

AMIS0005

Certificate of Analysis

UG2 Reef (ore grade) PGE Reference Material

Recommended Concentrations and two "Between Laboratory" Standard Deviations

Certified Concentrations

Platinum	3.38 ± 0.33 g/t	(Pb Collection)
Palladium	2.23 ± 0.18 g/t	(Pb Collection)
Rhodium	0.66 ± 0.08 g/t	(NIS Collection)
Ruthenium	1.24 ± 0.09 g/t	(NIS Collection)
Chromium	20.9 ± 1.1%	(Total Acid Digestion)
Copper	59 ± 8 ppm	(Total Acid Digestion)
Copper	60 ± 6 ppm	(Partial Acid Digestion)
Nickel	160 ± 18 ppm	(Partial Acid Digestion)

Provisional Concentrations

Platinum	3.46 ± 0.48 g/t	(NIS collection)
Palladium	2.22 ± 0.31 g/t	(NIS collection)
Iridium	0.29 ± 0.08 g/t	(NIS collection)
Nickel	1081 ± 333 ppm	(Total Acid Digestion)
Nickel	1211 ± 165 ppm	(XRF)
Cobalt	11.5 ± 3 ppm	(Partial digestion)
Specific Gravity	3.88 ± 0.27	(Gas pycnometer)

Indicated Means

Gold	0.02 g/t	(Pb collection)
Copper	68 ppm	(XRF)

Intended Use: AMIS-5 is suitable for monitoring the accuracy of a single analysis of PGE, Cu and Ni ores hosted by UG2 Reef or other similar chromitite rich mafic 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 using Pt/Pd rich UG2 chromitite (UG2) material supplied by Anglo Platinum Limited from the Western limb of the Bushveld Complex. This specific material was made from a bulk sample hand collected underground from the East Shaft section of the Waterval Mine.

Approximate Mineral and Chemical Composition: AMIS-7 comprises approximately 80% UG2 Chromitite seam, 15% pegmatoidal pyroxenite footwall and 5% pyroxenite hanging wall. The UG2 Chromitite is composed of chromite (60-90% by volume), orthopyroxene (5-25%), plagioclase (5-15%) as well as accessory amounts of other minerals, of which the more important are clinopyroxene, base metal sulphides, platinum-group minerals, ilmenite and magnetite. The base metal sulphides are predominantly pentlandite, pyrrhotite, pyrite, chalcopyrite and to a lesser extent millerite. The Platinum Group Minerals identified in the UG2 are cooperite, laurite, braggite, Pt-Fe Alloy and sperrylite.

FeO %	MnO %	Cr ₂ O ₃ %	V ₂ O ₅ %	TiO ₂ %	CaO %	SiO ₂ %	Al ₂ O ₃ %	MgO %	Na ₂ O %	K ₂ O %	S % (S.Q)
19.6	0.24	30.6	0.2	0.7	2.0	15.7	17.9	10.8	0.9	0.17	<0.01

Appearance: The material is a very fine powder. It is coloured a distinctive olive grey (Munsell 5Y 4/1) to grayish brown (Corstor 5YR 3/2).

Method of Preparation: The material was crushed, dry-milled and air-classified to <54um. Wet sieve particle size analysis of random samples confirmed the material was 98.5% <54um. 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 were randomly selected for homogeneity testing and third party analysis. Statistical analysis of both homogeneity and the consensus test results were carried out by independent statisticians.

Method of Analysis:

1. Pt, Pd and Au. ICP-OES or ICP-MS, Pb collection with Ag as a co-collector.
2. Au, Pt, Pd, Rh, Ru and Ir. ICP-MS, nickel sulphide collection.
3. Cu and Ni. Multi-acid total digestion, including HF, with ICP-OES finish.
4. Cu and Ni. Aqua regia digestion with ICP-OES finish.
5. Cr, Co, Cu and Ni. Pressed pellet XRF.
6. Specific Gravity. 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 randomly selected packages of sample and various results from the sixteen of those laboratories that reported back timeously were used for the determinations below. The following round robin results are displayed:

- Pt and Pd analyses by the Pb collection method;
- Rh and Ru analyses by the NiS method;
- Cr and Cu by the multi-acid (total) digestion method and
- Cu and Ni by the aqua regia (partial) digestion method.

