

# African Mineral Standards

## *Certificate of Analysis*

Tin Ore Reference Material AMIS0019

Recommended Concentrations and two "Between Laboratory" Standard Deviations

### *Certified Concentrations*

Tin	1.095 ± 0.062 %	Sn (XRF)
Tin	1.094 ± 0.122 %	Sn (other methods)
Zinc	5122 ± 426 ppm	Zn (XRF)
Zinc	5212 ± 358 ppm	Zn (other methods)
Copper	337 ± 35 ppm	Cu (other methods)
Specific Gravity	2.89 ± 0.24 gm/cc	Gas pycnometer

### *Provisional Concentrations*

Copper	359 ± 72 ppm	Cu (XRF)
Silver	22.4 ± 4.3 ppm	Ag (other methods)

**Intended Use:** AMIS0019 is suitable for monitoring the accuracy of a single analysis of Sn ores hosted by felsic or similar rocks. The material can be used for routine quality control by inserting within a batch of samples, method development and for the calibration of equipment.

The recommended mean and "Between Lab" standard deviations for this standard reflect the average results from the laboratories that participated in the round robin. Slight variations in analytical procedures between laboratories will reflect as slight biases to the recommended concentrations and this is acceptable. Good laboratories however will report results within the two standard deviation levels with a failure of <10 %.

**Origin of Material:** This standard was made from material supplied from porphyry tin exploration projects in Bolivia. Tin is hosted in high-level to subvolcanic felsic intrusives that have been subjected to pervasive sericitic alteration.

**Approximate Mineral and Chemical Composition:** The AMIS0019 ore comprises fine-grained cassiterite in veinlet and fracture stockwork zones that also contain stannite, chalcopyrite, sphalerite, galena, pyrite and arsenopyrite.

SiO2 %	Al2O3 %	Fe2O3 %	S (SQ) %	K2O %	MgO %	TiO2 %	Na2O %
54.15	14.8	12.48	5.20	3.46	1.05	0.60	0.37
MnO %	CaO %	P2O5 %	Cr2O3 %	V2O5 %	LOI %	CL (SQ) %	
0.14	0.11	0.08	0.02	0.02	8.97	<0.01	

**Method of Preparation:** The material was crushed, dry-milled and air-classified to 100% <54µ. It was then blended in a bi-conical mixer, systematically divided and then sealed into 1kg Laboratory Packs. Explorer Packs are subdivided from the Laboratory packs as required. Samples from the entire batch were selected for homogeneity testing and third party analysis. Statistical analysis of both homogeneity and the consensus test results were carried out by an independent statistician.

**Method of Analysis:**

**Analytical methods requested:**

1. Sn, Cu, Zn, Ag. - XRF
2. Sn, Cu, Zn, Ag. - ICP-MS
3. SG gas pycnometer

**Information requested:**

1. Aliquots used for all determinations.
2. Results for individual PGM's reported in ppb.
3. Results for base metals reported in ppm.
4. QC data, to include replicates, blanks and certified reference materials used.
5. Analytical techniques used.

**Method of Certification:** Eighteen laboratories were each given eight samples. Various results from the seventeen laboratories that reported back in a reasonable time period were used for the determinations. The following round robin results are displayed:

1. Sn, Cu, Zn, Ag by glass bead, pressed pellet or lithium borate fusion - XRF.
2. Sn, Cu, Zn, Ag by multi acid digest or lithium borate fusion; ICP-MS or AAS
3. SG gas pycnometer

The mean and standard deviation for all data was calculated. Outliers were defined as samples beyond the mean  $\pm$  2 Standard Deviations from all data. These outliers were removed from the data and a new mean and standard deviation was determined. This method is different from that used to calculate the Confidence Interval shown on many Government-produced standards in that the actual "between-laboratory" standard deviation is used in the calculations. This produces upper and lower limits that reflect actual individual analyses rather than a grouped set of analyses. The limits can therefore be used to monitor accuracy from individual analyses, unlike the Certified Limits published on other standards which quote a Confidence Interval.

The tables below represent raw data received from the laboratories.

