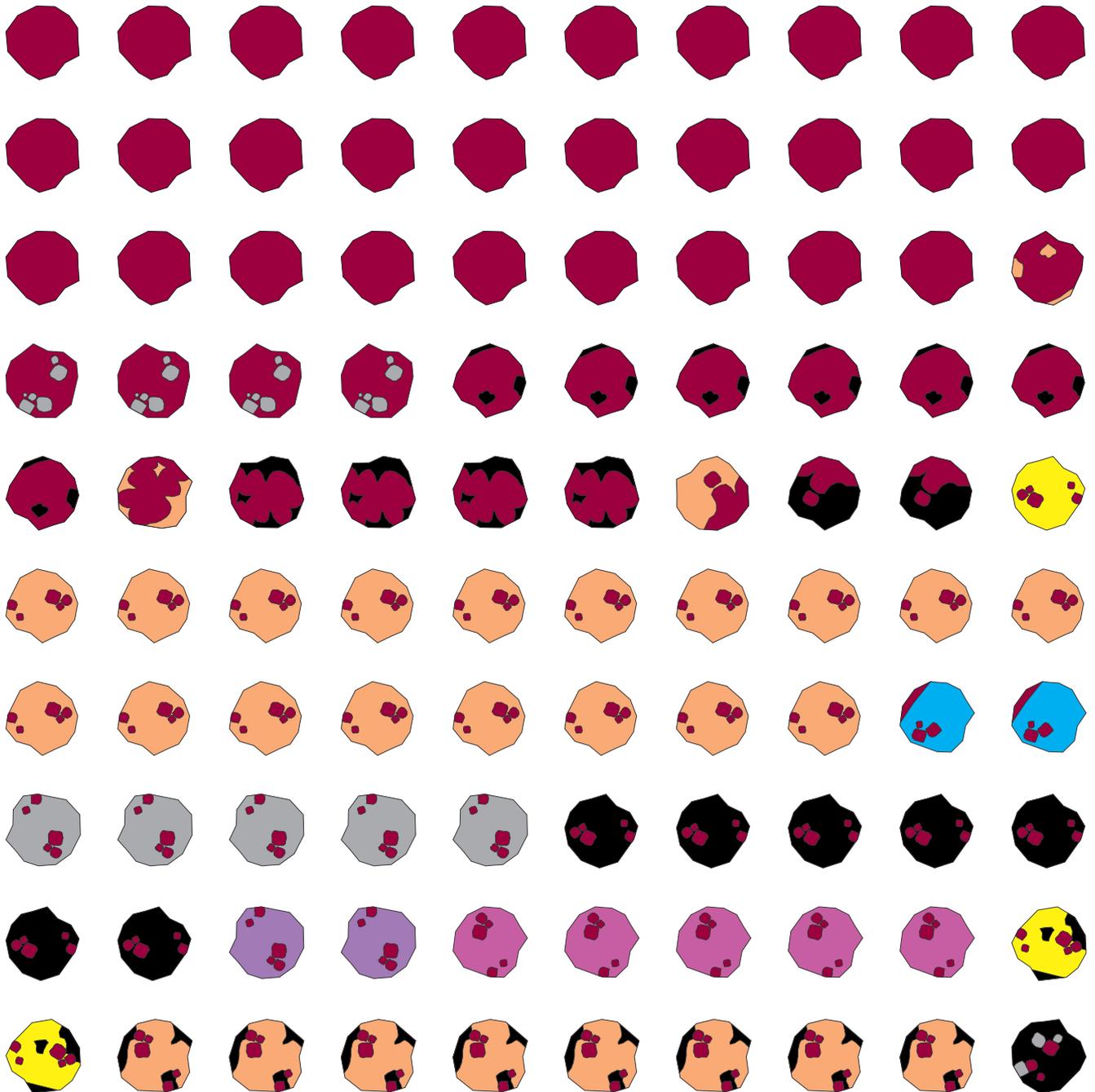
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 3 Sn  
SCAN

D +20µm

August

2014



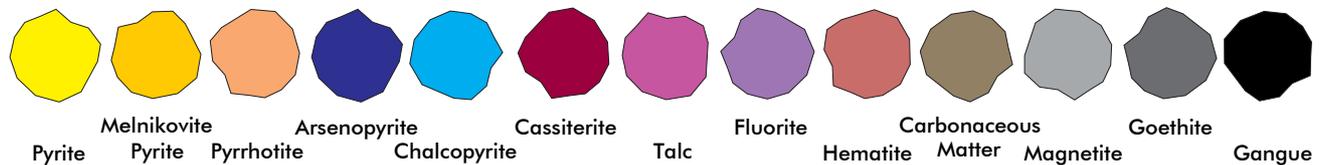
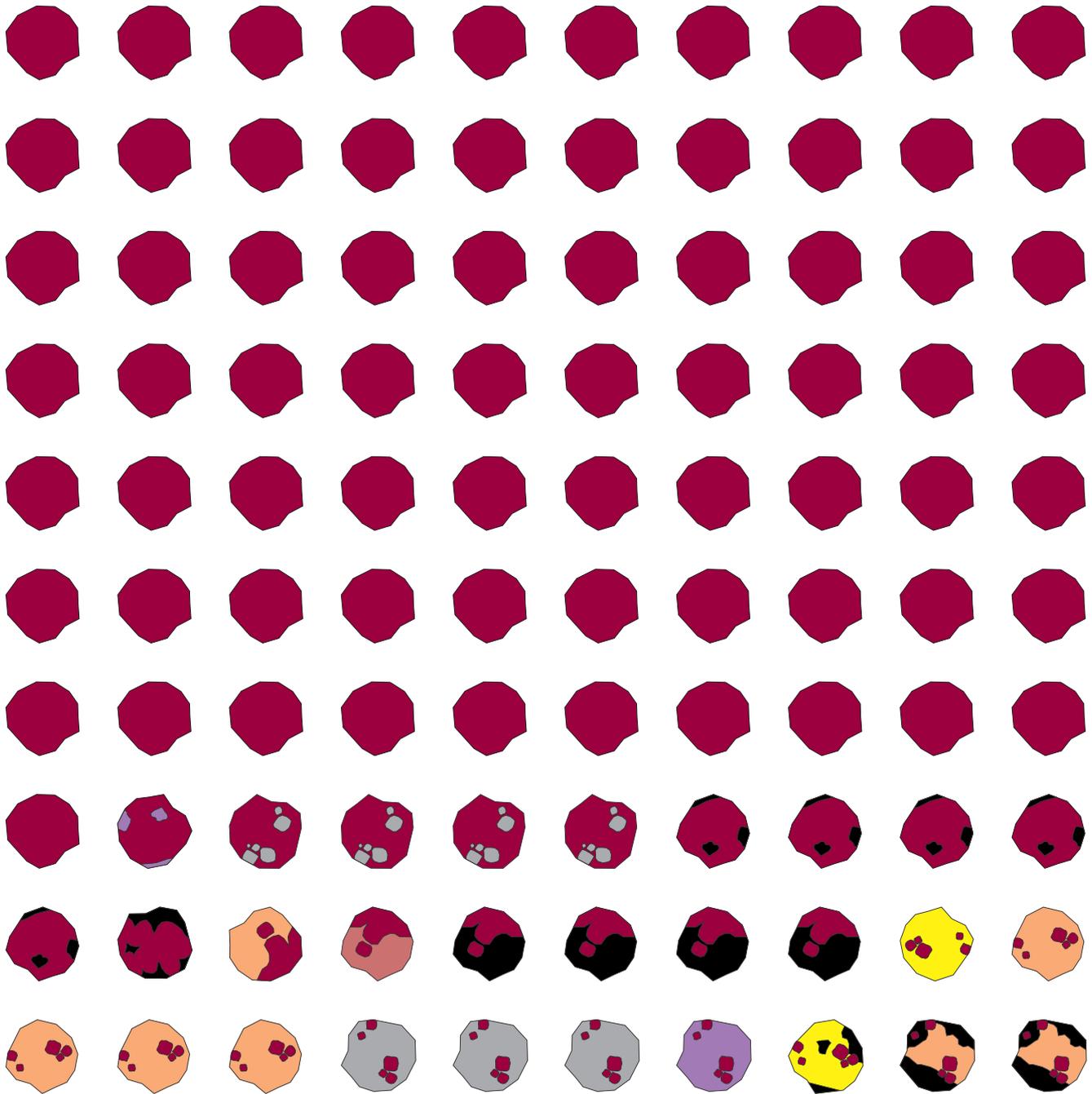
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 3 Sn  
SCAN

E +7 $\mu$ m

August

2014

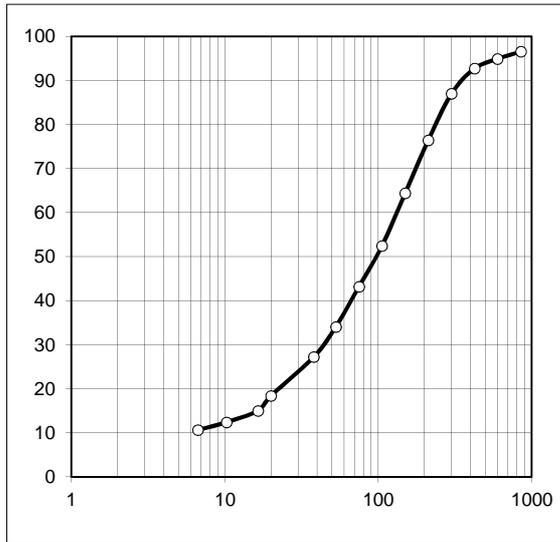




BURNIE LABORATORY  
Mineralogy sizing sheet

PROJECT	T0887
SAMPLE	St Dizier Comp 4
FROM TEST NO	
DATE	50814
TECHNICIAN	MS

St Dizier Comp 4		SIZE um	WEIGHTS			
			gm	(%)	%PASS	
P80	242	850	6.33	3.44	96.6	
		600	3.06	1.66	94.9	
		425	3.95	2.15	92.8	
		300	10.61	5.76	87.0	
		212	19.40	10.54	76.4	
		150	22.16	12.04	64.4	
		106	21.98	11.94	52.5	
		75	17.05	9.26	43.2	
		53	16.79	9.12	34.1	
		38	12.56	6.82	27.3	
20	16.26	8.83	18.4			
TEMP	21	CS3	17	6.21	3.37	15.0
SG	3.00	CS4	10	4.82	2.62	12.4
MINS	20	CS5	7	3.22	1.75	10.7
		SUB	19.65	10.68		
		TOTAL	184.05	100.00		



ANALYSES

SIZE um	WT %	Sn		Fe		S		SiO2		Mount Number
		%	dist	%	dist	%	dist	%	dist	
212	23.6	0.40	14.1	36.40	20.4	0.71	25.9	18.70	29.3	887162
106	24.0	0.66	23.6	49.20	28.0	0.58	21.5	11.60	18.5	887163
53	18.4	0.71	19.5	48.80	21.3	0.63	17.9	10.95	13.4	887164
20	15.7	0.73	17.1	47.10	17.5	0.53	12.8	12.55	13.1	887165
7	7.7	1.04	12.0	49.60	9.1	0.73	8.7	10.35	5.3	887166
<7	10.7	0.86	13.7	14.55	3.7	0.79	13.1	28.70	20.4	
CALC	100.0	0.67	100.0	42.11	100.0	0.65	100.0	15.03	100.0	
ASSAY		0.68		42.10		0.61		15.05		

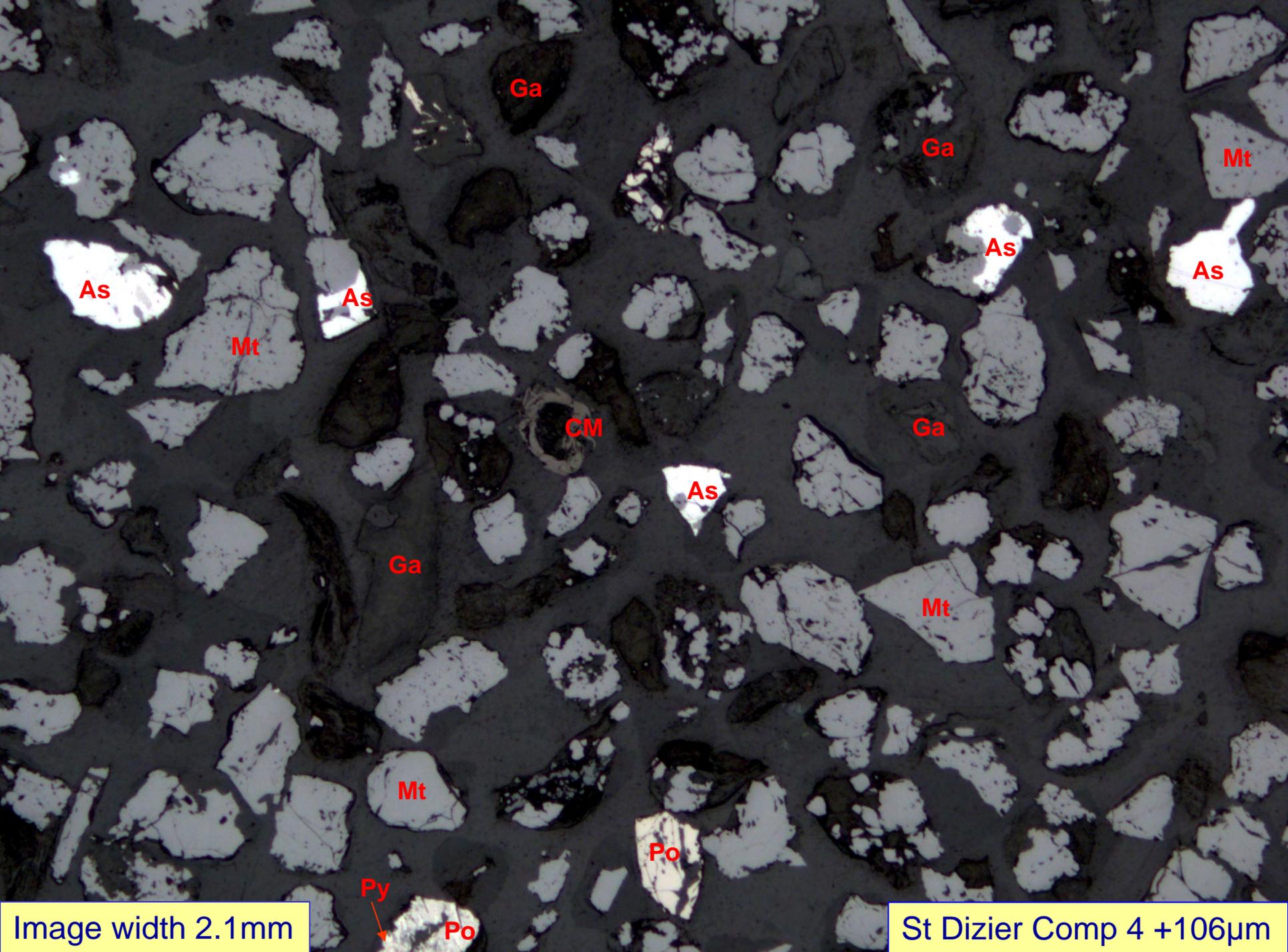


Image width 2.1mm

St Dizier Comp 4 +106µm



**PARTICLE MINERALOGY REPORT**

**St Dizier Comp 4  
August 2014**

**A +212µm 24 % by weight**

**GJMcA 15.8.14  
B +106µm 24 % by weight**

**C +53µm 18 % by weight**

**D +20µm 16 % by weight**

**E +7µm 8 % by weight**

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
0.1	0.2	0.3	0.0	0.0	0.0	54.0	45.5	100
5	5	3	15	0	0	73	54	

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
0.0	0.0	1.4	0.2	0.0	0.0	68.7	29.8	100
0	0	47	23	0	0	78	50	

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
0.2	0.0	2.0	0.0	0.0	0.0	58.8	39.1	100
17	3	65	51	0	0	79	70	

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
0.0	1.0	3.0	0.0	0.0	0.0	54.4	41.7	100
0	100	98	53	0	0	94	83	

Average composition - all grains

Py	Po	As	Cs	Cp	GoHe	Mt	Ga	n
0.0	0.2	1.0	0.0	0.0	0.0	54.3	44.5	100
0	20	100	94	0	0	97	97	

ASSAYS

Calc'd	SG	Cu	Sn	As	S	Fe
4.11	0.00	0.00		0.2	0.2	51.4
Actual			0.40		0.7	36.4

ASSAYS

Calc'd	SG	Cu	Sn	As	S	Fe
4.48	0.00	0.21		0.9	0.4	59.0
Actual			0.66		0.6	49.2

ASSAYS

Calc'd	SG	Cu	Sn	As	S	Fe
4.27	0.00	0.00		1.3	0.7	54.1
Actual			0.71		0.6	48.8

ASSAYS

Calc'd	SG	Cu	Sn	As	S	Fe
4.22	0.00	0.00		2.0	1.3	52.1
Actual			0.73		0.5	47.1

ASSAYS

Calc'd	SG	Cu	Sn	As	S	Fe
4.14	0.00	0.00		0.7	0.4	51.6
Actual			1.04		0.7	49.6

COMPOSITE PROPORTIONS

	Py	Po	As	Cs	GoHe	Mt	Ga
Mono	0	0	0	0	0	28	51
Binary	0	31	38	87	0	66	40
Ternary	9	56	62	10	0	6	7
Quat.y+	91	12	0	3	0	0	2
#Grains	2	3	8	0	0	74	84

COMPOSITE PROPORTIONS

	Py	Po	As	Cs	GoHe	Mt	Ga
Mono	0	0	71	38	0	54	37
Binary	0	0	11	39	0	44	62
Ternary	0	0	18	22	0	2	1
Quat.y+	0	0	0	1	0	0	0
#Grains	0	0	3	3	0	88	59

COMPOSITE PROPORTIONS

	Py	Po	As	Cs	GoHe	Mt	Ga
Mono	0	0	51	39	0	73	64
Binary	0	0	0	51	0	25	34
Ternary	0	0	49	10	0	1	1
Quat.y+	100	100	0	0	0	1	1
#Grains	1	1	3	0	0	74	56

COMPOSITE PROPORTIONS

	Py	Po	As	Cs	GoHe	Mt	Ga
Mono	0	0	68	61	0	86	91
Binary	0	0	32	38	0	14	9
Ternary	0	100	0	1	0	0	0
Quat.y+	0	0	0	0	0	0	0
#Grains	0	1	3	0	0	58	50

COMPOSITE PROPORTIONS

	Py	Po	As	Cs	GoHe	Mt	Ga
Mono	0	0	100	85	0	98	94
Binary	0	100	0	13	0	2	6
Ternary	0	0	0	2	0	0	0
Quat.y+	0	0	0	0	0	0	0
#Grains	0	1	1	0	0	56	46

BINARY ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	0	0
Po	0	0	0	0	0	0	100
As	0	0	0	0	0	50	50
Cs	0	0	0	0	0	44	56
GoHe	0	0	0	0	0	0	0
Mt	0	0	3	0	0	97	
Ga	0	5	5	0	0	90	

BINARY ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	0	0
Po	0	0	0	0	0	0	0
As	0	0	0	0	0	100	0
Cs	0	0	0	0	0	39	61
GoHe	0	0	0	0	0	0	0
Mt	0	0	3	6	0	91	
Ga	0	0	0	0	0	100	

BINARY ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	0	0
Po	0	0	0	0	0	0	0
As	0	0	0	0	0	0	0
Cs	0	0	0	0	0	71	29
GoHe	0	0	0	0	0	0	0
Mt	0	0	0	0	0	100	
Ga	0	0	0	0	0	100	

BINARY ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	0	0
Po	0	0	0	0	0	0	0
As	0	0	0	0	0	0	100
Cs	0	0	0	0	0	18	82
GoHe	0	0	0	0	0	0	0
Mt	0	0	0	0	0	100	
Ga	0	0	1	0	0	99	

BINARY ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	0	0
Po	0	0	0	0	0	0	100
As	0	0	0	0	0	0	0
Cs	0	0	0	0	0	36	64
GoHe	0	0	0	0	0	0	0
Mt	0	0	0	0	0	100	
Ga	0	32	0	0	0	68	

TOTAL ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	100	0	0	0	0	91	100
Po	69	0	0	0	0	12	100
As	0	0	0	0	0	81	81
Cs	0	0	3	0	0	52	62
GoHe	0	0	0	0	0	0	0
Mt	0	0	8	0	0	70	
Ga	4	6	8	0	0	43	

TOTAL ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	100	0	0	0	0	0	0
Po	0	0	0	0	0	0	0
As	0	0	0	0	0	29	18
Cs	0	0	1	0	0	38	46
GoHe	0	0	0	0	0	0	0
Mt	0	0	2	4	0	42	
Ga	0	0	1	0	0	63	