Lab	Pb Collection	Pb Collection	NiS	NiS	Total	Total	Partial	Partial
Code	Pt, g/t	Pd, g/t	Rh, g/t	Ru, g/t	Cr, %	Cu, ppm	Cu, ppm	Ni ppm
A	3.22	2.040	0.63					
A	3.38	2.197	0.68					
A	3.29	2.101	0.64					
A	3.41	2.148	0.66					
A	3.48	2.184	0.68					
A	3.33	2.100	0.67					
A								
A	3.17	2.056	0.64					
B			0.684	1.195	20.71	54	57	152
B			0.703	1.209	19.48	56	55	150
B			0.688	1.257	20.42	57	56	152
B			0.719	1.259	20.16	55	56	150
B			0.706	1.215	20.46	55	57	155
B			0.682	1.257	19.37	54	57	156
B			0.698	1.217	18.89	54	55	150
B			0.669	1.150	21.38	57	55	149
C						61	62	174
C						63	61	170
C						65	61	171
C						69	62	167
C						63	60	167
C						64	62	169
C						62	60	169
C						65	63	171

Lab	Pb Collection	Pb Collection	NiS	NiS	Total	Total	Partial	Partial
Code	Pt, g/t	Pd, g/t	Rh, g/t	Ru, g/t	Cr, %	Cu, ppm	Cu, ppm	Ni ppm
D	3.455	2.190	0.636	1.285	20.89	71	71	156
D	3.430	2.195	0.651	1.312	20.94	59	59	146
D	3.590	2.285	0.680	1.199	20.82	60	57	144
D	3.575	2.310	0.619	1.275	20.62	57	57	144
D	3.570	2.290	0.614	1.179	20.92	56	57	148
D	3.540	2.185	0.661	1.212	20.96	55	56	146
D	3.365	2.175	0.672	1.291	20.86	55	56	146
D	3.555	2.260	0.685	1.255	20.91	53	56	143
E	3.647	2.262				60	61	161
E	3.499	2.211				66	62	163
E	3.143	2.222				64	60	161
E	3.429	2.363				60	60	159
E	3.431	2.252				66	60	161
E	3.235	2.214				56	59	154
E	3.229	2.272				62	59	153
E	3.309	2.249				56	60	159
F	3.240	2.320	0.646	1.390	20.5	60	64	166
F	3.200	2.260	0.584	1.260	20.7	60	64	166
F	3.060	2.280	0.683	1.490	20.7	60	63	166
F	2.920	2.180	0.589	1.240	20.6	60	61	164
F	3.140	2.280	0.593	1.270	20.9	60	64	168
F	3.140	2.220	0.573	1.220	20.5	60	62	168
F	3.260	2.260	0.569	1.230	20.7	60	62	168
F	2.900	2.140	0.685	1.540	20.7	60	62	164
G	3.180	2.15			20.2	57		155
G	3.210	2.17			20.8	52		159
G	3.300	2.20			21.5	55		161
G	3.300	2.19			21.3	51		151
G	3.220	2.18			21.0	53		151
G	3.150	2.05			20.2	53		165
G	3.220	2.10			22.5	51		165
G	3.170	2.16			23.0	53		183
H	3.400	2.230	0.690			67	65	169
H	3.320	2.190	0.680			69	69	171
H	3.110	1.900	0.660			71	66	169
H	3.460	2.100	0.710			64	66	171
H	3.240	1.960	0.700			64	67	173
H	3.330	2.070	0.640			64	66	164
H	3.130	1.920	0.580			70	66	172
H	3.090	1.930	0.700			69	68	169

