

African Mineral Standards

Certificate of Analysis

Tin Ore Reference Material AMIS0020

Recommended Concentrations and two "Between Laboratory" Standard Deviations

Certified Concentrations

Tin	0.68 ± 0.04 %	Sn (XRF)
Tin	0.698 ± 0.056 %	Sn (other methods)
Zinc	2164 ± 199 ppm	Zn (XRF)
Zinc	2286 ± 190 ppm	Zn (other methods)
Copper	260 ± 23 ppm	Cu (other methods)
Specific Gravity	2.78 ± 0.22 gm/cc	Specific Gravity

Provisional Concentrations

Copper	274 ± 50 ppm	Cu (XRF)
Silver	17.6 ± 3.1 ppm	Ag (other methods)

Intended Use: AMIS0020 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 AMIS0020 ore comprises fine-grained cassiterite in veinlet and fracture stockwork zones that also contain stannite, chalcocopyrite, sphalerite, galena, pyrite and arsenopyrite.

SiO ₂ %	Al ₂ O ₃ %	Fe ₂ O ₃ %	LOI %	S (SQ) %	K ₂ O %	TiO ₂ %	MgO %
68.3	10.5	8.6	6.8	3.6	2.6	0.54	0.5
Na ₂ O %	P ₂ O ₅ %	Cr ₂ O ₃ %	MnO %	CaO %	V ₂ O ₅ %	CL (SQ) %	
0.19	0.05	0.05	0.03	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:

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) %	Cu XRF ppm	Cu (T) ppm	Zn XRF ppm	Zn (T) ppm	Ag XRF ppm	Ag (T) ppm	SG gm/cc
A	0.693	0.699	270	260	2180	2260		15	2.74
A	0.708	0.710	270	260	2190	2340		15	2.75
A	0.690	0.719	260	280	2170	2280		15	2.71
A	0.696	0.694	270	280	2200	2360		15	2.72
A	0.698	0.715	280	280	2180	2260		15	2.71
A	0.693	0.713	270	260	2200	2320		15	2.72
A	0.685	0.713	270	260	2180	2240		15	2.72
A	0.698	0.715	260	280	2180	2300		15	2.70
B	0.660	0.710	300	246		2147		19	2.97
B	0.660	0.719	300	255		2181		18	2.91
B	0.670	0.728	300	247		2027		20	2.91
B	0.660	0.739	290	248		2200		19	2.94
B	0.650	0.718	270	257		2144		19	2.94
B	0.670	0.711	300	251		2146		19	2.93
B	0.660	0.728	280	250		2200		19	2.96
B	0.660	0.731	290	251		2180		18	2.98
C		0.580		200					2.71
C		0.580		220					2.73
C		0.600		250					2.76
C		0.600		240					2.72
C		0.580		240					2.73
C		0.600		240					2.77
C		0.570		200					2.74
C		0.560		180					2.70

Lab Code	Sn XRF %	Sn (T) %	Cu XRF ppm	Cu (T) ppm	Zn XRF ppm	Zn (T) ppm	Ag XRF ppm	Ag (T) ppm	SG gm/cc
D	0.677		300	282	2300	2440		19	3.00
D	0.677		300	268	2300	2370		18	3.00
D	0.677		300	277	2300	2420		18	3.05
D	0.685		300	280	2300	2430		18	3.03
D	0.677		300	270	2300	2390		18	3.00
D	0.677		300	280	2300	2430		19	3.01
D	0.677		300	269	2300	2340		18	3.03
D	0.685		300	274	2300	2360		18	3.01
E		0.657		279				20	
E		0.689		289				21	
E		0.691		297				21	
E		0.711		277				20	
E		0.713		288				21	
E		0.725		293				21	
E		0.721		287				21	
E		0.720		295				22	
F	0.701		267		2058			19	2.76
F	0.697		269		2062			20	2.78
F	0.701		271		2072			19	2.76
F	0.682		268		2063			20	2.77
F	0.690		268		2059			19	2.77
F	0.702		268		2068			19	2.78
F	0.703		266		2061			19	2.78
F	0.694		268		2051			19	2.78
G	0.660		651		5285		46		
G	0.661		645		5281		46		
G	0.653		644		5216		41		
G	0.660		646		5346		44		
G	0.659		633		5358		46		
G	0.659		651		5258		46		
G	0.655		632		5251		46		
G	0.660		642		5322		45		
H		0.708		270		2230		19	2.66
H		0.710		272		2251		19	2.70
H		0.705		270		2211		19	2.68
H		0.691		272		2204		19	2.65
H		0.708		271		2213		19	2.67
H		0.726		271		2255		19	2.59
H		0.712		271		2194		19	2.62
H		0.712		271		2246		19	2.65