TOTAL ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	100	0	0	0	0	100	100
Po	100	0	0	0	0	100	100
As	0	0	0	0	0	49	49
Cs	0	0	0	0	0	46	25
GoHe	0	0	0	0	0	0	0
Mt	1	1	1	0	0	27	
Ga	1	1	1	0	0	36	

TOTAL ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	0	0
Po	0	0	0	0	0	0	0
As	0	0	0	0	0	0	32
Cs	0	0	0	0	0	8	33
GoHe	0	0	0	0	0	0	0
Mt	0	0	0	0	0	14	
Ga	0	0	0	0	0	9	

TOTAL ASSOCIATION MATRIX

	Py	Po	As	Cs	GoHe	Mt	Ga
Py	0	0	0	0	0	0	0
Po	0	0	0	0	0	0	100
As	0	0	0	0	0	0	0
Cs	0	0	0	0	0	7	10
GoHe	0	0	0	0	0	0	0
Mt	0	0	0	0	0	0	2
Ga	0	2	0	0	0	4	

DISTRIBUTION MATRIX

Free	Binary							Tern	Quat
	Py	Po	As	Cs	GoHe	Mt	Ga		
Py	0	0	0	0	0	0	0	9	91
Po	0	0	0	0	0	0	31	56	12
As	0	0	0	0	0	19	19	62	0
Cs	0	0	0	0	0	38	48	10	3
GoHe	0	0	0	0	0	0	0	0	0
Mt	28	0	0	2	0	0	64	6	0
Ga	51	0	2	2	0	0	36	7	2

DISTRIBUTION MATRIX

Free	Binary							Tern	Quat
	Py	Po	As	Cs	GoHe	Mt	Ga		
Py	0	0	0	0	0	0	0	0	0
Po	0	0	0	0	0	0	0	0	0
As	71	0	0	0	0	11	0	18	0
Cs	38	0	0	0	0	15	24	22	

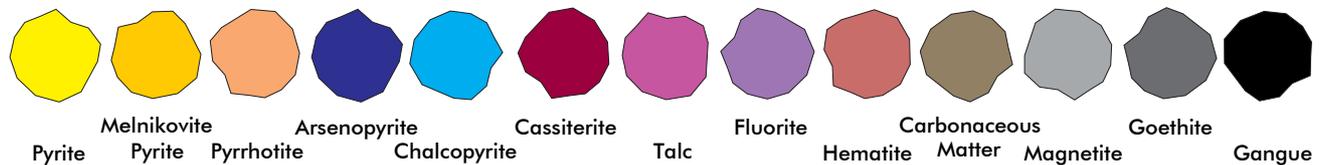
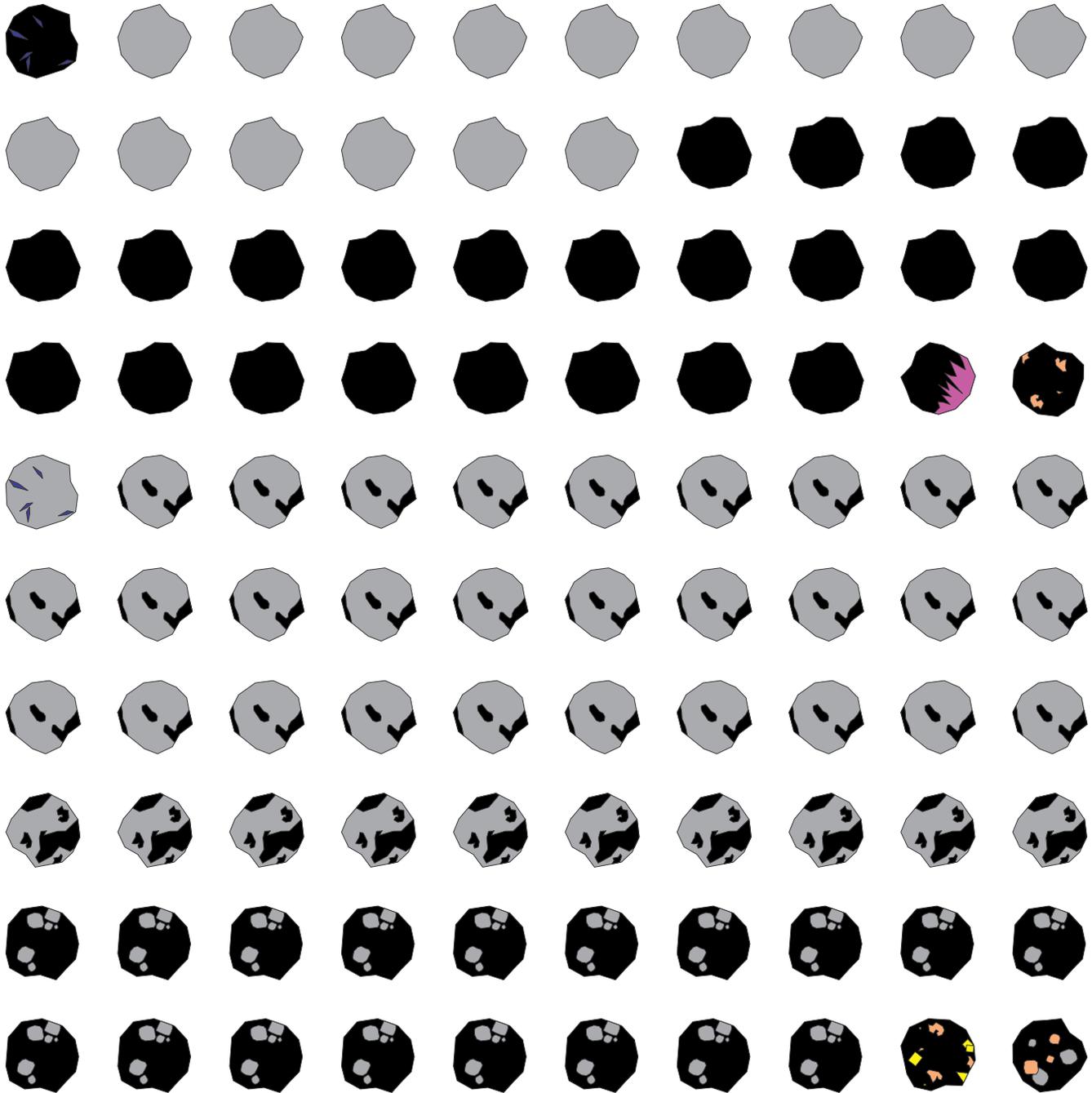
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 4

A +212µm

August

2014



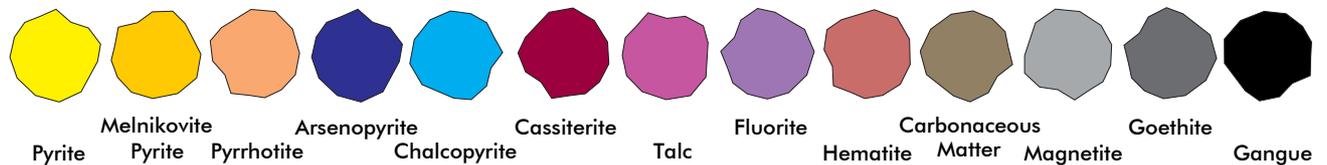
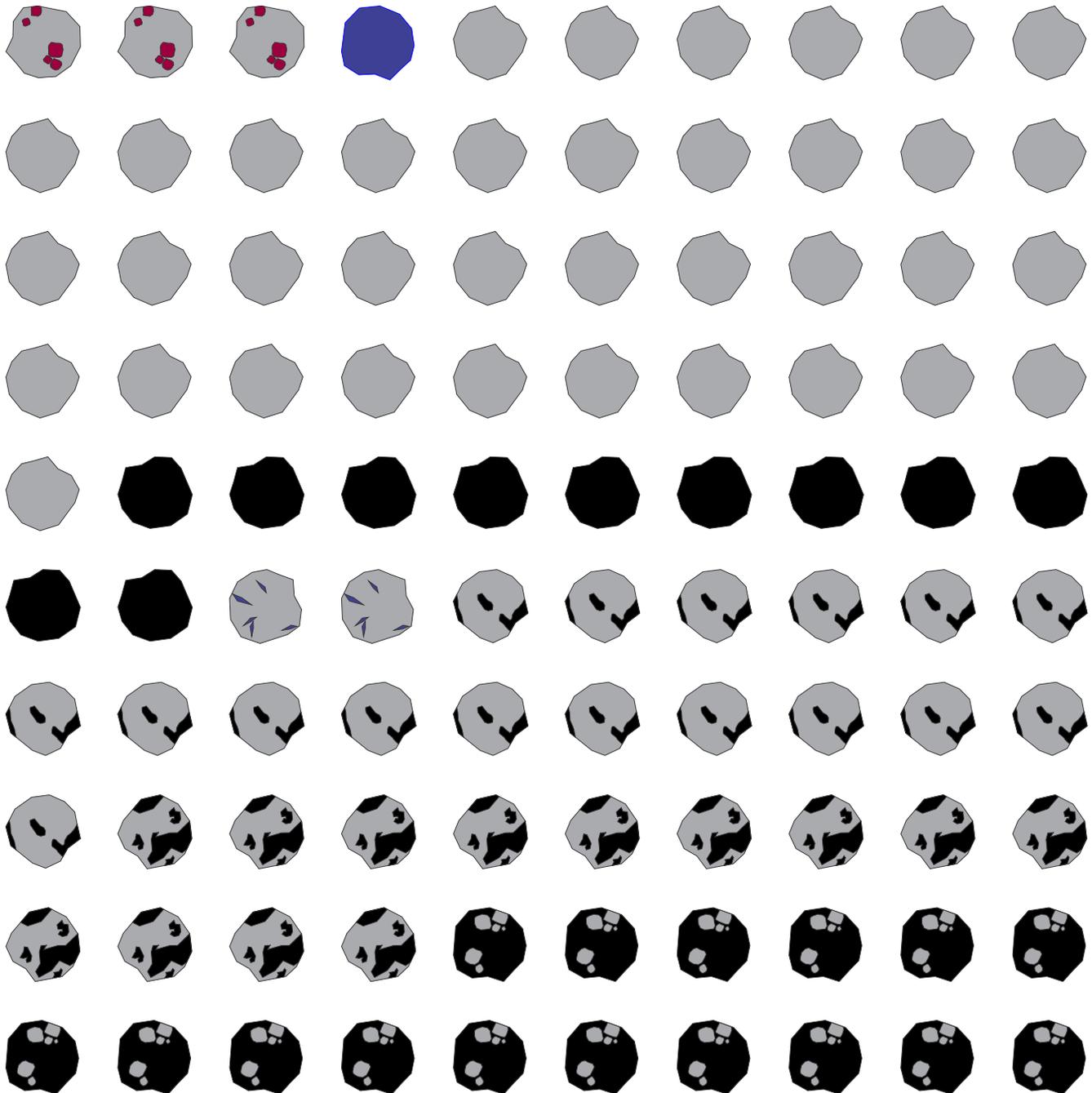
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 4

B + 106µm

August

2014



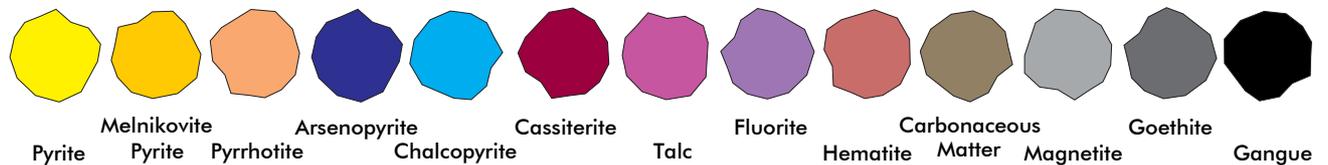
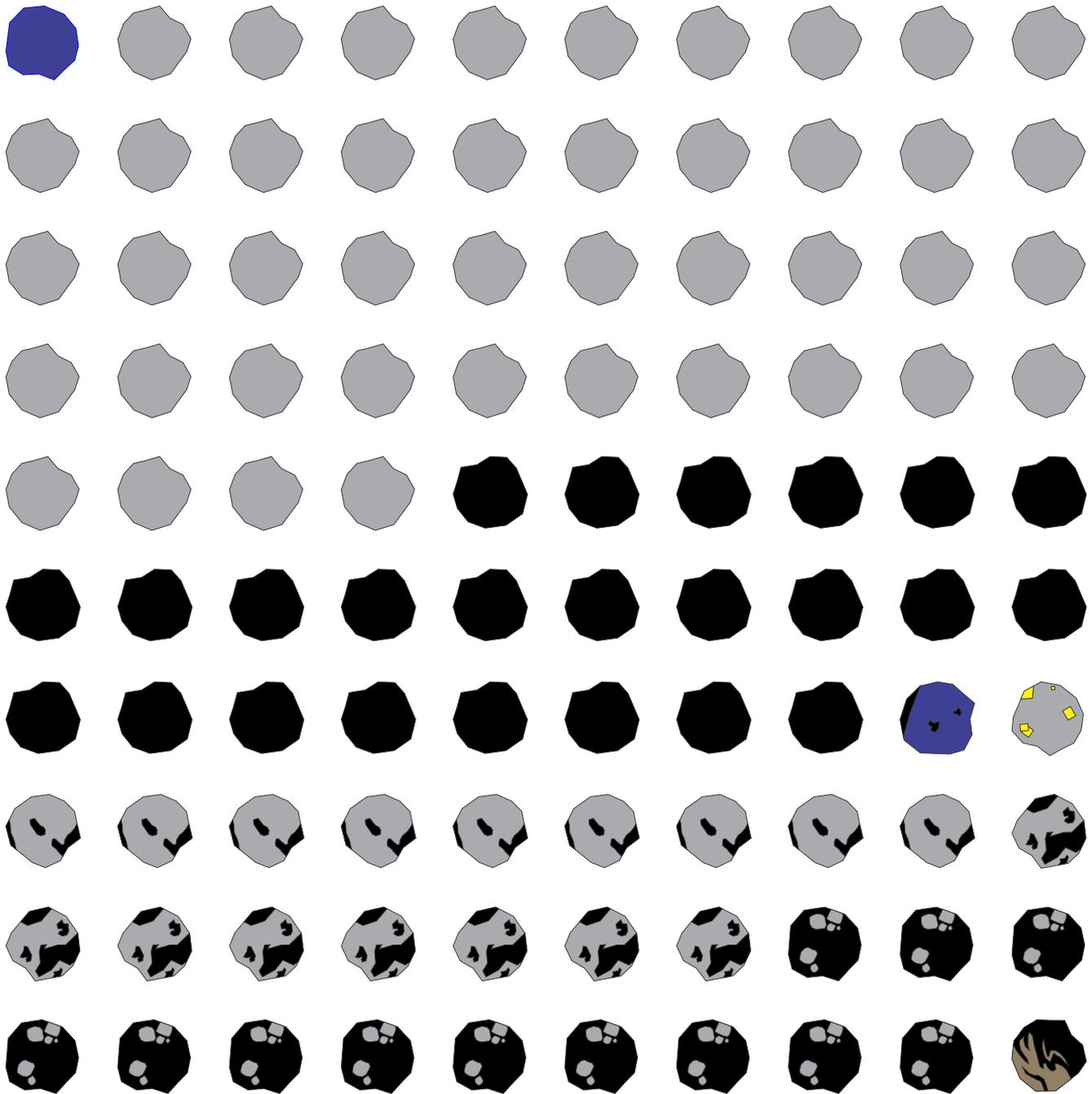
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 4

C +53µm

August

2014



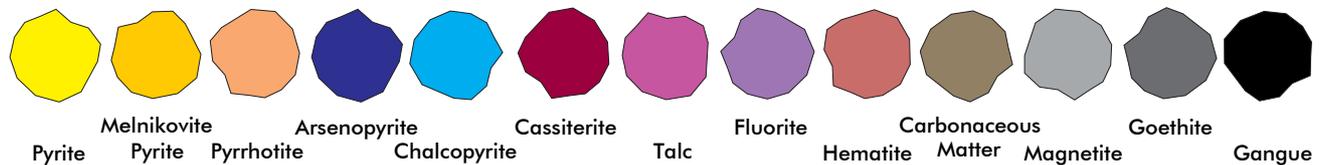
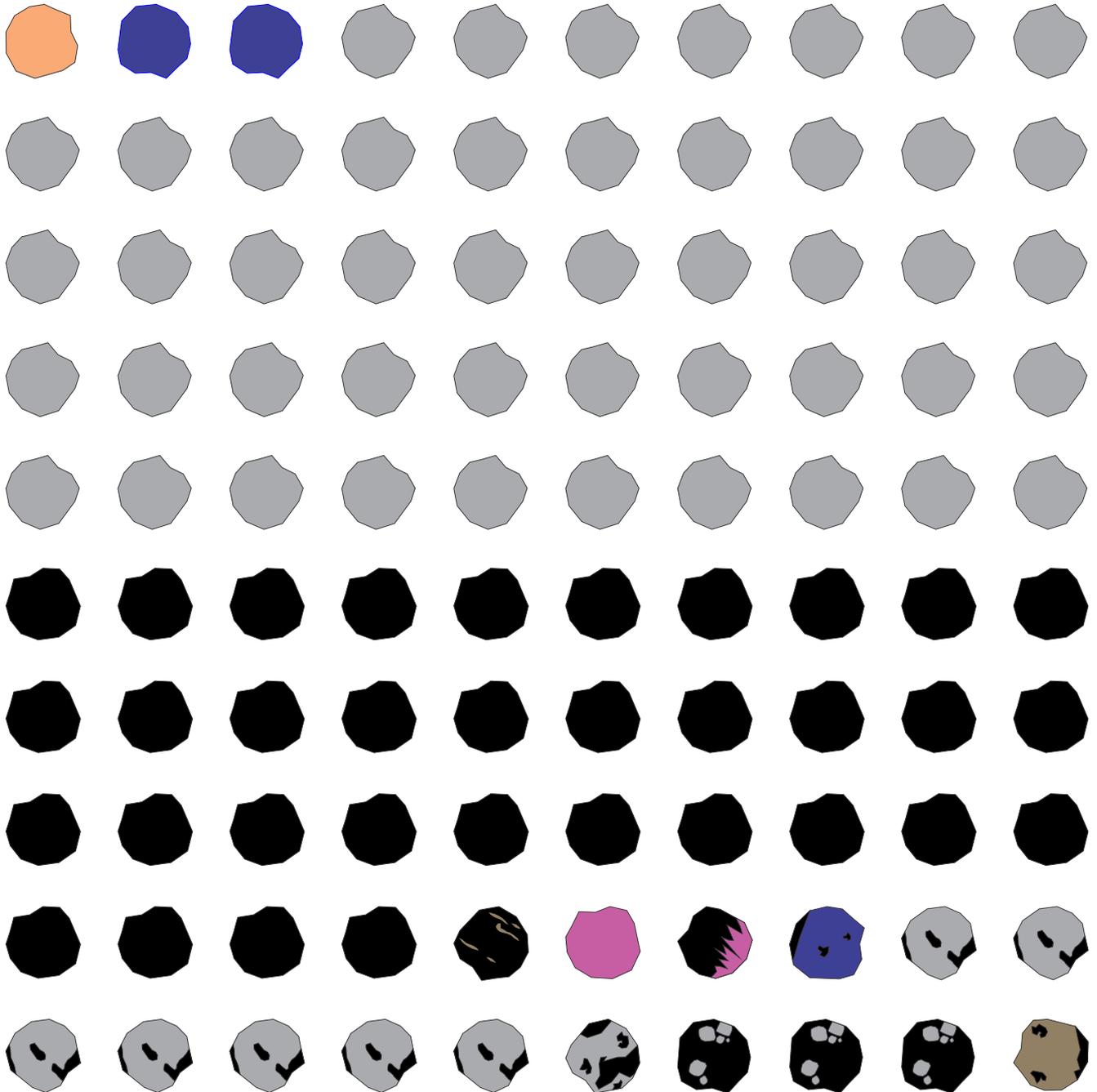
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 4

