

African Mineral Standards

Certificate of Analysis

Tin Ore Reference Material AMIS0021

Recommended Concentrations and two “Between Laboratory” Standard Deviations

Certified Concentrations

Tin	0.27 ± 0.026 %	Sn (XRF)
Zinc	352 ± 42 ppm	Zn (other methods)
Specific Gravity	2.74 ± 0.22 gm/cc	Gas pycnometer

Provisional Concentrations

Tin	0.29 ± 0.043 %	Sn (other methods)
Copper	54 ± 7.9 ppm	Cu (other methods)

Indicated Mean

Silver	11 ppm	Ag (other methods)
--------	--------	--------------------

Intended Use: AMIS0021 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 AMIS0021 ore comprises fine-grained cassiterite in veinlet and fracture stockwork zones that also contain stannite, chalcopyrite, sphalerite, galena, pyrite and arsenopyrite.

SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	LOI	K ₂ O	MgO	TiO ₂	S (SQ)
%	%	%	%	%	%	%	%
70.3	14.3	4.4	4.4	2.4	0.9	0.8	0.7
P ₂ O ₅	Na ₂ O	MnO	Cr ₂ O ₃	CaO	V ₂ O ₅	CL (SQ)	
%	%	%	%	%	%	%	
0.4	0.3	0.02	0.02	0.02	0.01	<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 were used for the determinations. The following round robin results are displayed:

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

The mean and standard deviation for all data was calculated. Outliers were defined as samples beyond the mean ± 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	0.300	2990	30	60	340			10	2.67
A	0.295	2820	60	60	340			10	2.69
A	0.299	2860	40	60	335			10	2.66
A	0.300	2880	40	60	345			10	2.71
A	0.298	3010	40	60	350			15	2.67
A	0.306	3000	30	60	335			10	2.69
A	0.298	2960	40	60	335			10	2.70
A	0.310	2940	50	60	340			10	2.67
B	0.280	3152	40	51		307		10	2.93
B	0.280	3152	40	48		316		10	2.94
B	0.280	3030	50	47		323		10	2.89
B	0.290	3075	40	50	360	333		9	2.86
B	0.280	3045	40	50	340	336		10	2.90
B	0.280	3072	50	49	340	333		9	2.91
B	0.280	3137	40	49	350	344		10	2.87
B	0.290	3057		50	350	331		9	2.89
C		2600		42		330			2.76
C		2400		52		320			2.74
C		2300		49		310			2.71
C		2200		49		300			2.73
C		2200		49		300			2.71
C		2500		51		320			2.75
C		2400		52		310			2.78
C		2500		58		310			2.75
D	0.291			54	400	377		11	2.99
D	0.291			55	400	380		12	3.00
D	0.284			54	400	378		11	2.97
D	0.291			54	400	381		11	2.99
D	0.291			54	400	377		11	3.02
D	0.291			54	400	379		11	2.97
D	0.291			56	400	379		32	2.99
D	0.284			53	400	382		11	3.00

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		2830		62		326		14	
E		2980		58		321		13	
E		2930		57		318		13	
E		2930		54		319		12	
E		3320		53		352		12	
E		3030		55		332		13	
E		2810		56		300		13	
E		3540		55		374		13	
F	0.280	2797	44		315			73	2.70
F	0.280	2836	46		316			84	2.69
F	0.290	2881	44		314			75	2.69
F	0.290	2897	45		315			77	2.70
F	0.290	2871	46		318			81	2.72
F	0.280	2755	46		316			74	2.71
F	0.290	2869	46		316			67	2.72
F	0.280	2839	47		314			78	2.73
G	0.280		49		335		21		
G	0.277		46		331		20		
G	0.280		51		331		20		
G	0.282		45		334		22		
G	0.282		51		328		22		
G	0.281		48		328		22		
G	0.281		49		333		20		
G	0.282		49		338		25		
H		3162		52		360		12	2.60
H		3062		54		364		12	2.62
H		3025		52		340		12	2.60
H		3041		53		380		12	2.58
H		3065		52		373		12	2.62
H		2995		53		357		12	2.64
H		3098		53		384		12	2.62
H		3194		53		360		12	2.63
I		2720		45		342		10	2.64
I		2410		45		348		7	2.72
I		2570		45		364		5	2.59
I		2560		46		361		10	2.54
I		2620		47		365		10	2.59
I		2600		48		361		10	2.58
I		2590		48		365		10	2.59
I		2580		46		355		10	2.68

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
J				63		331		11	
J				61		336		11	
J				58		322		10	
J				71		336		12	
J				52		300		10	
J				56		300		10	
J				61		305		12	
J				65		351		13	
K		2605		55		347		11	
K		2590		54		351		11	
K		2496		52		349		11	
K		2541		53		342		11	
K		2475		55		369		11	
K		2586		53		353		11	
K		2486		52		379		11	
K		2436		51		338		11	
L	0.300	2810		59	200	345		11	2.88
L	0.300	3110		156	300	380		13	2.98
L	0.290	3060		80	300	365		12	2.96
L	0.300	3360		166	300	385		12	2.89
L	0.300	3230		60	400	375		13	2.86
L	0.310	3270		64	300	380		12	2.84
L	0.300	3080		112	200	355		9	2.96
L	0.290	3130		144	300	405		10	2.96
M				53	300	342		5	
M				54	300	345		5	
M				55	300	353		5	
M				55	310	359		5	
M				54	310	350		5	
M				53	300	352		5	
M				54	320	348		5	
M				52	310	339		5	
N				47				11	2.81
N				50				11	2.81
N				45				11	2.82
N				50				11	2.80
N				49				11	2.81
N				51				11	2.82
N				46				11	2.81
N				51				11	2.81
O				52		371		12	

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
O				51		376		11	
O				52		369		11	
O				54		366		12	
O				51		380		12	
O				48		349		12	
O				55		405		11	
O				53		364		11	
P		3675		60		350		12	
P		3450		58		383		12	
P		3550		55		350		12	
P		3525		53		370		12	
P		3575		55		375		12	
P		3525		55		353		12	
P		3425		55		355		12	
P		3525		55		375		12	
Q	0.256	2940	41	58	352	390		8	
Q	0.254	3000	43	57	353	340		8	
Q	0.256	2950	43	57	356	340		8	
Q	0.256	2920	40	58	355	341		8	
Q	0.255	2950	42	56	357	342		7	
Q	0.258	2920	40	61	354	348		8	
Q	0.254	2940	42	56	353	336		8	
Q	0.256	2910	43	57	350	348		5	

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.

20 December, 2006

Certifying Officers:



African Mineral Standards: _____

Mike McWha
BSc (Hons), FGSSA, MAusIMM, Pr.Sci.Nat



Geochemist: _____

Barry W. Smee
BSc, PhD, P.Geo, (B.C.)