Lab Code	Sn XRF %	Sn (T) %	Cu XRF ppm	Cu (T) ppm	Zn XRF ppm	Zn (T) ppm	Ag XRF ppm	Ag (T) ppm	SG gm/cc
I		0.683				2150			2.63
I		0.674				2130			2.57
I		0.672				2160			2.62
I		0.678				2150			2.65
I		0.664				2170			2.67
I		0.684				2180			2.65
I		0.657				2110			2.64
I		0.667				2120			2.63
J		0.620		217		2500		14	
J		0.610		236		2400		17	
J		0.640		223		2400		15	
J		0.630		220		2400		14	
J		0.640		236		2300		15	
J		0.640		214		2400		15	
J		0.630		218		2400		15	
J		0.620		219		2400		15	
K		0.578		254		2323		18	
K		0.566		255		2316		17	
K		0.510		254		2408		17	
K		0.564		259		2363		16	
K		0.557		253		2218		15	
K		0.548		250		2204		15	
K		0.577		260		2383		15	
K		0.534		256		2434		16	
L	0.700	0.696	300	246	2200	2210	40	17	3.03
L	0.700	0.672	300	245	2200	2180	0	17	3.01
L	0.700	0.681	300	247	2200	2200	40	26	2.95
L	0.710	0.682	300	242	2200	2200	0	18	2.91
L	0.690	0.704	300	238	2200	2240	60	19	2.94
L	0.710	0.703	300	254	2300	2270	0	18	3.05
L	0.710	0.670	300	251	2300	2240	20	17	2.85
L	0.710	0.715	300	257	2300	2350	40	19	2.95
M	0.886		210	265	2000			9	
M	0.890		210	259	2000			8	
M	0.850		220	263	2010			9	
M	0.885		230	259	2090			8	
M	0.874		230	256	2040			9	
M	0.857		230	264	2000			9	
M	0.863		230	262	2010			8	
M	0.894		220	258	2030			9	

Lab Code	Sn XRF %	Sn (T) %	Cu XRF ppm	Cu (T) ppm	Zn XRF ppm	Zn (T) ppm	Ag XRF ppm	Ag (T) ppm	SG gm/cc
N				240	1900	2500		18	2.89
N				220	2100	2600		18	2.88
N				240	2200	2400		18	2.88
N				220	2200	2500		18	2.87
N				240	2100	2400		18	2.87
N				220	1900	2400		18	2.84
N				240	2100	2300		18	2.85
N				240	2000	2400		18	2.85
O	0.779			273		2320		19	
O	0.780			271		2290		18	
O	0.774			270		2300		19	
O	0.782			264		2270		18	
O	0.774			274		2330		19	
O	0.777			269		2290		18	
O	0.778			263		2250		18	
O	0.770			266		2260		18	
P		0.745		278		2225		18	
P		0.695		273		2225		18	
P		0.720		285		2375		18	
P		0.655		273		2275		18	
P		0.720		280		2350		19	
P		0.730		283		2375		18	
P		0.750		288		2400		19	
P		0.725		285		2375		19	
Q	0.652	0.680	248	250	2200	2230		9	
Q	0.654	0.689	251	257	2200	2260		11	
Q	0.656	0.665	251	247	2220	2140		10	
Q	0.658	0.687	253	254	2230	2250		11	
Q	0.653	0.683	249	260	2200	2240		13	
Q	0.656	0.682	253	259	2210	2230		12	
Q	0.654	0.682	252	263	2210	2230		12	
Q	0.657	0.694	250	260	2210	2270		10	

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

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