D +20µm

August

2014



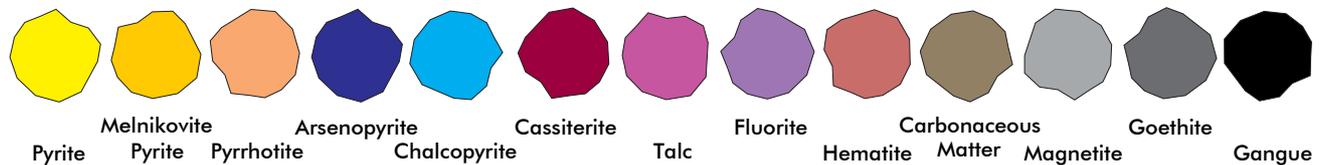
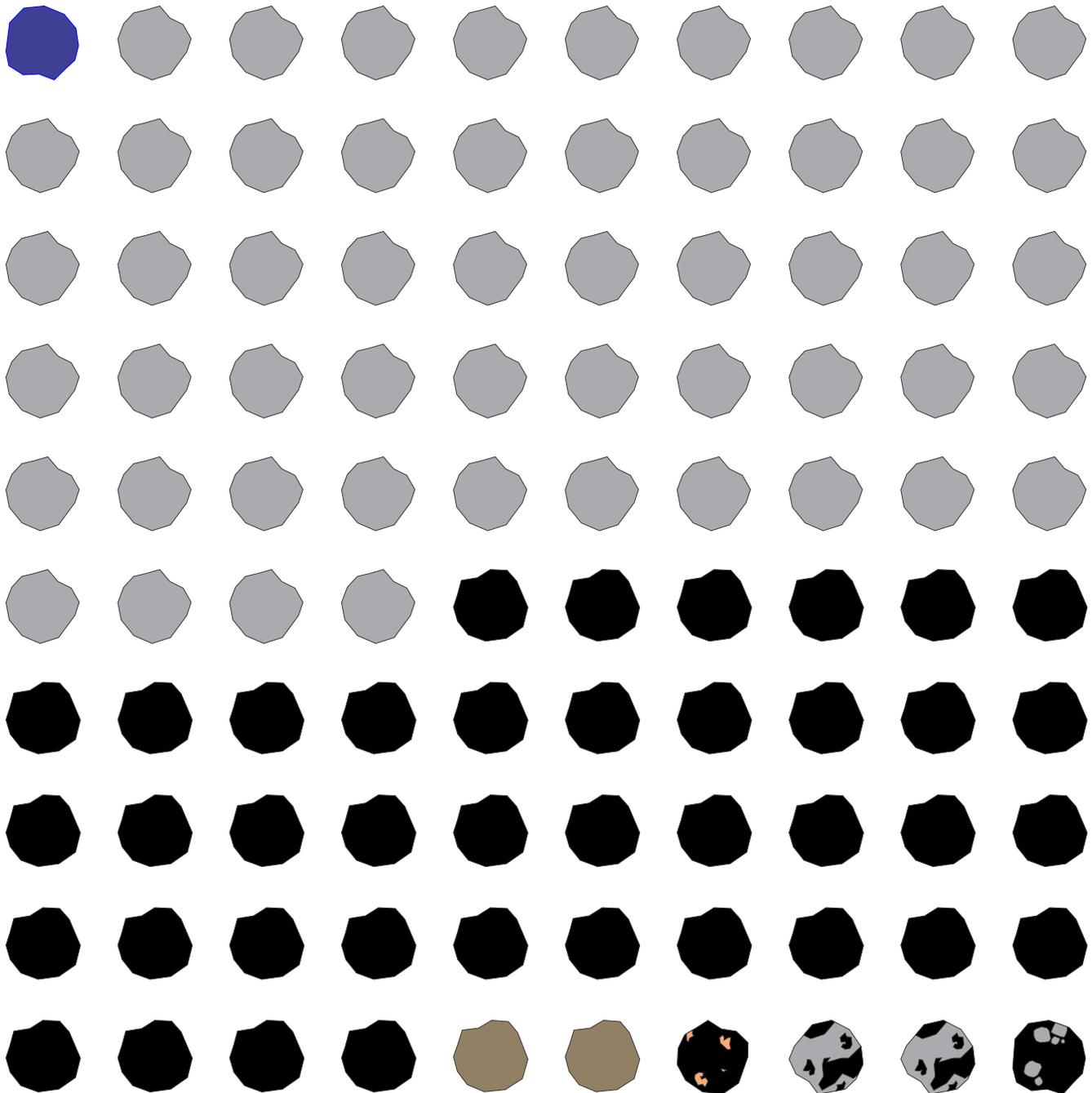
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 4

E +7 $\mu$ m

August

2014



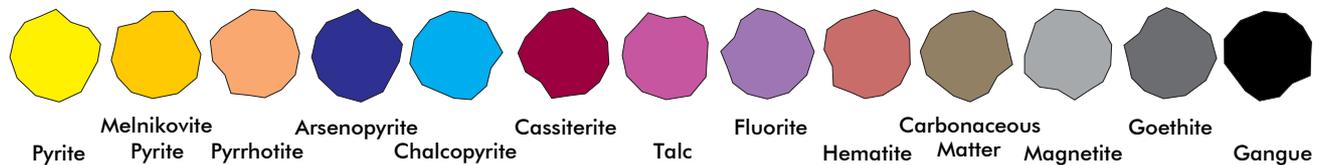
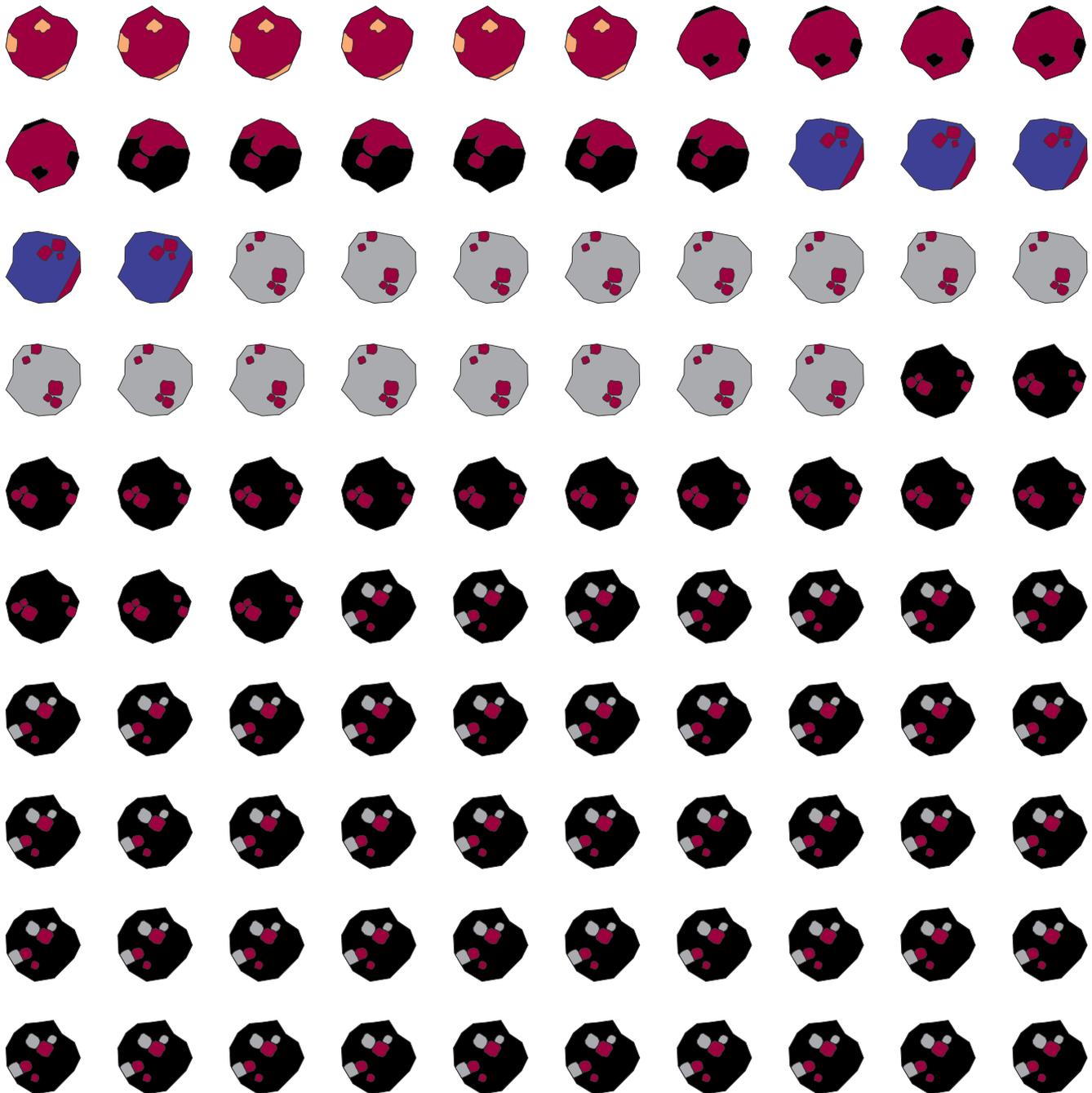
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 4 Sn  
SCAN

A +212µm

August

2014



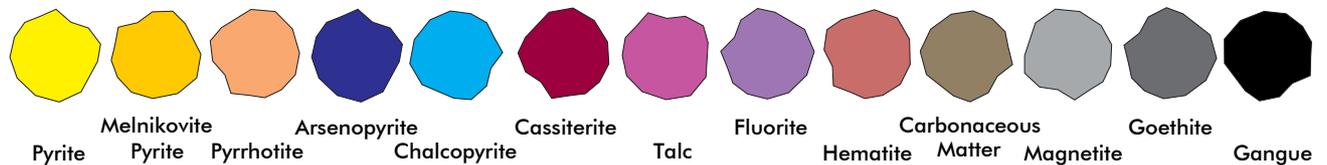
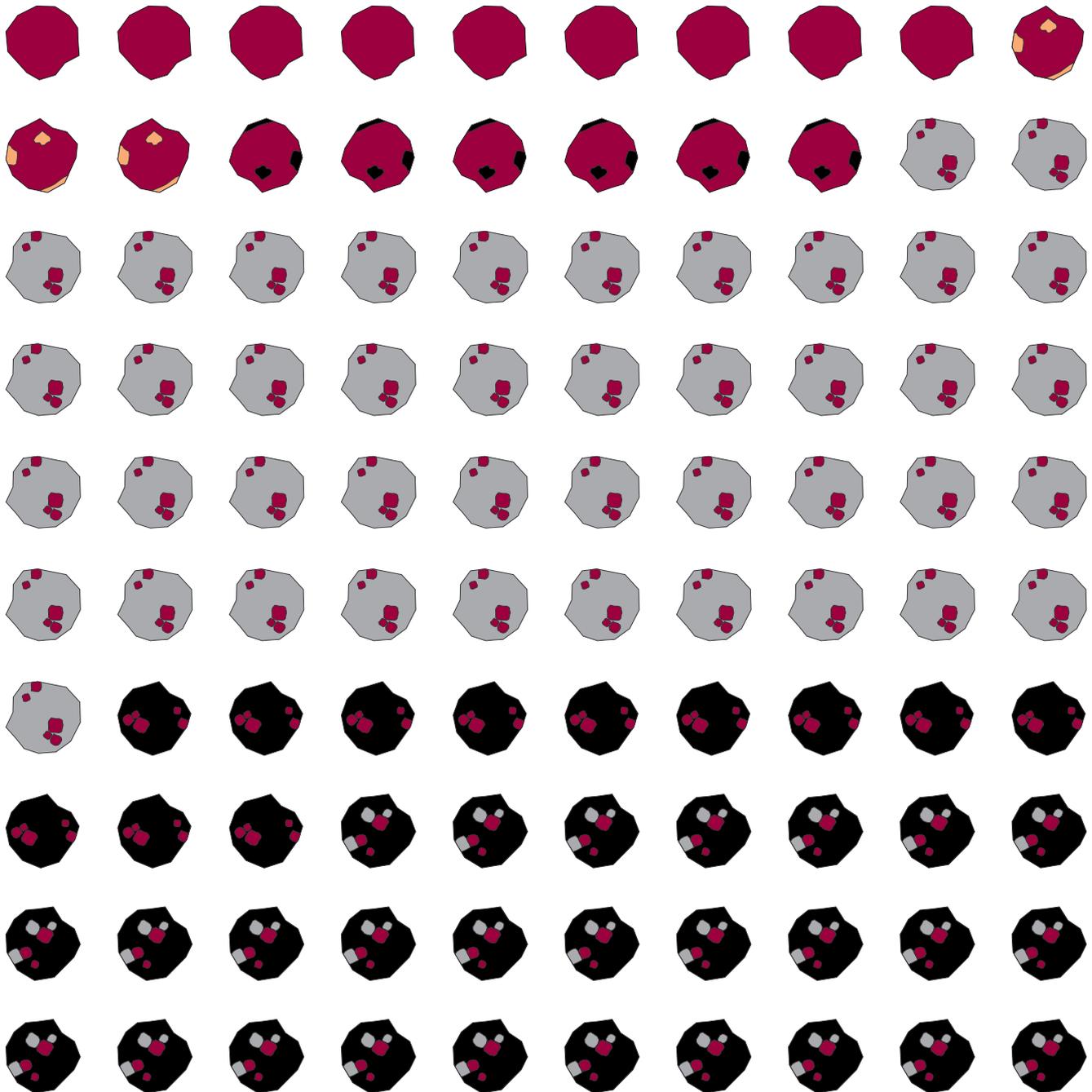
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 4 Sn  
SCAN

B + 106µm

August

2014



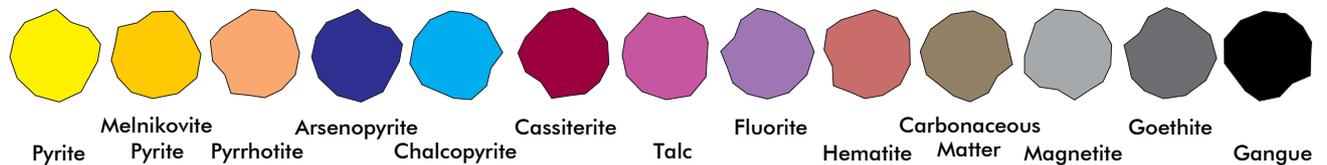
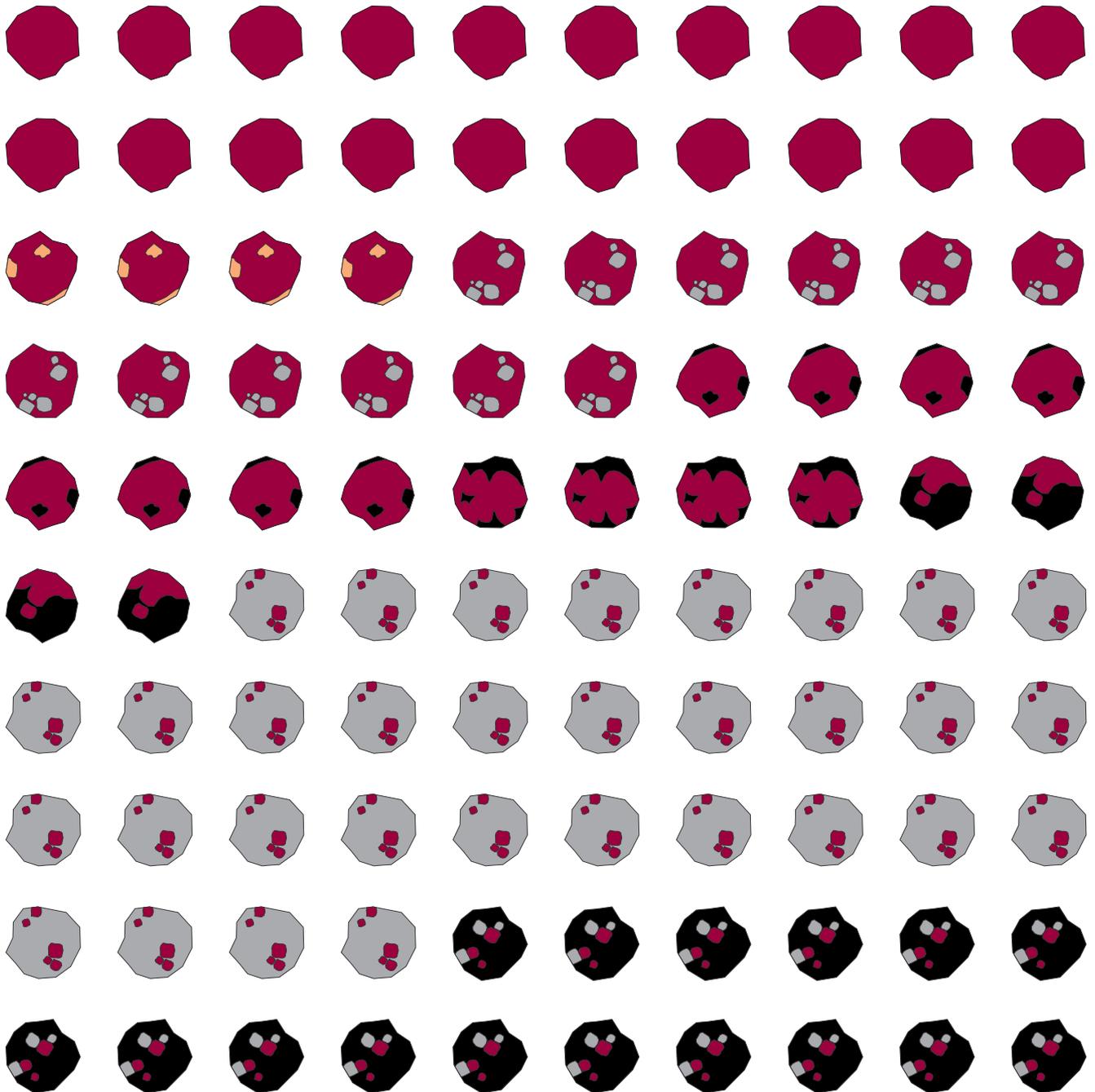
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 4 Sn  
SCAN

C +53µm

August

2014



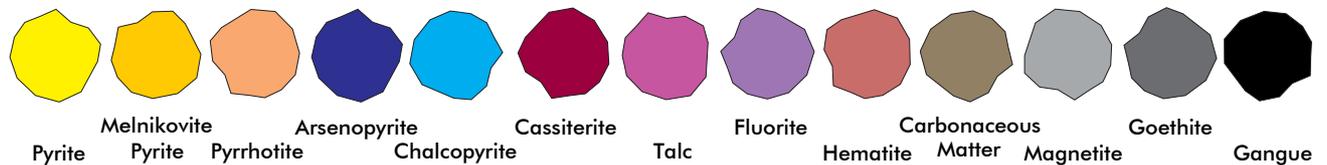
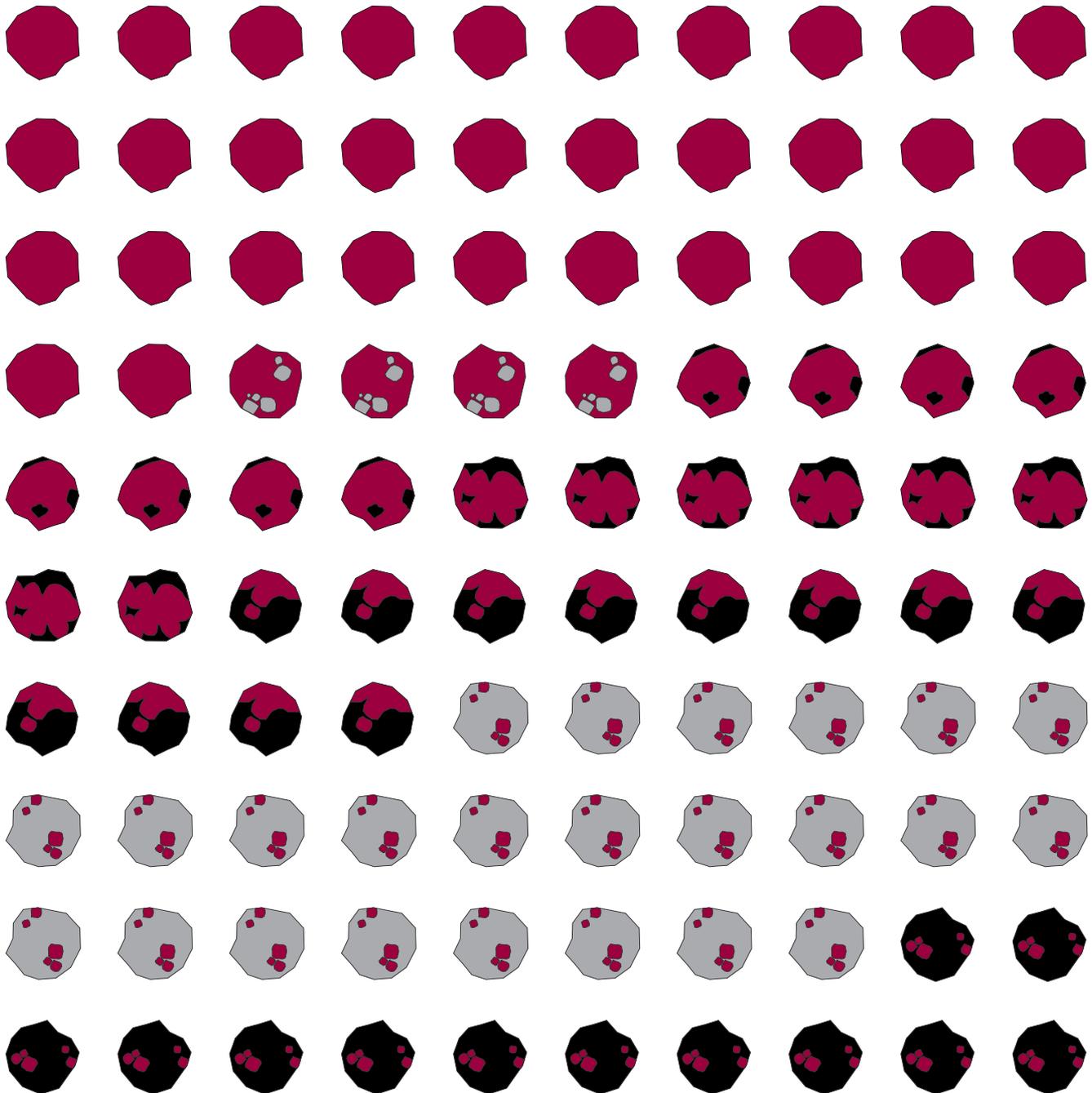
# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 4 Sn  
SCAN