Lab Code	Sn XRF %	Sn (T) ppm	Cu XRF ppm	Cu (T) ppm	Zn XRF ppm	Zn (T) ppm	Ag XRF ppm	Ag (T) ppm	SG gm/cc
A	1.120	1.120	340	320	5090	5200		20	2.74
A	1.120	1.130	360	300	5100	5160		25	2.75
A	1.120	1.150	350	320	5110	5200		20	2.80
A	1.120	1.130	350	320	5110	5120		20	2.80
A	1.130	1.110	350	300	5080	5120		20	2.81
A	1.140	1.150	350	320	5120	5080		20	2.78
A	1.120	1.120	350	320	5120	5140		20	2.76
A	1.120	1.130	350	320	5100	5160		20	2.76
B	1.060	1.088	380	318	5120	5021		23	3.00
B	1.060	1.135	400	310	5170	5097		24	3.01
B	1.060	1.145	380	315	5050	5028		23	3.04
B	1.070	1.126	390	320	5160	5081		23	3.05
B	1.070	1.131	400	319	5190	5105		23	3.04
B	1.070	1.142	390	319	5180	5441		23	3.05
B	1.050	1.158	390	328	5120	5297		23	3.07
B	1.060	1.149	390	322	5160	5099		25	3.08
C		0.870		230		4800			2.75
C		0.900		280		4900			2.73
C		0.930		270		4900			2.78
C		0.880		240		4700			2.75
C		0.940		240		4900			2.70
C		0.900		220		4900			2.76
C		0.940		240		4900			2.80
C		0.900		230		4900			2.73
D	1.103		400	377	5300	5360		23	3.12
D	1.103		400	358	5300	5510		23	3.11
D	1.103		400	353	5300	5500		23	3.12
D	1.111		400	362	5300	5620		24	3.11
D	1.118		400	352	5300	5460		23	3.10
D	1.103		300	349	5300	5470		23	3.11
D	1.103		400	353	5300	5560		23	3.14
D	1.111		400	349	5300	5480		23	3.13

Lab Code	Sn XRF %	Sn (T) ppm	Cu XRF ppm	Cu (T) ppm	Zn XRF ppm	Zn (T) ppm	Ag XRF ppm	Ag (T) ppm	SG gm/cc
E				362		5100		27	
E				370		5110		28	
E				365		5260		28	
E				382		5830		27	
E				394		6080		28	
E				384		5930		27	
E				415		6190		29	
E				403		5980		28	
F	1.116		355		4834			31	2.82
F	1.095		353		4880			31	2.82
F	1.086		356		4889			32	2.82
F	1.107		359		4908			32	2.82
F	1.087		357		4883			33	2.81
F	1.105		358		4914			32	2.81
F	1.096		360		4896			32	2.81
F	1.100		354		4873			32	2.83
G	1.045		805		12252		69		
G	1.047		798		12211		68		
G	1.042		797		12191		68		
G	1.045		789		12333		63		
G	1.039		808		12205		66		
G	1.044		802		12311		67		
G	1.043		818		12258		63		
G	1.036		799		12147		66		
H		1.120		350		5382		24	2.85
H		1.120		352		5434		24	2.78
H		1.160		352		5417		24	2.89
H		1.183		351		5450		24	2.77
H		1.091		350		5230		24	2.86
H		1.175		352		5415		24	2.75
H		1.136		353		5300		24	2.77
H		1.187		352		5339		24	2.79
I				302		4960		18	2.70
I				289		5050		19	2.65
I				309		4940		19	2.71
I				289		4940		19	2.66
I				259		4830		11	2.63
I				312		5070		19	2.66
I				292		4930		19	2.69
I				280		4970		20	2.57
J		0.999		258		5400		15	
J		1.020		256		5300		19	
J		1.020		251		5300		19	
J		1.000		232		5300		15	
J		1.010		253		5400		18	
J		1.030		249		5300		44	
J		1.030		241		5300		16	
J		0.973		243		5400		16	