Lab	Pb Collection	Pb Collection	NiS	NiS	Total	Total	Partial	Partial
Code	Pt, g/t	Pd, g/t	Rh, g/t	Ru, g/t	Cr, %	Cu, ppm	Cu, ppm	Ni ppm
I	3.600	2.34	0.71	1.28	20.4	58	60	160
I	3.550	2.36	0.70	1.22	21.7	60	60	160
I	3.550	2.29	0.73	1.24	23.3	57	60	150
I	3.520	2.35	0.69	1.28	18.5	59	60	160
I	3.550	2.33	0.69	1.22	20.7	60	60	150
I	3.570	2.34	0.70	1.22	20.4	58	60	160
I	3.590	2.32	0.70	1.25	22.8	58	60	150
I	3.570	2.34	0.70	1.21	25.4	57	60	150
J	3.471	2.266	0.765	1.233	20.4	52	55	160
J	3.491	2.273	0.779	1.256	21.0	55	55	159
J	3.688	2.290	0.772	1.253	20.8	57	56	164
J	3.557	2.268	0.776	1.259	21.2	60	53	159
J	3.644	2.293	0.763	1.209	21.0	48	53	161
J	3.569	2.302	0.799	1.281	21.0	51	53	159
J	3.542	2.253	0.763	1.233	20.9	55	53	157
J	3.663	2.312	0.803	1.258	21.0	53	53	156
K	3.280	2.250	0.660	1.210	20.70			
K	3.450	2.340	0.650	1.170	20.50			
K	3.400	2.320	0.660	1.200	20.90			
K	3.480	2.380	0.630	1.130	21.10			
K	3.470	2.400	0.670	1.240	21.10			
K	3.450	2.350	0.670	1.220	21.10			
K	3.470	2.380	0.670	1.200	21.00			
K	3.300	2.280	0.670	1.170	20.90			
L	3.270	2.150	0.570	1.200		59	59	160
L	3.360	2.220	0.600	1.210		58	58	150
L	3.340	2.200	0.610	1.250		61	61	160
L	3.360	2.200	0.580	1.230		59	59	150
L	3.210	2.130	0.630	1.260		60	60	150
L	3.340	2.200	0.630	1.200		59	59	150
L	3.360	2.200	0.600	1.240		59	59	160
L	3.360	2.250	0.620	1.250		57	57	150
M			0.655	1.360				
M			0.644	1.326				
M			0.610	1.248				
M			0.599	1.215				
M			0.642	1.315				
M			0.641	1.306				
M			0.645	1.325				
M			0.637	1.312				

Lab	Pb	Pb	NiS	NiS	Total	Total	Partial	Partial
Code	Collection Pt, g/t	Collection Pd, g/t	Rh, g/t	Ru, g/t	Cr, %	Cu, ppm	Cu, ppm	Ni ppm
N						59	57	156
N						60	56	152
N						59	60	156
N						59	56	152
N						59	61	165
N						63	60	160
N						59	63	174
N						59	62	166
O	3.253	2.257			21.25	60	70	180
O	3.163	2.177			21.59	70	60	190
O	3.115	2.124			20.54	60	60	190
O	3.105	2.125			21.31	60	60	180
O	3.372	2.309			21.02	70	60	170
O	3.181	2.168			20.88	70	60	180
O	3.244	2.196			21.16	70	60	180
O	3.292	2.262			21.34	60	60	190
P	3.655	2.663	0.694	1.298				
P	3.550	2.574	0.674	1.284				
P	3.543	2.594	0.656	1.255				
P	3.650	2.630	0.668	1.272				
P	3.624	2.632	0.667	1.261				
P	3.593	2.631	0.674	1.269				
P	3.538	2.630	0.673	1.256				
P	3.412	2.593	0.660	1.256				

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 (shown in red) 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.

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

Anglo American Research Laboratories (Pty) Ltd. (South Africa)
ACME Analytical Laboratories Ltd. (Canada)
ALS Chemex (Canada)
ALS Chemex South Africa (Pty) Ltd
Ammtec Ltd (Australia)
Anglo Platinum Research Center (ARC, South Africa)
Becquerel Laboratories Inc. (Canada)

Eastern Bushveld Research Laboratory (EBRL, Anglo Platinum)
Genalysis Laboratory Services (Pty) Ltd. (Australia)
Geoscience Laboratories (Geo Labs, Canada)
Innovative Metallurgical Products (Pty) Ltd. (South Africa)
Mintek (South Africa)
Muoro Analytical Services (South Africa)
Set Point Laboratories (Pty) Ltd (South Africa)
SGS Lakefield Research Africa (Pty) Ltd. (South Africa)
SGS Lakefield Research (Canada)
Ultra Trace (Pty) Ltd. (Australia)
University of Toronto. (Canada)

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.

14 September 2005

Certifying Officers:



African Mineral Standards: _____

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



Geochemist: _____

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