D +20µm

August

2014

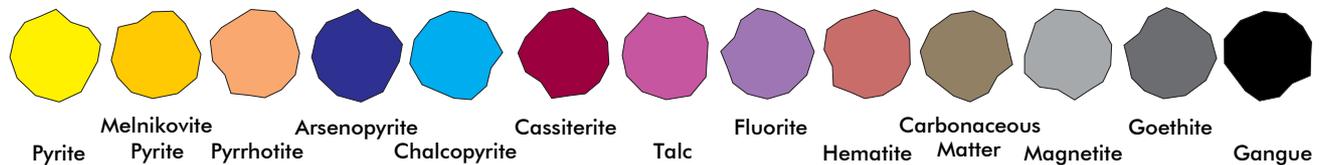
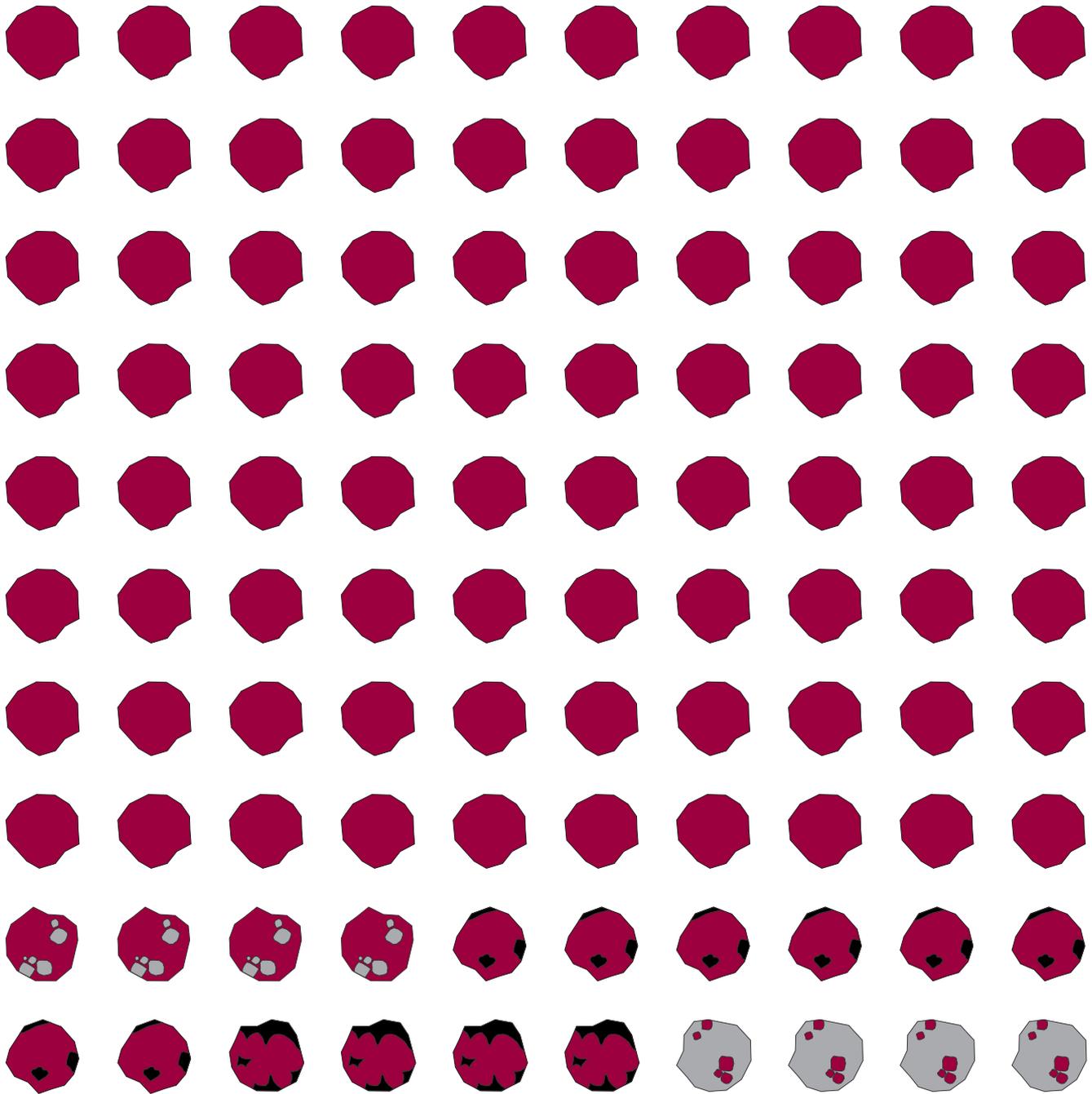


# ALS Metallurgy - Stellar Resources Testwork

St Dizier Comp 4 Sn  
SCAN

E +7 $\mu$ m

August 2014





**WorleyParsons**

resources & energy

EcoNomics™

STELLAR RESOURCES LIMITED  
SAINT DIZIER METALLURGICAL TESTWORK  
2014 PROGRESS REPORT

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## **Appendix 10 – Drill Hole Composites Davis Tube Results**

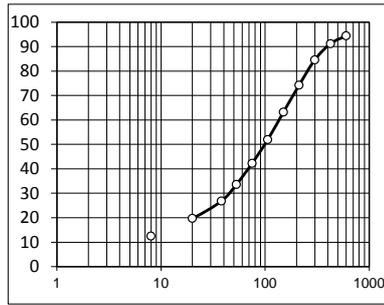
PROJECT	T0887
SAMPLE	St Dizier Composite 2
FROM TEST NO	T13
DATE	200814
TECHNICIAN	ID

DAVIS TUBE RECOVERY ON FRACTIONS

SIZING

SIZE um	WEIGHTS	
	(%)	%PASS
212	21.35	100
106	18.92	81.1
53	17.55	63.5
20	16.83	46.7
8	6.97	39.7
<8	18.38	21.4
TOTAL	100.00	

102.74



SEPARATIONS

Products	WT %	WT %	Fraction											
			%Tot Sn	dist	%Sol Sn	dist	%Cs Sn	dist	%Fe	dist	%SiO2	dist	%S	dist
Mags+212	55.14	11.77	1.03	76.4	0.11	82.1	0.92	75.8	33.50	81.4	20.60	39.6	4.10	56.1
Non Mags+212	44.86	9.58	0.39	23.6	0.03	17.9	0.36	24.2	9.44	18.6	38.70	60.4	3.94	43.9
Calc +212 Total	100.00	21.35	0.74	100.0	0.08	100.0	0.67	100.0	22.71	100.0	28.72	100.0	4.03	100.0
Mags+106	48.96	9.26	0.95	56.2	0.06	66.5	0.89	55.6	42.70	73.7	13.35	28.5	8.45	50.7
Non Mags+106	51.04	9.66	0.71	43.8	0.03	33.5	0.68	44.4	14.60	26.3	32.20	71.5	7.89	49.3
Calc +106 Total	100.00	18.92	0.83	100.0	0.04	100.0	0.78	100.0	28.36	100.0	22.97	100.0	8.16	100.0
Mags+53	40.83	7.17	0.72	35.3	0.05	52.7	0.67	34.5	52.10	69.2	9.00	16.9	6.51	32.9
Non Mags+53	59.17	10.38	0.91	64.7	0.03	47.3	0.88	65.5	16.00	30.8	30.50	83.1	9.17	67.1
Calc +53 Total	100.00	17.55	0.83	100.0	0.04	100.0	0.79	100.0	30.74	100.0	21.72	100.0	8.08	100.0
Mags+20	34.30	5.77	0.49	18.9	0.05	36.4	0.45	18.0	58.60	65.0	5.09	8.4	5.13	21.6
Non Mags+20	65.70	11.06	1.10	81.1	0.04	63.6	1.06	82.0	16.50	35.0	29.10	91.6	9.73	78.4
Calc +20 Total	100.00	16.83	0.89	100.0	0.04	100.0	0.85	100.0	30.94	100.0	20.86	100.0	8.15	100.0
Mags+CS5	31.29	2.18	0.34	6.7	0.04	27.1	0.30	7.0	63.50	63.1	3.03	5.9	4.44	15.6
Non Mags+CS5	68.71	4.79	2.15	93.3	0.05	72.9	2.10	93.0	19.40	36.9	25.30	94.1	12.55	84.4
Calc +CS5 Total	100.00	6.97	1.58	100.0	0.05	100.0	1.48	100.0	34.53	100.0	17.66	100.0	9.77	100.0
-CS5		18.38	0.56		0.06		0.50		15.70		34.10		4.24	
CALC FEED		100.00	0.82		0.04		0.68		23.22		19.03		5.88	

SUMMARY

FRACTIONS um	Picno SG	WT %	Overall											
			%Tot Sn	dist	%Sol Sn	dist	%Cs Sn	dist	%Fe	dist	%SiO2	dist	%S	dist
Mags+212		11.77	1.03	15.87	0.11	25.16	0.92	15.18	33.50	14.84	20.60	9.65	4.10	7.47
Mags+106		9.26	0.95	11.51	0.06	10.61	0.89	11.58	42.70	14.89	13.35	4.92	8.45	12.11
Mags+53		7.17	0.72	6.75	0.05	6.84	0.67	6.75	52.10	14.05	9.00	2.57	6.51	7.22
Mags+20		5.77	0.49	3.70	0.05	4.96	0.45	3.61	58.60	12.73	5.09	1.17	5.13	4.58
Mags+CS5		2.18	0.34	0.97	0.04	1.54	0.30	0.93	63.50	5.21	3.03	0.26	4.44	1.50
Non Mags+212		9.58	0.39	4.89	0.03	5.48	0.36	4.84	9.44	3.40	38.70	14.75	3.94	5.84
Non Mags+106		9.66	0.71	8.97	0.03	5.35	0.68	9.24	14.60	5.31	32.20	12.37	7.89	11.79
Non Mags+53		10.38	0.91	12.37	0.03	6.14	0.88	12.82	16.00	6.25	30.50	12.60	9.17	14.74
Non Mags+20		11.06	1.10	15.92	0.04	8.65	1.06	16.45	16.50	6.87	29.10	12.80	9.73	16.65
Non Mags+CS5		4.79	0.89	5.58	0.04	3.87	0.85	5.71	30.94	5.58	20.86	3.98	8.15	6.04
Total Mags		36.16	0.82	38.81	0.07	49.11	0.75	38.05	45.36	61.73	12.91	18.57	5.88	32.88
Total Non Mags		45.46	0.80	47.72	0.03	29.50	0.77	49.07	16.02	27.41	31.23	56.50	7.83	55.06
-CS5		18.38	0.56	13.47	0.06	21.40	0.50	12.89	15.70	10.86	34.10	24.94	4.24	12.06
CALC FEED		100.00	0.76	100.00	0.05	100.00	0.71	100.00	26.57	100.00	25.13	100.00	6.46	100.00

PROJECT	T0887
TEST NO	T13
DATE	200814
TECHNICIAN	ID

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	11.77
Magnetic Sample (gms)	6.49
Non-magnetic sample(gms)	5.28
Magnetics Mass (%)	55.14

SAMPLE TESTED

St Dizier Composite 2 +212um
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MAGNETIC SEPARATION RESULTS

PRODUCT	Wt (%)	Sn (%)	Dist (%)	Sn (ppm)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	55.14	1.03	76.4	1120	82.1	33.50	81.4	20.60	39.6	4.10	56.1
Non Magnetics	44.86	0.39	23.6	300	17.9	9.44	18.6	38.70	60.4	3.94	43.9
Total	100.00	0.74	100.0	752	100.0	22.71	100.0	28.72	100.0	4.03	100.0
Head		0.72		710		23.10		29.00		2.58	

PROJECT	T0887
TEST NO	T13
DATE	200814
TECHNICIAN	ID

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	11.97
Magnetic Sample (gms)	5.86
Non-magnetic sample(gms)	6.11
Magnetics Mass (%)	48.96

SAMPLE TESTED

St Dizier Composite 2 +106um
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MAGNETIC SEPARATION RESULTS

PRODUCT	Wt (%)	Sn (%)	Dist (%)	SoISn (ppm)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	48.96	0.95	56.2	600	66.5	42.70	73.7	13.35	28.5	8.45	50.7
Non Magnetics	51.04	0.71	43.8	290	33.5	14.60	26.3	32.20	71.5	7.89	49.3
Total	100.00	0.83	100.0	442	100.0	28.36	100.0	22.97	100.0	8.16	100.0
Head		0.83		460		28.70		23.40		7.69	

PROJECT	T0887
TEST NO	T13
DATE	200814
TECHNICIAN	ID

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	11.29
Magnetic Sample (gms)	4.61
Non-magnetic sample(gms)	6.68
Magnetics Mass (%)	40.83

SAMPLE TESTED

St Dizier Composite 2 +53um
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MAGNETIC SEPARATION RESULTS

PRODUCT	Wt (%)	Sn (%)	Dist (%)	SoISn (ppm)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	40.83	0.72	35.3	500	52.7	52.10	69.2	9.00	16.9	6.51	32.9
Non Magnetics	59.17	0.91	64.7	310	47.3	16.00	30.8	30.50	83.1	9.17	67.1
Total	100.00	0.83	100.0	388	100.0	30.74	100.0	21.72	100.0	8.08	100.0
Head		0.84		420		31.90		21.80		5.85	

PROJECT	T0887
TEST NO	T13
DATE	200814
TECHNICIAN	ID

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	12.01
Magnetic Sample (gms)	4.12
Non-magnetic sample(gms)	7.89
Magnetics Mass (%)	34.30

SAMPLE TESTED

St Dizier Composite 2 +20um

MAGNETIC SEPARATION RESULTS

PRODUCT	Wt (%)	Sn (%)	Dist (%)	SoISn (ppm)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	34.30	0.49	18.9	450	36.4	58.60	65.0	5.09	8.4	5.13	21.6
Non Magnetics	65.70	1.10	81.1	410	63.6	16.50	35.0	29.10	91.6	9.73	78.4
Total	100.00	0.89	100.0	424	100.0	30.94	100.0	20.86	100.0	8.15	100.0
Head		0.86		430		31.70		21.10		7.89	

PROJECT	T0887
TEST NO	T13
DATE	200814
TECHNICIAN	ID

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	10.29
Magnetic Sample (gms)	3.22
Non-magnetic sample(gms)	7.07
Magnetics Mass (%)	31.29

SAMPLE TESTED
St Dizier Composite 2 +CS5

MAGNETIC SEPARATION RESULTS

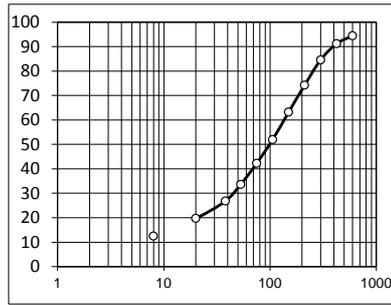
PRODUCT	Wt (%)	Sn (%)	Dist (%)	SolSn (ppm)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	31.29	0.34	6.7	370	24.5	63.50	59.9	3.03	5.2	4.44	13.9
Non Magnetics	68.71	2.15	93.3	520	75.5	19.40	40.1	25.30	94.8	12.55	86.1
Total	100.00	1.58	100.0	473	100.0	33.20	100.0	18.33	100.0	10.01	100.0
Head		1.51		480		34.10		18.70		6.89	

PROJECT	T0887
SAMPLE	St Dizier Composite 3
FROM TEST NO	T14
DATE	200814
TECHNICIAN	ID

DAVIS TUBE RECOVERY ON FRACTIONS

SIZING

SIZE um	WEIGHTS	
	(%)	%PASS
212	21.89	100
106	20.22	79.8
53	19.09	60.7
20	17.28	43.4
8	6.42	37.0
<8	15.10	21.9
TOTAL	100.00	



SEPARATIONS

Products	WT %	WT %	Fraction											
			%Tot Sn	dist	%Sol Sn	dist	%Cs Sn	dist	%Fe	dist	%SiO2	dist	%S	dist
Mags+212	55.72	12.20	0.99	64.0	0.022	71.6	0.97	63.9	40.10	87.3	19.55	36.1	5.05	74.8
Non Mags+212	44.28	9.69	0.70	36.0	0.011	28.4	0.69	36.1	7.32	12.7	43.50	63.9	2.14	25.2
Calc +212 Total	100.00	21.89	0.86	100.0	0.017	100.0	0.84	100.0	25.59	100.0	30.15	100.0	3.76	100.0
Mags+106	57.87	11.70	0.89	43.5	0.025	75.7	0.87	42.9	54.70	88.9	9.33	23.6	6.27	73.5
Non Mags+106	42.13	8.52	1.59	56.5	0.011	24.3	1.58	57.1	9.39	11.1	41.60	76.4	3.11	26.5
Calc +106 Total	100.00	20.22	1.18	100.0	0.019	100.0	1.17	100.0	35.61	100.0	22.92	100.0	4.94	100.0
Mags+53	56.23	10.73	0.60	28.1	0.025	72.8	0.58	27.4	60.90	89.0	4.96	13.7	6.95	66.9
Non Mags+53	43.77	8.36	1.97	71.9	0.012	27.2	1.96	72.6	9.68	11.0	40.00	86.3	4.42	33.1
Calc +53 Total	100.00	19.09	1.20	100.0	0.019	100.0	1.18	100.0	38.48	100.0	20.30	100.0	5.84	100.0
Mags+20	49.90	8.62	0.35	13.5	0.024	64.8	0.33	12.8	65.20	84.8	2.84	6.8	7.79	61.8
Non Mags+20	50.10	8.66	2.23	86.5	0.013	35.2	2.22	87.2	11.65	15.2	38.70	93.2	4.79	38.2
Calc +20 Total	100.00	17.28	1.29	100.0	0.018	100.0	1.27	100.0	38.37	100.0	20.80	100.0	6.29	100.0
Mags+CS5	36.98	2.37	0.22	5.9	0.023	62.1	0.20	6.5	65.30	83.9	1.70	4.5	8.21	56.0
Non Mags+CS5	63.02	4.05	2.82	76.0	0.014	37.9	2.81	93.5	12.50	16.1	36.20	95.5	6.43	44.0
Calc +CS5 Total	100.00	6.42	1.86	81.9	0.018	100.0	1.50	100.0	38.85	100.0	18.98	100.0	7.32	100.0
-CS5		15.10	0.39		0.018		0.37		17.20		37.60		3.45	
CALC FEED		100.00	1.06		0.016		0.96		29.27		19.93		4.49	