Lab Code	Sn XRF %	Sn (T) ppm	Cu XRF ppm	Cu (T) ppm	Zn XRF ppm	Zn (T) ppm	Ag XRF ppm	Ag (T) ppm	SG gm/cc
K		0.973		322		5216		22	
K		1.024		330		5172		22	
K		0.997		339		5186		23	
K		1.082		345		5272		22	
K		0.986		326		5317		24	
K		1.058		361		5207		22	
K		0.984		349		5216		22	
K		1.023		346		5063		22	
L	1.150	1.170	400	351	5400	5310	80	23	3.02
L	1.130	1.160	400	335	5500	5400	100	24	3.02
L	1.150	1.150	400	322	5500	5260	40	25	3.03
L	1.140	1.100	400	342	5400	4990	40	21	3.12
L	1.130	1.060	400	390	5400	4980	40	20	3.06
L	1.140	1.150	400	321	5500	5260	60	23	2.94
L	1.140	1.190	400	336	5300	5360	0	24	3.06
L	1.140	1.110	400	316	5400	5070	100	20	3.04
M	1.103		310	330	4840			11	
M	1.103		300	343	4800			11	
M	1.103		320	328	4790			11	
M	1.111		310	345	4810			11	
M	1.119		310	338	4810			11	
M	1.103		310	341	4740			11	
M	1.103		300	344	4730			12	
M	1.111		290	345	4700			11	
N		1.131		310	5200			24	2.97
N		1.230		330	5300			23	3.00
N		1.300		320	5200			23	2.99
N		1.280		320	5400			23	3.01
N		1.270		310	5400			23	2.97
N		1.250		320	5200			23	2.99
N		1.270		310	5500			23	2.99
N		1.290		330	5100			24	3.00
O	1.240			345		5270		24	
O	1.240			344		5290		24	
O	1.230			346		5320		24	
O	1.240			345		5210		24	
O	1.240			351		5390		24	
O	1.230			350		5310		24	
O	1.230			346		5340		24	
O	1.240			351		5410		24	
P		1.010		355		5250		25	
P		1.025		343		5000		23	
P		1.040		345		5150		24	
P		1.040		345		5150		24	
P		1.060		360		5300		24	
P		1.100		353		5300		25	
P		1.080		358		5250		24	
P		1.125		358		5300		24	
Q	1.090	1.080	322	316	5070	5220		12	
Q	1.080	1.070	321	314	5060	5070		12	
Q	1.080	1.100	326	316	5050	5200		13	
Q	1.090	1.090	325	323	5080	5290		15	
Q	1.090	1.100	330	324	5080	5260		14	
Q	1.080	1.090	328	323	5090	5270		14	
Q	1.060	1.100	318	328	4980	5370		13	
Q	1.080	1.100	322	325	5040	5250		13	

**Participating Laboratories:** (Not in the same order as in the table of assays)

1. Activation Laboratories Ltd., (ActLabs, Ancaster, ON, Canada).
2. Activation Laboratories Ltd (Perth, Australia).
3. ALS Chemex, (Brisbane, Australia).
4. ALS Chemex (, Vancouver, Canada).
5. ALS Chemex South Africa ( Pty ) Ltd.
6. Amdel Limited, (Perth, Australia).
7. Genalysis Laboratory Services ( Pty ) Ltd. (Australia).
8. Geoscience Laboratories (Geo Labs, Canada).
9. Mintek (South Africa).
10. OMAC Laboratories (Ireland).
11. Pt Intertek Utama Services (Intertek, Indonesia)
12. Set Point Laboratories ( Pty ) Ltd (South Africa).
13. SGS Lakefield Research Africa ( Pty ) Ltd. (South Africa).
14. SGS Welshpool Minerals (Australia).
15. SGS Lakefield Research (Canada).
16. SGS Lakefield Research (Peru).
17. Ultra Trace ( Pty ) Ltd. (Australia).

**Availability:** This product is available in Laboratory Packs containing 1kg of material and Explorer Packs containing custom weights (of <250g) of material. The Laboratory Packs are sealed bottles delivered in sealed foil pouches. The Explorer Packs contain material in standard geochem envelopes, nitrogen flushed and vacuum sealed in foil pouches.

**Legal Notice:** This certificate and the reference material described in it have been prepared with due care and attention. However AMIS, Set Point Technology (Pty) Ltd, Mike McWha, Dr Barry Smee and Smee and Associates Ltd; accept no liability for any decisions or actions taken following the use of the reference material.

19 December, 2006

**Certifying Officers:**



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