SUMMARY

FRACTIONS um	Picno SG	WT %	Overall											
			%Tot Sn	dist	%Sol Sn	dist	%Cs Sn	dist	%Fe	dist	%SiO2	dist	%S	dist
Mags+212		12.20	0.99	12.11	0.02	14.50	0.97	12.07	40.10	15.06	19.55	9.44	5.05	12.33
Mags+106		11.70	0.89	10.45	0.03	15.81	0.87	10.35	54.70	19.71	9.33	4.32	6.27	14.69
Mags+53		10.73	0.60	6.46	0.03	14.50	0.58	6.31	60.90	20.13	4.96	2.11	6.95	14.94
Mags+20		8.62	0.35	3.03	0.02	11.18	0.33	2.87	65.20	17.31	2.84	0.97	7.79	13.45
Mags+CS5		2.37	0.22	0.52	0.02	2.95	0.20	0.48	65.30	4.77	1.70	0.16	8.21	3.90
Non Mags+212		9.69	0.70	6.81	0.01	5.76	0.69	6.83	7.32	2.18	43.50	16.69	2.14	4.15
Non Mags+106		8.52	1.59	13.59	0.01	5.06	1.58	13.75	9.39	2.46	41.60	14.03	3.11	5.30
Non Mags+53		8.36	1.97	16.51	0.01	5.42	1.96	16.72	9.68	2.49	40.00	13.23	4.42	7.40
Non Mags+20		8.66	2.23	19.37	0.01	6.08	2.22	19.62	11.65	3.11	38.70	13.26	4.79	8.30
Non Mags+CS5		4.05	1.29	5.24	0.02	4.04	1.27	5.27	38.37	4.78	20.80	3.33	6.29	5.09
Total Mags		45.63	0.71	32.57	0.02	58.94	0.69	32.08	54.79	76.98	9.41	17.00	6.49	59.32
Total Non Mags		39.27	1.56	61.52	0.01	26.37	1.55	62.18	12.42	15.02	38.95	60.53	3.85	30.25
-CS5		15.10	0.39	5.91	0.02	14.69	0.37	5.74	17.20	8.00	37.60	22.47	3.45	10.43
CALC FEED		100.00	1.00	100.00	0.02	100.00	0.98	100.00	32.48	100.00	25.27	100.00	4.99	100.00

PROJECT	T0887
TEST NO	T14
DATE	200814
TECHNICIAN	ID

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	11.45
Magnetic Sample (gms)	6.38
Non-magnetic sample(gms)	5.07
Magnetics Mass (%)	55.72

SAMPLE TESTED

St Dizier Composite 3 +212um
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MAGNETIC SEPARATION RESULTS

PRODUCT	Wt (%)	Sn (%)	Dist (%)	SolSn (%)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	55.72	0.99	64.0	220	71.6	40.10	87.3	19.55	36.1	5.05	74.8
Non Magnetics	44.28	0.70	36.0	110	28.4	7.32	12.7	43.50	63.9	2.14	25.2
Total	100.00	0.86	100.0	171	100.0	25.59	100.0	30.15	100.0	3.76	100.0
Head		0.86		170		24.70		30.60		3.70	

PROJECT	T0887
TEST NO	T14
DATE	200814
TECHNICIAN	ID

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	11.56
Magnetic Sample (gms)	6.69
Non-magnetic sample(gms)	4.87
Magnetics Mass (%)	57.87

SAMPLE TESTED

St Dizier Composite 3 +106um
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MAGNETIC SEPARATION RESULTS

PRODUCT	Wt (%)	Sn (%)	Dist (%)	SoISn (%)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	57.87	0.89	43.5	250	75.7	54.70	88.9	9.33	23.6	6.27	73.5
Non Magnetics	42.13	1.59	56.5	110	24.3	9.39	11.1	41.60	76.4	3.11	26.5
Total	100.00	1.18	100.0	191	100.0	35.61	100.0	22.92	100.0	4.94	100.0
Head		1.13		200		36.90		21.90		5.21	

0.89	250	54.7	9.33	6.27
1.59	110	9.39	41.6	3.11

PROJECT	T0887
TEST NO	T14
DATE	200814
TECHNICIAN	ID

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	10.28
Magnetic Sample (gms)	5.78
Non-magnetic sample(gms)	4.50
Magnetics Mass (%)	56.23

SAMPLE TESTED
St Dizier Composite 3 +53um

MAGNETIC SEPARATION RESULTS

PRODUCT	Wt (%)	Sn (%)	Dist (%)	SoISn (%)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	56.23	0.60	28.1	250	72.8	60.90	89.0	4.96	13.7	6.95	66.9
Non Magnetics	43.77	1.97	71.9	120	27.2	9.68	11.0	40.00	86.3	4.42	33.1
Total	100.00	1.20	100.0	193	100.0	38.48	100.0	20.30	100.0	5.84	100.0
Head		1.11		200		39.30		20.10		5.55	

0.6	250	60.9	4.96	6.95
1.97	120	9.68	40	4.42

PROJECT	T0887
TEST NO	T14
DATE	200814
TECHNICIAN	ID

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	10.28
Magnetic Sample (gms)	5.13
Non-magnetic sample(gms)	5.15
Magnetics Mass (%)	49.90

SAMPLE TESTED	
St Dizier Composite 3 +20um	

MAGNETIC SEPARATION RESULTS

PRODUCT	Wt (%)	Sn (%)	Dist (%)	SoISn (%)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	49.90	0.35	13.5	240	64.8	65.20	84.8	2.84	6.8	7.79	61.8
Non Magnetics	50.10	2.23	86.5	130	35.2	11.65	15.2	38.70	93.2	4.79	38.2
Total	100.00	1.29	100.0	185	100.0	38.37	100.0	20.80	100.0	6.29	100.0
Head		1.17		180		38.40		19.85		6.63	

0.35	240	65.2	2.84	7.79
2.23	130	11.65	38.7	4.79

PROJECT	T0887
TEST NO	T14
DATE	200814
TECHNICIAN	ID

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	10.41
Magnetic Sample (gms)	3.85
Non-magnetic sample(gms)	6.56
Magnetics Mass (%)	36.98

SAMPLE TESTED	
St Dizier Composite 3 +CS5	

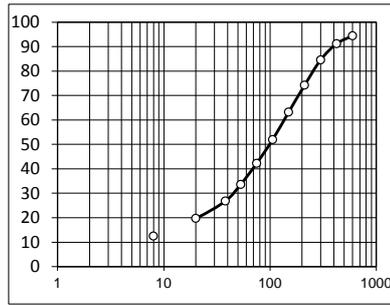
MAGNETIC SEPARATION RESULTS											
PRODUCT	Wt (%)	Sn (%)	Dist (%)	SolSn (%)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	36.98	0.22	4.4	230	49.1	65.30	75.4	1.70	2.7	8.21	42.8
Non Magnetics	63.02	2.82	95.6	140	50.9	12.50	24.6	36.20	97.3	6.43	57.2
Total	100.00	1.86	100.0	173	100.0	32.03	100.0	23.44	100.0	7.09	100.0
Head		1.62		180		39.60		18.50		7.11	

PROJECT	T0887
SAMPLE	St Dizier Composite 4
FROM TEST NO	T15
DATE	200814
TECHNICIAN	ID

DAVIS TUBE RECOVERY ON FRACTIONS

SIZING

SIZE um	WEIGHTS	
	(%)	%PASS
212	27.29	100
106	23.85	76.2
53	18.00	58.2
20	14.41	43.7
8	5.75	38.0
<8	10.70	27.3
TOTAL	100.00	



SEPARATIONS

Products	WT %	WT %	Fraction											
			%Tot Sn	dist	%Sol Sn	dist	%Cs Sn	dist	%Fe	dist	%SiO2	dist	%S	dist
Mags+212	74.44	20.31	0.53	80.2	0.04	81.5	0.49	80.1	51.80	98.1	11.10	47.3	0.63	78.9
Non Mags+212	25.56	6.98	0.38	19.8	0.03	18.5	0.35	19.9	2.97	1.9	36.00	52.7	0.49	21.1
Calc +212 Total	100.00	27.29	0.49	100.0	0.04	100.0	0.45	100.0	39.32	100.0	17.46	100.0	0.59	100.0
Mags+106	82.93	19.78	0.61	77.5	0.05	75.7	0.57	77.6	57.80	98.6	6.54	49.2	0.51	67.4
Non Mags+106	17.07	4.07	0.86	22.5	0.07	24.3	0.79	22.4	3.92	1.4	32.80	50.8	1.20	32.6
Calc +106 Total	100.00	23.85	0.65	100.0	0.05	100.0	0.60	100.0	48.60	100.0	11.02	100.0	0.63	100.0
Mags+53	77.34	13.92	0.55	56.9	0.04	62.3	0.51	56.5	62.20	97.8	5.22	35.6	0.23	29.4
Non Mags+53	22.66	4.08	1.42	43.1	0.09	37.7	1.33	43.5	4.78	2.2	32.20	64.4	1.89	70.6
Calc +53 Total	100.00	18.00	0.75	100.0	0.05	100.0	0.69	100.0	49.19	100.0	11.33	100.0	0.61	100.0
Mags+20	18.31	2.64	0.33	3.5	0.04	7.3	0.29	3.3	65.40	74.9	3.17	2.2	0.36	3.8
Non Mags+20	81.69	11.77	2.02	96.5	0.11	92.7	1.91	96.7	4.91	25.1	32.10	97.8	2.03	96.2
Calc +20 Total	100.00	14.41	1.71	100.0	0.10	100.0	1.61	100.0	15.98	100.0	26.80	100.0	1.72	100.0
Mags+CS5	68.34	3.93	0.15	2.3	0.03	5.2	0.12	0.8	67.40	75.6	1.73	1.2	0.34	4.8
Non Mags+CS5	31.66	1.82	3.44	235.8	0.14	94.8	3.30	99.2	4.88	24.4	32.30	98.8	1.50	95.2
Calc +CS5 Total	100.00	5.75	1.19	238.1	0.12	100.0	2.72	100.0	16.33	100.0	26.70	100.0	1.29	100.0
-CS5		10.70	0.92		0.06		0.86		14.55		29.20		0.87	
CALC FEED		100.00	0.84		0.05		0.78		34.42		14.83		0.74	

SUMMARY

FRACTIONS um	Picno SG	WT %	Overall											
			%Tot Sn	dist	%Sol Sn	dist	%Cs Sn	dist	%Fe	dist	%SiO2	dist	%S	dist
Mags+212		20.31	0.53	13.35	0.04	15.83	0.49	13.17	51.80	27.71	11.10	13.28	0.63	15.85
Mags+106		19.78	0.61	14.96	0.05	15.76	0.57	14.90	57.80	30.10	6.54	7.62	0.51	12.49
Mags+53		13.92	0.55	9.50	0.04	10.60	0.51	9.41	62.20	22.80	5.22	4.28	0.23	3.97
Mags+20		2.64	0.33	1.08	0.04	1.87	0.29	1.02	65.40	4.54	3.17	0.49	0.36	1.18
Mags+CS5		3.93	0.15	0.73	0.03	2.37	0.12	0.61	67.40	6.97	1.73	0.40	0.34	1.65
Non Mags+212		6.98	0.38	3.29	0.03	3.58	0.35	3.27	2.97	0.55	36.00	14.79	0.49	4.23
Non Mags+106		4.07	0.86	4.34	0.07	5.05	0.79	4.29	3.92	0.42	32.80	7.87	1.20	6.05
Non Mags+53		4.08	1.42	7.18	0.09	6.43	1.33	7.24	4.78	0.51	32.20	7.73	1.89	9.55
Non Mags+20		11.77	2.02	29.49	0.11	23.56	1.91	29.94	4.91	1.52	32.10	22.26	2.03	29.60
Non Mags+CS5		1.82	1.71	3.86	0.10	3.21	1.61	3.91	15.98	0.77	26.80	2.87	1.72	3.89
Total Mags		60.58	0.53	39.62	0.04	46.43	0.48	39.11	57.75	92.13	7.31	26.07	0.47	35.15
Total Non Mags		28.72	1.35	48.17	0.08	41.83	1.27	48.64	4.98	3.77	32.82	55.52	1.50	53.32
-CS5		10.70	0.92	12.21	0.06	11.75	0.86	12.24	14.55	4.10	29.20	18.40	0.87	11.53
CALC FEED		100.00	0.81	100.00	0.06	100.00	0.75	100.00	37.98	100.00	16.98	100.00	0.81	100.00

PROJECT	T0887
TEST NO	T15
DATE	200814
TECHNICIAN	ID

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	13.85
Magnetic Sample (gms)	10.31
Non-magnetic sample(gms)	3.54
Magnetics Mass (%)	74.44

SAMPLE TESTED

St Dizier Composite 4 +212um
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MAGNETIC SEPARATION RESULTS

PRODUCT	Wt (%)	Sn (%)	Dist (%)	SolSn (ppm)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	74.44	0.53	80.2	440	81.5	51.80	98.1	11.10	47.3	0.63	78.9
Non Magnetics	25.56	0.38	19.8	290	18.5	2.97	1.9	36.00	52.7	0.49	21.1
Total	100.00	0.49	100.0	402	100.0	39.32	100.0	17.46	100.0	0.59	100.0
Head		0.42		380		37.20		17.85		0.74	

PROJECT	T0887
TEST NO	T15
DATE	200814
TECHNICIAN	ID

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	13.53
Magnetic Sample (gms)	11.22
Non-magnetic sample(gms)	2.31
Magnetics Mass (%)	82.93

SAMPLE TESTED

St Dizier Composite 4 +106um
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MAGNETIC SEPARATION RESULTS

PRODUCT	Wt (%)	Sn (%)	Dist (%)	SolSn (ppm)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	82.93	0.61	77.5	450	75.7	57.80	98.6	6.54	49.2	0.51	67.4
Non Magnetics	17.07	0.86	22.5	700	24.3	3.92	1.4	32.80	50.8	1.20	32.6
Total	100.00	0.65	100.0	493	100.0	48.60	100.0	11.02	100.0	0.63	100.0
Head		0.65		490		49.10		11.00		0.62	

PROJECT	T0887
TEST NO	T15
DATE	200814
TECHNICIAN	ID

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	10.77
Magnetic Sample (gms)	8.33
Non-magnetic sample(gms)	2.44
Magnetics Mass (%)	77.34

SAMPLE TESTED
St Dizier Composite 4 +53um

MAGNETIC SEPARATION RESULTS

PRODUCT	Wt (%)	Sn (%)	Dist (%)	SolSn (ppm)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	77.34	0.55	56.9	430	62.3	62.20	97.8	5.22	35.6	0.23	29.4
Non Magnetics	22.66	1.42	43.1	890	37.7	4.78	2.2	32.20	64.4	1.89	70.6
Total	100.00	0.75	100.0	534	100.0	49.19	100.0	11.33	100.0	0.61	100.0
Head		0.74		520		49.70		10.45		0.70	

PROJECT	T0887
TEST NO	T15
DATE	200814
TECHNICIAN	ID

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	11.69
Magnetic Sample (gms)	2.14
Non-magnetic sample(gms)	9.55
Magnetics Mass (%)	18.31

SAMPLE TESTED

St Dizier Composite 4 +20um
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MAGNETIC SEPARATION RESULTS

PRODUCT	Wt (%)	Sn (%)	Dist (%)	SolSn (ppm)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	18.31	0.33	3.5	400	7.3	65.40	74.9	3.17	2.2	0.36	3.8
Non Magnetics	81.69	2.02	96.5	1130	92.7	4.91	25.1	32.10	97.8	2.03	96.2
Total	100.00	1.71	100.0	996	100.0	15.98	100.0	26.80	100.0	1.72	100.0
Head		0.73		560		48.30		11.50		0.64	

PROJECT	T0887
TEST NO	T15
DATE	200814
TECHNICIAN	id

Electric Current (A)	1.40
Water Flowrate (mls/min)	570
Run Time (min)	15
Sample Start Weight (gms)	10.77
Magnetic Sample (gms)	7.36
Non-magnetic sample(gms)	3.41
Magnetics Mass (%)	68.34

SAMPLE TESTED
St Dizier Composite 4 +CS5

MAGNETIC SEPARATION RESULTS

PRODUCT	Wt (%)	Sn (%)	Dist (%)	SolSn (ppm)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	68.34	0.15	8.6	340	34.7	67.40	96.8	1.73	10.4	0.34	32.9
Non Magnetics	31.66	3.44	91.4	1380	65.3	4.88	3.2	32.30	89.6	1.50	67.1
Total	100.00	1.19	100.0	669	100.0	47.60	100.0	11.41	100.0	0.71	100.0
Head		1.05		550		50.70		9.30		0.81	



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## **Appendix 11 – Composite 2+3 Magnetic Separation Results**



BURNIE LABORATORY: MAGNETIC SEPARATION REPORT SHEET

PROJECT	T0887
TEST NO	T15+T16
DATE	220914
TECH	DG

	Rghr	Cleaner
TEST TYPE	SALA Wet Drum	SALA Wet Drum
Feed Solids (g)	2000.0	2000.0
Feed Water (L)	17.6	17.6
Pump Flow Rate (lpm)	1.4	1.4
Density (%)	10.0	10.0
Time (min)	17.5	18
Pump 01 Output (%)	56	56
Pump 02 Output (%)	56	56
Comments	Rghr mag sep followed by regrind and cleaner mag sep. Primary grind P80 = 250 um, R/G P80 = 31 um	

FEED MATERIAL
Composite 2+3

Products	Wt (gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	SiO <sub>2</sub> (%)	Dist (%)	S (%)	Dist (%)
Cleaner Magnetics	723.0	37.7	0.46	18.3	60.9	74.2	5.40	8.2	5.25	37.3
Cleaner Non Magnetics	185.7	9.7	1.97	20.1	13.1	4.1	34.4	13.5	5.12	9.3
Rougher Non Magnetics	1009.6	52.6	1.11	61.6	12.8	21.8	36.7	78.3	5.39	53.4
Calc Feed	1918.4	100.0	0.95	100.0	31.0	100.0	24.7	100.0	5.31	100.0

Cummulated Products	Wt (gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	SiO <sub>2</sub> (%)	Dist (%)	S (%)	Dist (%)
<b>Cleaner Magnetics</b>	<b>723.0</b>	<b>37.7</b>	<b>0.46</b>	<b>18.3</b>	<b>60.9</b>	<b>74.2</b>	<b>5.40</b>	<b>8.2</b>	<b>5.25</b>	<b>37.3</b>
Rougher Magnetics	908.7	47.4	0.77	38.4	51.1	78.2	11.3	21.7	5.22	46.6
Calc Feed	1918.4	100.0	0.95	100.0	31.0	100.0	24.7	100.0	5.31	100.0

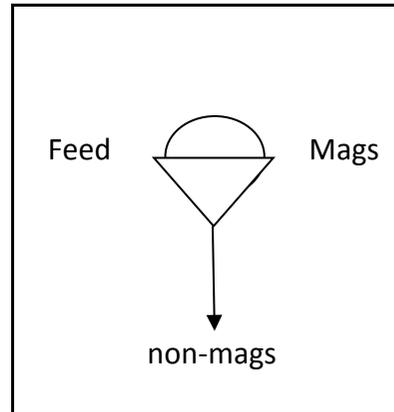
Cummulated Products	Wt (gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	SiO <sub>2</sub> (%)	Dist (%)	S (%)	Dist (%)
<b>Rougher+cleaner Non-Magnetics</b>	<b>1195.4</b>	<b>62.3</b>	<b>1.24</b>	<b>81.7</b>	<b>12.8</b>	<b>25.8</b>	<b>36.3</b>	<b>91.8</b>	<b>5.35</b>	<b>62.7</b>
<b>Cleaner Magnetics</b>	<b>723.0</b>	<b>37.7</b>	<b>0.46</b>	<b>18.3</b>	<b>60.9</b>	<b>74.2</b>	<b>5.4</b>	<b>8.2</b>	<b>5.25</b>	<b>37.3</b>
Calc Feed	1918.4	100.0	0.95	100.0	31.0	100.0	24.7	100.0	5.31	100.0



BURNIE LABORATORY: MAGNETIC SEPARATION REPORT SHEET

PROJECT	T0887
TEST NO	T15
DATE	220914
TECH	DG

TEST TYPE	SALA Wet Drum
Feed Solids (g)	2000.0
Feed Water (L)	17.6
Pump Flow Rate (lpm)	1.4
Density (%)	10.0
Time (min)	17.5
Pump 01 Output (%)	56
Pump 02 Output (%)	56
Comments	



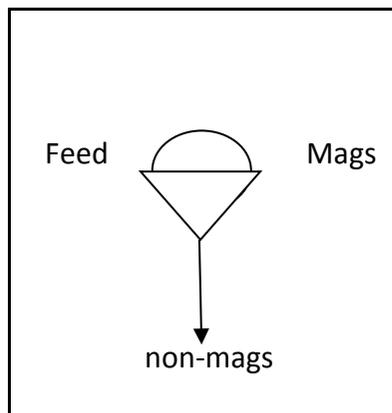
FEED MATERIAL	
Composite 2+3	
FROM TEST NO	
START WT (gm)	1918.3

MAGNETIC SEPARATION RESULTS

NAME	Wt (gm)	Calc(gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	908.7	908.7	47.37	0.77	38.4	51.12	78.2	11.33	21.7	5.22	46.6
Non Magnetics	1009.6	1009.6	52.63	1.11	61.6	12.80	21.8	36.70	78.3	5.39	53.4
Total	1918.3		100.00	0.95	100.0	30.95	100.0	24.68	100.0	5.31	100.0

BURNIE LABORATORY: MAGNETIC SEPARATION REPORT SHEET

TEST TYPE	SALA Wet Drum
Feed Solids (g)	2000.0
Feed Water (L)	17.6
Pump Flow Rate (lpm)	1.4
Density (%)	10.0
Time (min)	18
Pump 01 Output (%)	56
Pump 02 Output (%)	56
Comments	



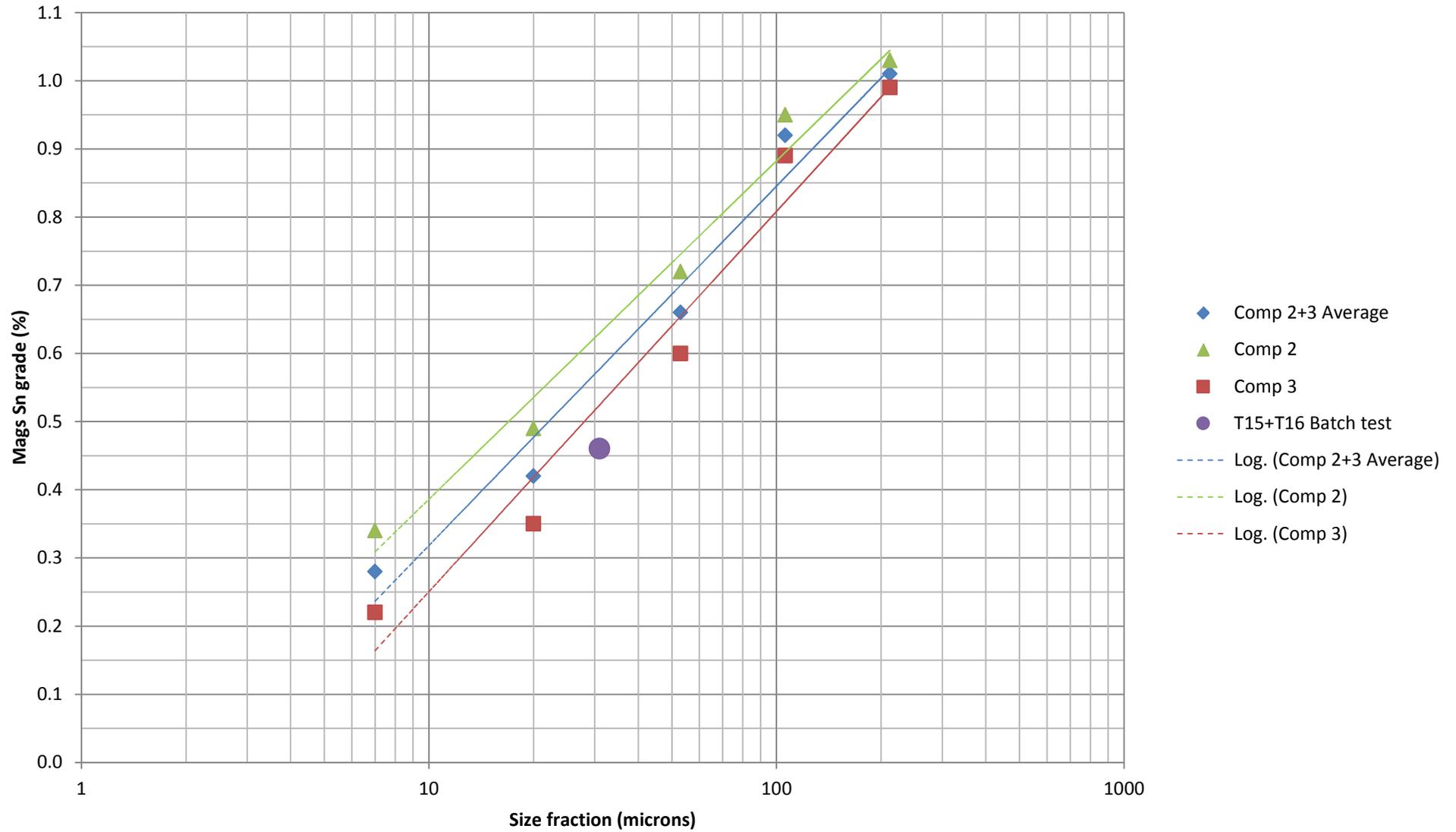
PROJECT	T0887
TEST NO	T16
DATE	220914
TECH	DG

FEED MATERIAL	
T15 Reground mags (p80=31um)	
FROM TEST NO	
START WT (gm)	908.74

MAGNETIC SEPARATION RESULTS

NAME	Wt (gm)	Calc(gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	SiO2 (%)	Dist (%)	S (%)	Dist (%)
Magnetics	723.0	723.0	79.56	0.46	47.6	60.90	94.8	5.40	37.9	5.25	80.0
Non Magnetics	185.7	185.7	20.44	1.97	52.4	13.05	5.2	34.40	62.1	5.12	20.0
TOTAL	908.7		100.00	0.77	100.0	51.12	100.0	11.33	100.0	5.22	100.0

# Davis Tube Testing - Variation in Mags Sn concent with size Saint Dizer Composite 2 & 3





**WorleyParsons**

resources & energy

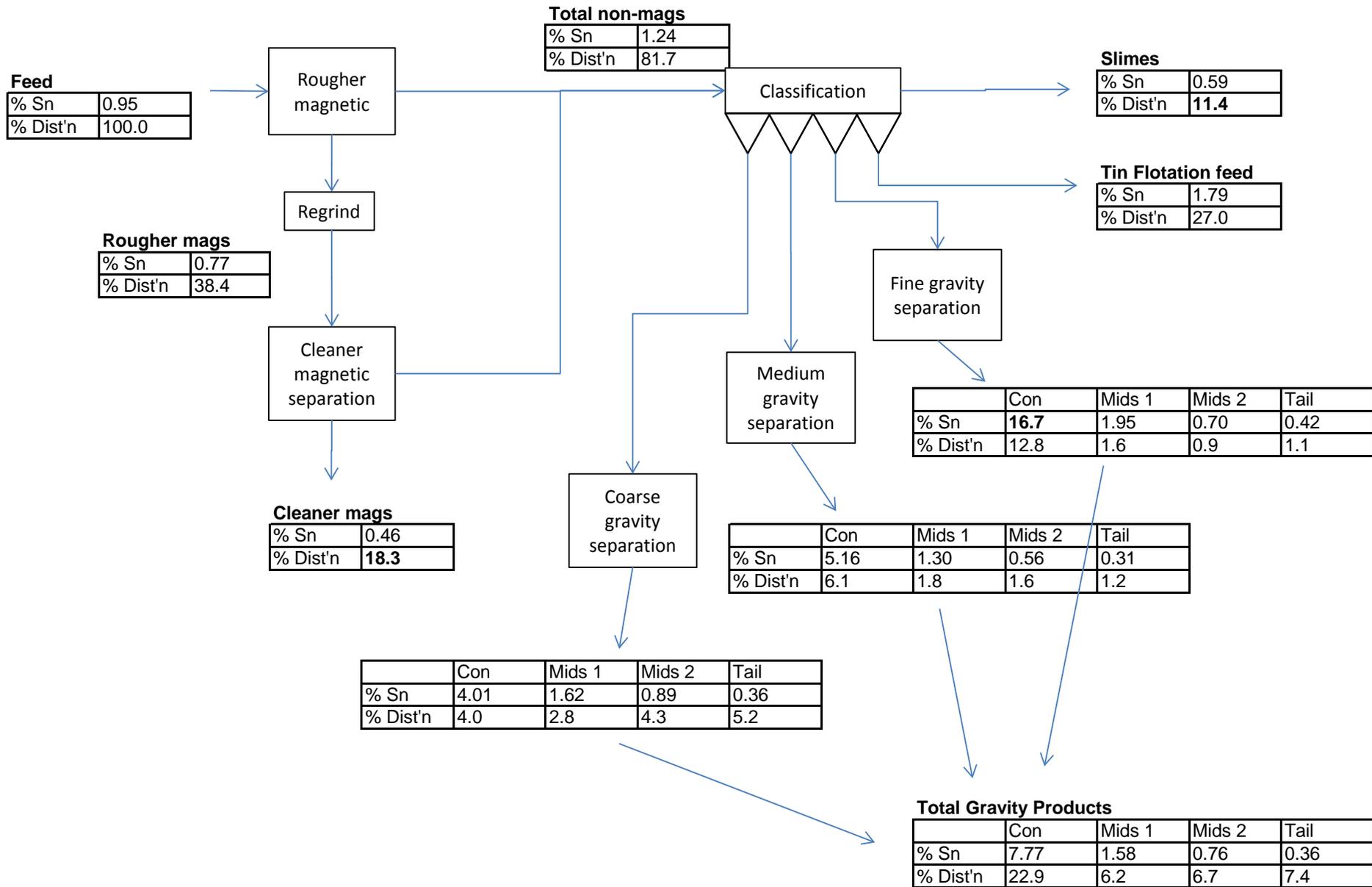
EcoNomics™

STELLAR RESOURCES LIMITED  
SAINT DIZIER METALLURGICAL TESTWORK  
2014 PROGRESS REPORT

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## **Appendix 12 – Composite 2+3 Gravity Separation Results**

**Saint Dizier Comp 2+3 Batch magnetic and gravity separation Sn deportment summary**





BURNIE LABORATORY: MAGNETIC SEPARATION REPORT SHEET

PROJECT	T0887
TEST NO	T15+T16
DATE	220914
TECH	DG

Rghr Cleaner

TEST TYPE	SALA Wet Drum	SALA Wet Drum
Feed Solids (g)	2000.0	2000.0
Feed Water (L)	17.6	17.6
Pump Flow Rate (lpm)	1.4	1.4
Density (%)	10.0	10.0
Time (min)	17.5	18
Pump 01 Output (%)	56	56
Pump 02 Output (%)	56	56
Comments	Rghr mag sep followed by regrind and cleaner mag sep. Primary grind P80 = 250 um, R/G P80 = 31 um	

FEED MATERIAL
Composite 2+3

Products	Wt (gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	SiO <sub>2</sub> (%)	Dist (%)	S (%)	Dist (%)
Cleaner Magnetics	723.0	37.7	0.46	18.3	60.9	74.2	5.40	8.2	5.25	37.3
Cleaner Non Magnetics	185.7	9.7	1.97	20.1	13.1	4.1	34.4	13.5	5.12	9.3
Rougher Non Magnetics	1009.6	52.6	1.11	61.6	12.8	21.8	36.7	78.3	5.39	53.4
Calc Feed	1918.4	100.0	0.95	100.0	31.0	100.0	24.7	100.0	5.31	100.0

Cummulated Products	Wt (gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	SiO <sub>2</sub> (%)	Dist (%)	S (%)	Dist (%)
<b>Cleaner Magnetics</b>	<b>723.0</b>	<b>37.7</b>	<b>0.46</b>	<b>18.3</b>	<b>60.9</b>	<b>74.2</b>	<b>5.40</b>	<b>8.2</b>	<b>5.25</b>	<b>37.3</b>
Rougher Magnetics	908.7	47.4	0.77	38.4	51.1	78.2	11.3	21.7	5.22	46.6
Calc Feed	1918.4	100.0	0.95	100.0	31.0	100.0	24.7	100.0	5.31	100.0

Cummulated Products	Wt (gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	SiO <sub>2</sub> (%)	Dist (%)	S (%)	Dist (%)
<b>Rougher+cleaner Non-Magnetics</b>	<b>1195.4</b>	<b>62.3</b>	<b>1.24</b>	<b>81.7</b>	<b>12.8</b>	<b>25.8</b>	<b>36.3</b>	<b>91.8</b>	<b>5.35</b>	<b>62.7</b>
<b>Cleaner Magnetics</b>	<b>723.0</b>	<b>37.7</b>	<b>0.46</b>	<b>18.3</b>	<b>60.9</b>	<b>74.2</b>	<b>5.4</b>	<b>8.2</b>	<b>5.25</b>	<b>37.3</b>
Calc Feed	1918.4	100.0	0.95	100.0	31.0	100.0	24.7	100.0	5.31	100.0

TEST TYPE	Gravity
Stage 1	Grind to p80=250um
Stage 2	LIMS
Stage 3	Grind mags to p80=31um
Stage 4	LIMS
Stage 5	Combine non mags
Stage 6	Size to fractions to +CS1
Stage 7	Gravity separation each fraction by Mozley table

PROJECT	T0887
TEST NO	T19
DATE	31014
TECH	ID

START MATERIAL	
START WT (gm)	
FROM TEST NO	T18

GRAVITY SEPARATION RESULTS

Product	Wt (gm)	Calc (gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	S (%)	Dist (%)	SiO2 (%)	Dist (%)	Sn Dist of ore feed
<b>+106 Conc</b>	<b>16.8</b>	<b>16.8</b>	<b>1.41</b>	<b>4.01</b>	<b>4.9</b>	<b>36.10</b>	<b>4.3</b>	<b>26.30</b>	<b>7.8</b>	<b>7.83</b>	<b>0.3</b>	<b>4.0</b>
Mids 1	29.4	29.4	2.46	1.62	3.5	28.10	5.9	18.25	9.5	19.10	1.3	2.8
Mids 2	80.6	80.6	6.74	0.89	5.2	12.45	7.1	4.78	6.8	36.90	6.8	4.3
<b>Tail</b>	<b>241.6</b>	<b>241.6</b>	<b>20.21</b>	<b>0.36</b>	<b>6.3</b>	<b>6.29</b>	<b>10.8</b>	<b>0.95</b>	<b>4.1</b>	<b>43.20</b>	<b>23.7</b>	<b>5.2</b>
<b>+53 Conc</b>	<b>20.0</b>	<b>20.0</b>	<b>1.67</b>	<b>5.16</b>	<b>7.5</b>	<b>36.60</b>	<b>5.2</b>	<b>29.40</b>	<b>10.4</b>	<b>5.97</b>	<b>0.3</b>	<b>6.1</b>
Mids 1	22.7	22.7	1.90	1.30	2.1	20.70	3.3	8.63	3.5	25.40	1.3	1.8
Mids 2	47.3	47.3	3.96	0.56	1.9	7.45	2.5	1.10	0.9	41.60	4.5	1.6
<b>Tail</b>	<b>63.9</b>	<b>63.9</b>	<b>5.35</b>	<b>0.31</b>	<b>1.4</b>	<b>5.79</b>	<b>2.6</b>	<b>0.46</b>	<b>0.5</b>	<b>44.10</b>	<b>6.4</b>	<b>1.2</b>
<b>+CS1 Conc</b>	<b>12.9</b>	<b>12.9</b>	<b>1.08</b>	<b>16.70</b>	<b>15.7</b>	<b>33.20</b>	<b>3.0</b>	<b>23.20</b>	<b>5.3</b>	<b>1.61</b>	<b>0.0</b>	<b>12.8</b>
Mids 1	14.2	14.2	1.19	1.95	2.0	34.30	3.5	20.80	5.2	12.55	0.4	1.6
Mids 2	20.6	20.6	1.72	0.70	1.0	10.35	1.5	2.48	0.9	36.70	1.7	0.9
<b>Tail</b>	<b>44.5</b>	<b>44.5</b>	<b>3.72</b>	<b>0.42</b>	<b>1.4</b>	<b>6.65</b>	<b>2.1</b>	<b>0.81</b>	<b>0.6</b>	<b>42.90</b>	<b>4.3</b>	<b>1.1</b>
CS2-CS5	253.98	254.0	21.25	1.79	33.0	12.70	22.9	6.05	27.2	34.20	19.7	27.0
<b>-CS5</b>	<b>326.8</b>	<b>326.8</b>	<b>27.34</b>	<b>0.59</b>	<b>14.0</b>	<b>10.95</b>	<b>25.4</b>	<b>2.95</b>	<b>17.1</b>	<b>39.40</b>	<b>29.3</b>	<b>11.4</b>
Total	1195.3	1195.3	100.00	1.15	100.00	11.80	100.00	4.72	100.00	36.82	100.00	81.70
Head				1.20		12.20		3.23		37.10		

Overall Gravity Combine (coarse, medium and fine combine)

Product	Wt (gm)	Calc (gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	S (%)	Dist (%)	SiO2 (%)	Dist (%)	Sn Dist from gravity feed	Sn Dist of ore feed
<b>Gravity Con</b>	<b>49.7</b>		<b>4.2</b>	<b>7.77</b>	<b>28.0</b>	<b>35.5</b>	<b>12.5</b>	<b>26.7</b>	<b>23.6</b>	<b>5.5</b>	<b>0.6</b>	<b>53.0</b>	<b>22.9</b>
Mids 1	66.3		5.5	1.58	7.6	26.9	12.6	15.5	18.2	19.9	3.0	14.4	6.2
Mids 2	148.5		12.4	0.76	8.2	10.6	11.1	3.3	8.7	38.4	12.9	15.5	6.7
<b>Gravity Tail</b>	<b>350.0</b>		<b>29.3</b>	<b>0.36</b>	<b>9.1</b>	<b>6.2</b>	<b>15.5</b>	<b>0.8</b>	<b>5.2</b>	<b>43.3</b>	<b>34.5</b>	<b>17.2</b>	<b>7.4</b>
Tin float feed (CS2-CS5)	253.98		21.2	1.79	33.0	12.7	22.9	6.1	27.2	34.2	19.7		27.0
<b>Slimes -CS5</b>	<b>326.8</b>		<b>27.3</b>	<b>0.59</b>	<b>14.0</b>	<b>11.0</b>	<b>25.4</b>	<b>3.0</b>	<b>17.1</b>	<b>39.4</b>	<b>29.3</b>		<b>11.4</b>
Total	1195.3		100.0	1.15	100.0	11.8	100.0	4.7	100.0	36.8	100.0		81.7
<b>Gravity Feed</b>	<b>614.5</b>		<b>51.4</b>	<b>1.19</b>	<b>53.0</b>	<b>11.89</b>	<b>51.8</b>	<b>5.11</b>	<b>55.7</b>	<b>36.53</b>	<b>51.0</b>	<b>100.0</b>	<b>43.3</b>

Overall Department Summary

Product	Wt (gm)	Calc (gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	S (%)	Dist (%)	SiO2 (%)	Dist (%)	Sn Dist of gravity feed	Sn Dist of ore feed
Total +106	368.4		30.8	0.74	19.9	10.74	28.0	4.32	28.2	38.29	32.0	37.5	16.2
Total +53	153.9		12.9	1.16	13.0	12.50	13.6	5.62	15.3	35.62	12.5	24.6	10.6
Total +CS1	92.2		7.7	3.00	20.1	15.45	10.1	7.39	12.1	31.06	6.5	37.9	16.4
Tin float feed (CS2-CS5)	253.98		21.2	1.79	33.0	12.70	22.9	6.05	27.2	34.20	19.7		27.0
<b>Slimes -CS5</b>	<b>326.8</b>		<b>27.3</b>	<b>0.59</b>	<b>14.0</b>	<b>10.95</b>	<b>25.4</b>	<b>2.95</b>	<b>17.1</b>	<b>39.40</b>	<b>29.3</b>		<b>11.4</b>
Total	1195.3		100.0	1.15	100.0	11.80	100.0	4.72	100.0	36.82	100.0		81.7
<b>Gravity Feed</b>	<b>614.5</b>		<b>51.4</b>	<b>1.19</b>	<b>53.0</b>	<b>11.89</b>	<b>51.8</b>	<b>5.11</b>	<b>55.7</b>	<b>36.53</b>	<b>51.0</b>	<b>100.0</b>	<b>43.3</b>

Recovery to non-mags (feed to test) **81.7**  
(from T15+T16)

TEST TYPE	Gravity
Stage 1	Grind to p80=250um
Stage 2	LIMS
Stage 3	Grind mags to p80=31um
Stage 4	LIMS
Stage 5	Combine non mags
Stage 6	Size to fractions to +CS1
Stage 7	Gravity separation each fraction by Mozley table

PROJECT	T0887
TEST NO	T19
DATE	31014
TECH	ID

START MATERIAL	
START WT (gm)	
FROM TEST NO	T18

GRAVITY SEPARATION RESULTS

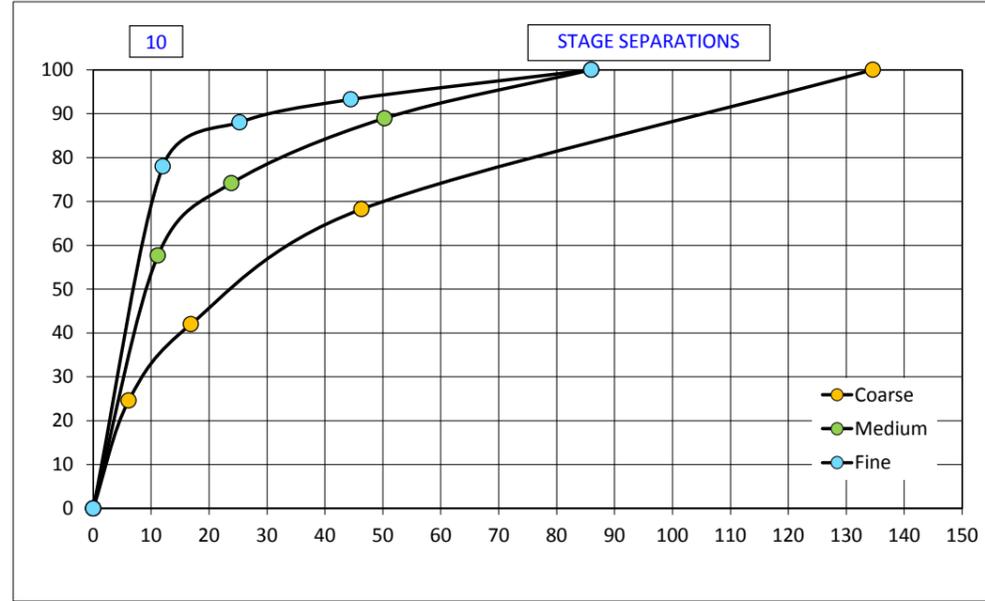
Product	Wt (gm)	Calc (gm)	Wt (%)	Sn (%)	Dist (%)	Fe (%)	Dist (%)	S (%)	Dist (%)	SiO2 (%)	Dist (%)						
+106 Conc	16.8	16.8	1.41	4.01	4.9	36.10	4.3	26.30	7.8	7.83	0.3						
Mids 1	29.4	29.4	2.46	1.62	3.5	28.10	5.9	18.25	9.5	19.10	1.3						
Mids 2	80.6	80.6	6.74	0.89	5.2	12.45	7.1	4.78	6.8	36.90	6.8						
Tail	241.6	241.6	20.21	0.36	6.3	6.29	10.8	0.95	4.1	43.20	23.7						
+53 Conc	20.0	20.0	1.67	5.16	7.5	36.60	5.2	29.40	10.4	5.97	0.3						
Mids 1	22.7	22.7	1.90	1.30	2.1	20.70	3.3	8.63	3.5	25.40	1.3						
Mids 2	47.3	47.3	3.96	0.56	1.9	7.45	2.5	1.10	0.9	41.60	4.5						
Tail	63.9	63.9	5.35	0.31	1.4	5.79	2.6	0.46	0.5	44.10	6.4						
+CS1 Conc	12.9	12.9	1.08	16.70	15.7	33.20	3.0	23.20	5.3	1.61	0.0						
Mids 1	14.2	14.2	1.19	1.95	2.0	34.30	3.5	20.80	5.2	12.55	0.4						
Mids 2	20.6	20.6	1.72	0.70	1.0	10.35	1.5	2.48	0.9	36.70	1.7						
Tail	44.5	44.5	3.72	0.42	1.4	6.65	2.1	0.81	0.6	42.90	4.3						
CS2-CS5	253.98	254.0	21.25	1.79	33.0	12.70	22.9	6.05	27.2	34.20	19.7						
-CS5	326.8	326.8	27.34	0.59	14.0	10.95	25.4	2.95	17.1	39.40	29.3						
Total	1195.3	1195.3	100.00	1.15	100.00	11.80	100.00	4.72	100.00	36.82	100.00						
Head				1.20		12.20		3.23		37.10							

GRAVITY SEPARATION BALANCE

PRODUCT Coarse	Wt (%)	Sn (%)	Dist (%)	Cum Dist	Units	Cum Units
+106 Conc	4.56	4.0	24.6	24.6	6.14	6.1
Mids 1	7.98	1.6	17.4	42.0	10.74	16.9
Mids 2	21.88	0.9	26.2	68.2	29.45	46.3
Tail	65.58	0.4	31.8	100.0	88.27	134.6
	100.00	0.7	100.0			

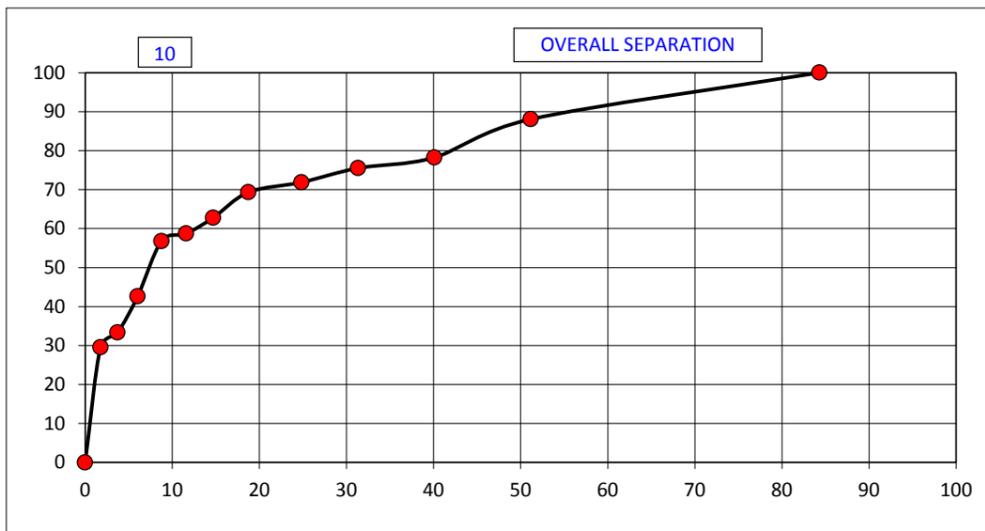
PRODUCT Medium	Wt (%)	Sn (%)	Dist (%)	Cum Dist	Units	Cum Units
+53 Conc	13.00	5.2	57.7	57.7	11.17	11.2
Mids 1	14.75	1.30	16.5	74.1	12.68	23.9
Mids 2	30.73	0.56	14.8	88.9	26.42	50.3
Tail	41.52	0.31	11.1	100.0	35.70	86.0
	100.00	1.16	100.0			

PRODUCT Fine	Wt (%)	Sn (%)	Dist (%)	Cum Dist	Units	Cum Units
+CS1 Conc	13.99	16.7	78.0	78.0	12.03	12.0
Mids 1	15.40	1.95	10.0	88.0	13.24	25.3
Mids 2	22.34	0.70	5.2	93.2	19.21	44.5
Tail	48.26	0.42	6.8	100.0	41.50	86.0
	100.00	3.00	100.0			



OVERALL SEPARATION

Product Wt (gm)	Sn (%)	Wt (%)	Dist (%)	Cum Dist	Units	Cum Units
12.9	16.70	2.10	29.55	29.55	1.77	1.77
14.2	1.95	2.31	3.80	33.35	1.95	3.72
16.8	4.01	2.73	9.24	42.59	2.30	6.02
20.0	5.16	3.25	14.16	56.75	2.74	8.77
20.6	0.70	3.35	1.98	58.73	2.83	11.59
22.7	1.30	3.69	4.05	62.78	3.11	14.71
29.4	1.62	4.78	6.53	69.31	4.03	18.74
44.5	0.42	7.24	2.56	71.88	6.10	24.84
47.3	0.56	7.70	3.63	75.51	6.49	31.33
63.9	0.31	10.40	2.72	78.23	8.77	40.10
80.6	0.89	13.12	9.84	88.07	11.06	51.16
241.6	0.36	39.32	11.93	100.00	33.14	84.30
614.5	1.19	100.00	100.0			





BURNIE LABORATORY: LOCKED CYCLE GRAVITY TEST

PROJECT	T0887
TEST NO	LC08
FEED	
FROM TEST	
DATE	
TECH	

EXIT STREAMS

CYCLE NO		1	2	3	4	5	6	7	8	9	10	WT AV
Gravity coarse conc (+75 Conc) dry wt and assays	gm	34.90	41.20	37.20	43.00	42.50	47.10	44.20	44.10	42.50	40.00	43.34
	%Sn	5.37	5.36	6.07	4.18	5.99	5.14	4.87	5.61	5.48	5.19	5.22
	%Fe	33.40	36.90	37.00	33.50	35.90	35.90	35.30	34.60	36.40	35.70	35.35
	%S	16.35	30.80	29.30	23.40	27.40	28.50	26.50	30.00	23.10	28.90	26.90
	%SiO2	10.35	4.61	4.41	9.60	5.62	6.15	7.43	6.53	5.48	6.16	6.67
Gravity fine conc (-75 Conc) dry wt and assays	gm	29.90	30.60	30.80	32.50	35.60	46.10	43.60	44.20	42.80	42.10	40.99
	%Sn	22.00	23.00	25.40	23.30	21.60	17.6	17.85	19.30	19.10	18.40	19.48
	%Fe	29.90	29.10	28.40	28.90	29.80	33.9	33.5	31.20	32.30	32.80	31.87
	%S	26.00	26.90	18.20	25.90	23.20	33.1	23.6	30.80	29.10	30.80	28.21
	%SiO2	1.50	1.31	2.30	2.29	1.88	1.25	2.13	2.01	1.46	1.48	1.77
Gravity Final Tail (-75 Tails) dry wt and assays	gm	276.30	508.10	736.50	715.30	597.80	721.50	652.30	763.80	788.30	778.30	716.76
	%Sn	0.59	0.65	0.63	0.72	0.61	0.6	0.6	0.62	0.59	0.65	0.63
	%Fe	8.89	10.35	11.35	11.40	11.15	10.9	10.1	11.20	10.60	10.90	10.88
	%S	2.62	3.55	3.78	3.19	3.47	3.52	3.1	4.61	2.52	3.84	3.47
	%SiO2	39.50	37.50	36.70	37.40	36.80	38.6	38.5	36.40	38.70	37.60	37.74
Over Flow dry wt and assays	gm	897.2	993.1	1161.8	1198.1	1314.2	1246.8	1257.1	1320.9	1207.7	1191.5	1248.04
	%Sn	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
	%Fe	11.45	11.45	11.45	11.45	11.45	11.45	11.45	11.45	11.45	11.45	11.45
	%S	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
	%SiO2	38.20	38.20	38.20	38.20	38.20	38.20	38.20	38.20	38.20	38.20	38.20
Combined Concentrate	gm	64.80	71.80	68.00	75.50	78.10	93.20	87.80	88.30	85.30	82.10	84.33
	%Sn	13.04	12.88	14.83	12.41	13.11	11.30	11.32	12.46	12.31	11.96	12.10
	%Fe	31.79	33.58	33.10	31.52	33.12	34.91	34.41	32.90	34.34	34.21	33.68
	%S	20.80	29.14	24.27	24.48	25.49	30.78	25.06	30.40	26.11	29.87	27.56
	%SiO2	6.27	3.20	3.45	6.45	3.92	3.73	4.80	4.27	3.46	3.76	4.31

REGRIND DATA

New Feed (gm) (dry)	1790	2000	2000	2000	2000	2000	2000	2000	2000	2000
Regrind feed Damp Wt (gm)		591.5	1089.3	1134	1134	1171	1175	1228	1122	1149
Regrind Time (min per 100gm)	3.3	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Regrind Time (min.sec)	0.0	24.5	45.2	47.1	47.1	48.6	48.8	51.0	46.6	47.7
Underflow (%Wt)	49.9	61.7	62.4	61.8	58.1	60.7	60.4	59.1	61.3	62.2

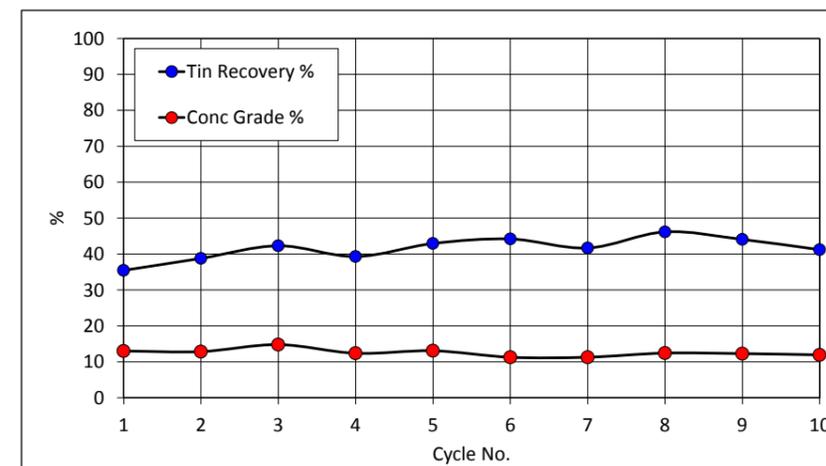
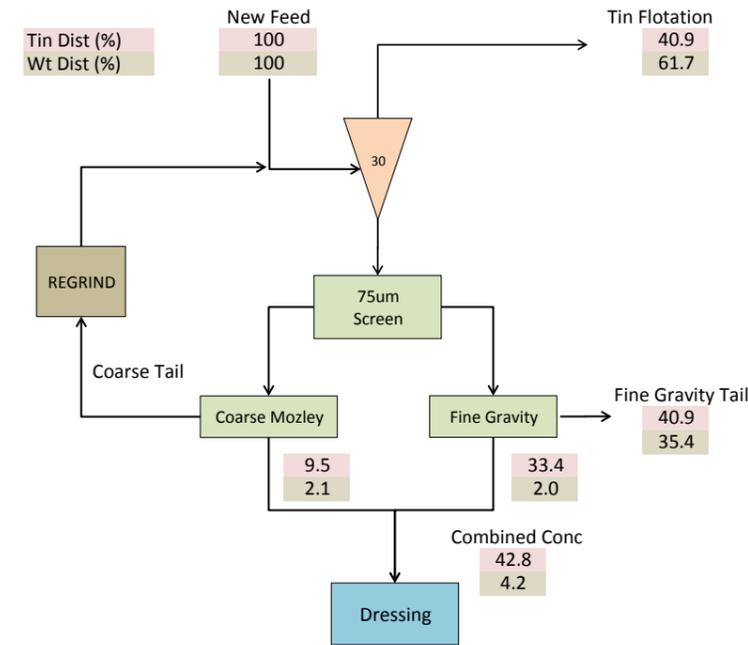
t75 tail

INTERNAL STREAMS

Final Regrind Feed		Final Reg Discharge		Mids-75		NEW FEED		CALC		10
gm	1114.0	gm	1114.0	gm	188.0	gm	20235	2023.5		
%Sn	0.54	%Sn	0.54	%Sn	1.72	%Sn	1.18	1.27		
%Fe	9.44	%Fe	9.44	%Fe	38.30	%Fe	12.00	12.60		
%S	3.08	%S	3.08	%S	26.20	%S	4.63	3.98		
%SiO2	39.60	%SiO2	39.60	%SiO2	9.29	%SiO2	36.77	36.20		
p80	342	p80	84	p80						

DISTRIBUTIONS	AV	FROM NEW FEED (%)										
		Cyc 1	Cyc 2	Cyc 3	Cyc 4	Cyc 5	Cyc 6	Cyc 7	Cyc 8	Cyc 9	Cyc 10	
MASS	+75 Conc	2.14	1.72	2.04	1.84	2.12	2.10	2.33	2.18	2.18	2.10	1.98
	-75 Conc	2.03	1.48	1.51	1.52	1.61	1.76	2.28	2.15	2.18	2.12	2.08
	-75 Tail	35.42	13.65	25.11	36.40	35.35	29.54	35.66	32.24	37.75	38.96	38.46
	Over Flow	61.68	44.34	49.08	57.41	59.21	64.95	61.61	62.12	65.28	59.68	58.88
	Calc Recycle	-1.26	38.81	22.27	2.83	1.71	1.65	-1.88	1.30	-7.39	-2.85	-1.40
TIN	+75 Conc	9.47	7.87	9.27	9.48	7.55	10.69	10.16	9.04	10.39	9.78	8.72
	-75 Conc	33.35	27.61	29.55	32.84	31.79	32.28	34.06	32.67	35.81	34.32	32.52
	-75 Tail	18.88	6.84	13.86	19.48	21.62	15.31	18.17	16.43	19.88	19.52	21.24
	Over Flow	40.87	29.38	32.52	38.04	39.23	43.03	40.83	41.16	43.25	39.55	39.02
	Calc Recycle	-2.57	28.30	14.80	0.16	-0.19	-1.31	-3.22	0.70	-9.33	-3.17	-1.49
<b>TIN REC OA (%)</b>	<b>42.82</b>	<b>35.48</b>	<b>38.82</b>	<b>42.32</b>	<b>39.33</b>	<b>42.97</b>	<b>44.22</b>	<b>41.71</b>	<b>46.20</b>	<b>44.10</b>	<b>41.23</b>	
<b>TIN REC GRAVITY (%)</b>	<b>69.44</b>	<b>83.83</b>	<b>73.68</b>	<b>68.48</b>	<b>64.53</b>	<b>73.73</b>	<b>70.88</b>	<b>71.74</b>	<b>69.91</b>	<b>69.31</b>	<b>66.00</b>	
IRON	+75 Conc	6.31	4.80	6.26	5.67	5.93	6.28	6.96	6.43	6.28	6.37	5.88
	-75 Conc	5.39	3.68	3.67	3.60	3.87	4.37	6.44	6.01	5.68	5.69	5.69
	-75 Tail	32.16	10.11	21.66	34.42	33.58	27.45	32.38	27.13	35.23	34.41	34.93
	Over Flow	58.85	42.30	46.83	54.78	56.49	61.97	58.79	59.27	62.28	56.94	56.18
	Calc Recycle	-2.70	39.10	21.59	1.53	0.13	-0.06	-4.57	1.16	-9.47	-3.42	-2.68
SULPHUR	+75 Conc	12.41	6.09	13.54	11.63	10.74	12.42	14.32	12.50	14.12	10.47	12.33
	-75 Conc	12.39	8.29	8.78	5.98	8.98	8.81	16.28	10.98	14.52	13.29	13.83
	-75 Tail	26.54	7.72	19.24	29.70	24.34	22.13	27.10	21.57	37.57	21.19	31.89
	Over Flow	52.20	37.52	41.53	48.59	50.11	54.96	52.14	52.58	55.24	50.51	49.83
	Calc Recycle	-3.54	40.37	16.90	4.10	5.83	1.67	-9.84	2.38	-21.45	4.53	-7.89
SILICA	+75 Conc	0.391	0.49	0.26	0.22	0.55	0.32	0.39	0.44	0.39	0.31	0.33
	-75 Conc	0.097	0.06	0.05	0.10	0.10	0.09	0.08	0.12	0.12	0.08	0.08
	-75 Tail	36.34	14.67	25.61	36.32	35.95	29.56	37.43	33.75	37.36	41.00	39.33
	Over Flow	64.07	46.06	50.98	59.64	61.50	67.46	64.00	64.53	67.81	62.00	61.17
	Calc Recycle	-0.90	38.73	23.10	3.72	1.89	2.56	-1.90	1.15	-5.68	-3.39	-0.91

LOCKED CYCLE TEST FLOWSHEET





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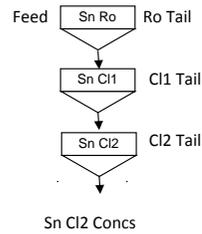
## Appendix 13 – Tin Flotation Results



BURNIE LABORATORY: ROUGHER FLOTATION REPORT SHEET

PROJECT	T0887
TEST NO	T08
DATE	180614
TECHNICIAN	MW

Milling		Primary	Regrind
Mill type			
Media type			
Media kg			
Solids g			
Water g			
Time min			
Speed rpm			
Lime g			
End pH			
End p80			



PRODUCT FLOATED
-53um Non mags

NOTES
no water change
0

kwh/t		Regrind Power
Float Cell Volume		Start
Rougher C1	2.5	Finish
Speed	700	W/h
		kWh/t

	pH	0.1 PAX g/t	H2SO4 g/t	0.495 MIBC g/t	100 SSF g/t	1.0 SS g/t	1.0 SPA7080 g/t		Cond Time min	Air L/min	Float Time min	Cum Float Time	Wet Wt g	Con % Solids
Sulphide Prefloat Filtration	7.1	60		40						5-10	3.0	3.0	110	
HIC Conditioning	3.5		3008		201				5					
Condition SSF	3.5					301			1					
Condition SS	5.2								3					
Condition SPA	5.2						602		3					
Sn Ro Con1	5.3			79			602			5-10	10.0	13.0	300	
Condition														
Sn Ro Con2	6.0			20			602			5-10	8.5	21.5	300	
Condition														
Sn Ro Con3	6.3			20			301		3	5-8	5.0	18.0	300	
Condition						100			3					
Sn Cl1 Con	7.0									3-7	9.0	30.5	280	
Condition						201			3					
Sn Cl2 Con1	7.1									4-7	1.5	32.0	20	14
Sn Cl2 Con2										4-7	2.0	34.0	30	10
Sn Cl2 Con3										4-7	2.5	34.5	60	5
REAGENT TOTALS (g/t)		60	3008	159	201	602	1504							

PRODUCTS	WT g	WT %	Sn %	DIST	Fe %	DIST	S %	DIST	SiO2 %	DIST
T30 Sulphide Prefloat	26.5	5.3	0.49	1.6	17.7	6.2	13.6	30.4	35.1	5.9
Sn Cl2 C1	2.8	0.6	1.15	0.4	40.7	1.5	34.1	8.1	2.81	0.0
Sn Cl2 C2	2.6	0.5	1.21	0.4	40.4	1.4	34.5	7.5	3.34	0.1
Sn Cl2 C3	3.0	0.6	1.74	0.6	39.5	1.5	29.8	7.5	4.65	0.1
Sn Cl2 Tail	29.2	5.9	5.63	20.0	34.6	13.4	2.28	5.6	7.28	1.3
Sn Cl1 Tail	21.8	4.4	2.96	7.8	22.9	6.6	2.52	4.7	23.7	3.3
Sn Ro T	330.1	66.2	1.43	57.3	11.9	52.2	0.98	27.4	34.7	72.4
Slimes (-CS6)	82.8	16.6	1.18	11.9	15.5	17.0	1.25	8.8	32.3	16.9
CALC	498.7	100.0	1.65	100.0	15.1	100.0	2.37	100.0	31.7	100.0
ASSAY HEAD										

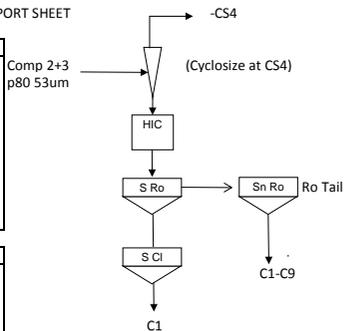
CUM PRODUCTS	CUM Wt	WT %	Sn %	CUM	Fe %	CUM	S %	CUM	SiO2 %	CUM
Sn Cl2 C1	2.8	0.6	1.15	0.4	40.7	1.5	34.1	8.1	2.81	0.0
Sn Cl2 C2	5.4	1.1	1.18	0.8	40.6	2.9	34.3	15.6	3.06	0.1
Sn Cl2 C3	8.3	1.7	1.38	1.4	40.2	4.4	32.7	23.1	3.63	0.2
Sn Cl2 Tail	37.5	7.5	4.69	21.4	35.8	17.9	9.03	28.7	6.47	1.5
Sn Cl1 Tail	59.3	11.9	4.05	29.2	31.1	24.5	6.63	33.4	12.8	4.8



BURNIE LABORATORY: ROUGHER FLOTATION REPORT SHEET

PROJECT	T0887
TEST NO	T20
DATE	151014
TECHNICIAN	MW

Milling		Primary	Regrind
Mill type		HIC	
Media type			
Solids	kg	500	
Water	g	400	
Time	min	5.0	
Speed	rpm	60HZ	
Lime	g		
End pH	pH		
End p80	µm		



PRODUCT FLOATED	
Comp. 2+3	
Deslimed at CS4	

NOTES	
P80=53um	
2kg lots 60mins grinding	
Use 1kg for desliming	

Float Cell		Volume	Regrind	Power
Rougher	2.5		Start	
C1	1.5		Finish	
Speed	850		W/h	
			kWh/t	

	pH	10.0 H2SO4 g/t	0.5 SIPX g/t	1.0 SSF g/t	1.0 Na2SO3 g/t	1.0 SPA7080 g/t	0.495 MIBC g/t		Cond Time min	Air L/min	Float Time min	Cum Float Time	Wet Wt g	Con % Solids
HIC Cond (60HZ)	2.5	1785		198					5					
Water Change	5.9		50						3					
Conditioning S Ro C	5.9						59			3-9	14.0	14.0	700	
Condition S Cl1 C1	6.4						20			1-9	4.5	18.5	350	37
Condition	4.0	397		198					3					
Condition					298				3					
Condition						298			3					
Sn Ro C1	5.2									8-12	3.0	3.0	110	
Sn Ro C2	5.4									8-12	3.0	6.0	110	
Sn Ro C3	5.4						20		3		3.0	9.0	115	
Condition	6.0									7-10	3.0	12.0	140	
Sn Ro C4	6.0						20			7-9	3.0	15.0	160	
Sn Ro C5	6.2									8-10	3.0	18.0	155	
Condition	6.5								3					
Sn Ro C7	6.5									7-10	3.0	21.0	155	
Sn Ro C8	6.5						20			6-8	3.0	24.0	155	2
Sn Ro C9	6.6									7-9	3.0	27.0	145	2
REAGENT TOTALS (g/t)		2182	50	397	298	893	137.47							

PRODUCTS	WT g	WT %	Sn %	DIST	Fe %	DIST	S %	DIST	SiO2 %	DIST
T20 S Cl1 C1	129.0	25.6	0.84	19.2	33.2	24.5	21.8	93.1	21.4	25.4
S Cl1 Tail	8.2	1.6	1.53	2.2	34.2	1.6	3.77	1.0	24.1	1.8
Sn Ro C1	2.6	0.5	2.73	1.3	32.2	0.5	0.80	0.1	15.9	0.4
C2	2.8	0.6	7.75	3.8	33.3	0.5	0.63	0.1	13.9	0.4
C3	3.5	0.7	11.7	7.2	36.0	0.7	0.56	0.1	11.2	0.4
C4	26.3	5.2	6.16	28.7	48.0	7.2	0.19	0.2	7.34	1.8
C5	23.3	4.6	1.60	6.6	58.7	7.8	0.34	0.3	6.33	1.4
C6	24.9	4.9	1.02	4.5	60.3	8.6	0.40	0.3	6.19	1.4
C7	18.7	3.7	0.70	2.3	54.7	5.9	0.57	0.4	7.87	1.4
C8	8.3	1.6	0.59	0.9	55.1	2.6	0.92	0.3	8.80	0.7
C9	9.2	1.8	0.63	1.0	54.6	2.9	1.61	0.5	9.05	0.8
Ro Tail	247.3	49.1	0.51	22.3	26.2	37.1	0.47	3.8	28.3	64.4
CALC	504.1	100.0	1.12	100.0	34.6	100.0	5.99	100.0	21.6	100.0
ASSAY HEAD			1.16		30.4		5.87		23.7	

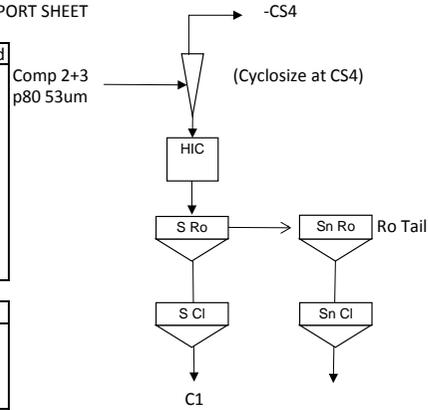
CUM PRODUCTS	CUM Wt	WT %	Sn %	CUM	Fe %	CUM	S %	CUM	SiO2 %	CUM
T20 S Cl1 C1	129.0	25.6	0.84	19.2	33.2	24.5	21.8	93.1	21.4	25.4
S Cl1 Tail	137.2	27.2	0.88	21.4	33.3	26.1	20.7	94.1	21.6	27.2
Sn Ro C1	2.6	0.5	2.73	1.3	32.2	0.5	0.80	1.1	15.9	0.4
C2	5.4	1.1	5.33	5.1	32.8	1.0	0.71	1.2	14.8	0.7
C3	8.9	1.8	7.84	12.3	34.0	1.7	0.65	1.2	13.4	1.1
C4	35.2	7.0	6.58	41.0	44.5	9.0	0.31	1.4	8.87	2.9
C5	58.5	11.6	4.60	47.6	50.1	16.8	0.32	1.6	7.86	4.2
C6	83.4	16.5	3.53	52.1	53.2	25.4	0.34	2.0	7.36	5.6
C7	102.1	20.3	3.01	54.4	53.5	31.3	0.39	2.3	7.46	7.0
C8	110.4	21.9	2.83	55.3	53.6	33.9	0.43	2.6	7.56	7.7
C9	119.6	23.7	2.66	56.3	53.7	36.8	0.52	3.1	7.67	8.4



BURNIE LABORATORY: ROUGHER FLOTATION REPORT SHEET

PROJECT	T0887
TEST NO	T21
DATE	291014
TECHNICIAN	MW

Milling		Primary	Regrind
Mill type		HIC	
Media type			
Media kg		500	
Solids g		400	
Water g		5.0	
Time min		60HZ	
Speed rpm			
Lime g			
End pH			
End p80			



PRODUCT FLOATED	
Comp. 2+3 Deslimed at CS4	

NOTES	
P80=53um 2kg lots 60mins grinding Use 1kg for desliming	

Float Cell		Volume	Regrind Power
Rougher	2.5	Start	
C1	1.5	Finish	
Speed	850	W/h	kWh/t

	pH	10.0 H2SO4 g/t	0.5 SIPX g/t	1.0 SSF g/t	1.0 Na2SO3 g/t	1.0 SPA7080 g/t	0.495 MIBC g/t		Cond Time min	Air L/min	Float Time min	Cum Float Time	Wet Wt g	Con % Solids
HIC Cond (60HZ)	2.5	2151		196					5					
Water Change	5.9		49						3					
Conditioning S Ro C	5.9						39			3-10	5.0	5.0	350	
Condition S Cl1 C1	6.8						19			3-9	4.0	9.0	250	42
Condition Condition Sn Ro C1	4.0	352		196	293	293			3 3 3		9.0	9.0	335	
Condition Condition Sn Ro C2	6.2				293	293				10.14	7.5	16.5	300	
Condition Condition Sn Cl1 C1	6.5									7-10	2.0	18.5	30	
Condition Condition Sn Cl1 C2	6.5									8-11	3.0	21.5	50	
REAGENT TOTALS (g/t)		2503	49	391	587	587	58							

PRODUCTS	WT g	WT %	Sn %	DIST	Fe %	DIST	S %	DIST	SiO2 %	DIST		
T21 S Cl1 C1	104.2	20.4	0.80	14.8	31.4	18.2	22.3	79.3	22.5	21.8		
S Cl1 Tail	6.7	1.3	1.65	2.0	30.0	1.1	4.65	1.1	27.2	1.7		
Sn Cl1 C1	11.6	2.3	5.95	12.3	30.5	2.0	4.52	1.8	17.9	1.9		
Sn Cl1 C2	7.3	1.4	5.51	7.2	31.6	1.3	4.75	1.2	18.2	1.2		
Sn Cl1 Tail	18.3	3.6	2.71	8.8	29.3	3.0	2.68	1.7	24.9	4.2		
Ro Tail	363.2	71.0	0.85	54.9	36.9	74.5	1.21	15.0	20.5	69.1		
CALC	511.3	100.0	1.10	100.0	35.2	100.0	5.73	100.0	21.1	100.0		
ASSAY HEAD			1.11		33.0		5.86		22.0			

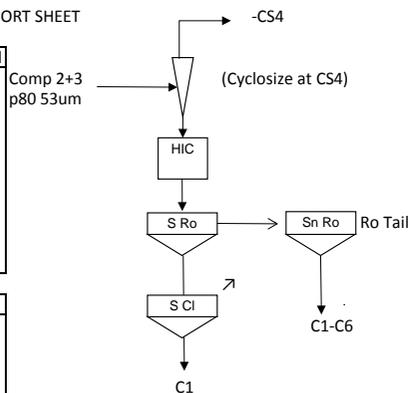
CUM PRODUCTS	CUM Wt	WT %	Sn %	CUM	Fe %	CUM	S %	CUM	SiO2 %	CUM		
T21 S Cl1 C1	104.2	20.4	0.80	14.8	31.4	18.2	22.3	79.3	22.5	21.8		
S Cl1 Tail	110.9	21.7	0.85	16.8	31.3	19.3	21.2	80.4	22.8	23.5		
Sn Cl1 C1	11.6	2.3	5.95	12.3	30.5	2.0	4.52	2.9	17.9	1.9		
Sn Cl1 C2	18.9	3.7	5.78	19.4	30.9	3.2	4.61	4.0	18.0	3.2		
Sn Cl1 Tail	37.2	7.3	4.27	28.3	30.1	6.2	3.66	5.7	21.4	7.4		



BURNIE LABORATORY: ROUGHER FLOTATION REPORT SHEET

PROJECT	T0887
TEST NO	T23
DATE	071114
TECHNICIAN	MW

Milling		Primary	Regrind
Mill type		HIC	
Media type			
Media kg			
Solids g		500	
Water g		400	
Time min		5.0	
Speed rpm		60HZ	
Lime g			
End pH			
End p80			



PRODUCT FLOATED	
Comp. 2+3	
Deslimed at CS4	

NOTES	
P80=53um	
2kg lots 60mins grinding	
Use 1kg for desliming	

kwh/t		Regrind Power
Float Cell Volume	2.5	Start Finish W/h kWh/t
Rougher Speed	850	

	pH	10.0 H2SO4 g/t	0.5 SIPX g/t	1.0 SSF g/t	1.0 SPA7080 g/t	0.5 MIBC g/t			Cond Time min	Air L/min	Float Time min	Cum Float Time	Wet Wt g	Con % Solids
HIC Cond (60HZ)	2.5	1574		197					5					
Water Change	6.3		49						3					
Conditioning	6.3					58				3-9	14.0	14.0	700	
S Ro C	6.3													
Condition	6.8									1-9	4.5	18.5	330	40
S Cl1 C1	6.8													
Condition	4.0	393		197					3					
Condition	4.0				295				3					
Sn Ro C1	5.2									3.0	3.0	3.0	110	1
Sn Ro C2	5.2									8-12	3.0	6.0	110	1
Sn Ro C3	5.5					19				8-12	3.0	9.0	115	2
Condition	5.8				98				3					
Sn Ro C4	5.8									7-10	3.0	12.0	140	5
Sn Ro C5	6.0					19				7-9	3.0	15.0	160	5
Sn Ro C6	6.2									8-10	3.0	18.0	155	5
REAGENT TOTALS (g/t)		1967	49	393	393	97								

PRODUCTS	WT g	WT %	Sn %	DIST	Fe %	DIST	S %	DIST	SiO2 %	DIST
T23 S Cl1 C1	130.8	25.7	0.89	21.1	32.7	24.7	20.9	92.9	21.1	25.7
Sn Ro C1	1.2	0.2	4.11	0.9	25.2	0.2	3.25	0.1	24.9	0.3
C2	1.3	0.2	5.92	1.4	27.7	0.2	2.82	0.1	22.3	0.3
C3	2.1	0.4	6.37	2.4	28.5	0.3	2.67	0.2	22.9	0.4
C4	6.9	1.4	9.67	12.1	32.1	1.3	0.93	0.2	14.8	0.9
C5	8.2	1.6	6.22	9.2	36.9	1.7	0.96	0.3	16.2	1.2
C6	7.6	1.5	4.33	6.0	39.8	1.7	1.30	0.3	15.9	1.1
Ro Tail	350.3	68.9	0.74	47.0	34.5	69.8	0.49	5.8	21.5	70.0
CALC	508.4	100.0	1.09	100.0	34.1	100.0	5.79	100.0	21.2	100.0
ASSAY HEAD			1.05		29.8		5.35		24.4	

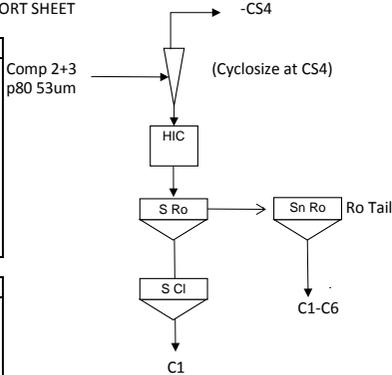
CUM PRODUCTS	CUM Wt	WT %	Sn %	CUM	Fe %	CUM	S %	CUM	SiO2 %	CUM
T23 S Cl1 C1	130.8	25.7	0.89	21.1	32.7	24.7	20.9	92.9	21.1	25.7
Sn Ro C1	1.2	0.2	4.11	0.9	25.2	0.2	3.25	0.1	24.9	0.3
C2	2.5	0.5	5.03	2.3	26.5	0.4	3.03	0.3	23.6	0.5
C3	4.6	0.9	5.63	4.6	27.4	0.7	2.87	0.4	23.3	1.0
C4	11.5	2.3	8.07	16.7	30.2	2.0	1.70	0.7	18.1	1.9
C5	19.7	3.9	7.30	26.0	33.0	3.7	1.39	0.9	17.3	3.2
C6	27.3	5.4	6.47	31.9	34.9	5.5	1.37	1.3	16.9	4.3



BURNIE LABORATORY: ROUGHER FLOTATION REPORT SHEET

PROJECT	T0887
TEST NO	T24
DATE	071114
TECHNICIAN	MW

Milling		Primary	Regrind
Mill type		HIC	
Media type			
Media	kg		
Solids	g	500	
Water	g	400	
Time	min	5.0	
Speed	rpm	60HZ	
Lime	g		
End pH	pH		
End p80	µm		



PRODUCT FLOATED	
Comp. 2+3	
Deslimed at CS4	

NOTES	
P80=53um	
2kg lots 60mins grinding	
Use 1kg for desliming	

Float Cell	Volume	Regrind Power
Rougher	2.5	Start
		Finish
		W/h
Speed	850	kWh/t

	pH	10.0 H2SO4 g/t	0.5 SIPX g/t	1.0 SPA7080 g/t	0.5 MIBC g/t	Cond Time min	Air L/min	Float Time min	Cum Float Time	Wet Wt g	Con % Solids
HIC Cond (60HZ)	2.5	1577				5					
Water Change	6.3		49			3					
S Ro C	6.3				59		3-9	14.0	14.0	700	
Condition S Cl C1	6.8						1-9	4.5	18.5	330	28
Condition Sn Ro C1	4.0	394		296		3		3.0	3.0	110	3
Sn Ro C2	5.2					3	8-12	3.0	6.0	110	3
Sn Ro C3	5.5			99	20		8-12	3.0	9.0	115	3
Condition Sn Ro C4	5.8					3	7-10	3.0	12.0	140	8
Sn Ro C5	6.0				20		7-9	3.0	15.0	160	3
Sn Ro C6	6.2						8-10	3.0	18.0	155	3
<b>REAGENT TOTALS (g/t)</b>		<b>1971</b>	<b>49</b>	<b>394</b>	<b>98</b>						

PRODUCTS	WT g	WT %	Sn %	DIST	Fe %	DIST	S %	DIST	SiO2 %	DIST
T24 S Cl1 C1	93.8	18.5	0.81	14.3	28.4	16.2	13.3	53.4	27.3	21.9
S Cl Tail	44.0	8.7	1.11	9.2	40.8	10.9	19.9	37.4	14.4	5.4
Sn Ro C1	3.8	0.7	2.12	1.5	23.3	0.5	1.25	0.2	28.6	0.9
C2	3.1	0.6	2.15	1.3	25.9	0.5	1.48	0.2	23.6	0.6
C3	3.8	0.7	1.99	1.4	24.5	0.6	1.71	0.3	21.9	0.7
C4	11.2	2.2	3.95	8.3	30.7	2.1	0.76	0.4	13.4	1.3
C5	4.8	0.9	3.13	2.8	32.0	0.9	1.16	0.2	20.4	0.8
C6	4.7	0.9	3.52	3.1	33.7	1.0	1.48	0.3	19.2	0.8
Ro Tail	338.1	66.6	0.91	58.0	32.6	67.2	0.53	7.7	23.3	67.5
CALC	507.3	100.0	1.05	100.0	32.3	100.0	4.61	100.0	23.0	100.0
ASSAY HEAD			1.05		29.8		5.35		24.4	

CUM PRODUCTS	CUM Wt	WT %	Sn %	CUM	Fe %	CUM	S %	CUM	SiO2 %	CUM
T24 S Cl1 C1	93.8	18.5	0.81	14.3	28.4	16.2	13.3	53.4	27.3	21.9
S Cl Tail	137.8	27.2	0.91	23.5	32.4	14.6	15.4	48.3	23.2	16.7
Sn Ro C1	141.6	0.7	2.12	1.5	23.3	0.5	1.25	0.2	28.6	0.9
C2	144.7	1.4	2.13	2.8	24.5	0.5	1.35	0.2	26.4	0.8
C3	148.5	2.1	2.08	4.2	24.5	0.5	1.48	0.2	24.8	0.8
C4	159.7	4.3	3.04	12.5	27.7	1.3	1.11	0.3	18.9	1.0
C5	164.5	5.3	3.05	15.4	28.4	1.3	1.12	0.3	19.2	1.0
C6	169.2	6.2	3.12	18.5	29.23	1.2	1.17	0.3	19.19	1.0