AMIS0014

Certificate of Analysis

UG2 Reef (feed grade) PGE Reference Material

Recommended Concentrations and two "Between Laboratory" Standard Deviations

Certified Concentrations

Pt (NIS)	2.00	±	0.19	g/t
Pt (Pb Collection)	1.95	±	0.22	g/t
Pd (NIS)	1.19	±	0.08	g/t
Pd (Pb Collection)	1.20	±	0.13	g/t
Ru (NiS)	0.54	±	0.04	g/t
Cr (XRF) %	8.55	±	0.50	%
Cr (F) %	8.35	±	0.68	%
Ni (XRF)	989	±	69	ppm
Specific Gravity	3.46	±	0.24	g/cc

Provisional Concentrations

Au (NIS)	0.036	±	0.008	g/t
Rh	0.35	±	0.05	g/t
Cu (P)	103	±	13.2	ppm
Cu (T)	102	±	19.2	ppm
Cu (F)	106	±	15.4	ppm
Ni (P)	225	±	30	ppm
Ni (T)	886	±	172	ppm
Ni (F)	977	±	148	ppm
Co (P)	27	±	4.3	ppm

Indicated Means

Ir (NiS)	0.13	g/t
Au (Pb Collection)	0.038	g/t
Cu (XRF)	116	ppm
Co (XRF)	174	ppm
Co (F)	146	ppm

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SET POINT TECHNOLOGY

Intended Use: AMIS0014 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 collected underground from the East Shaft section of the Waterval Mine.

Approximate Mineral and Chemical Composition: AMIS0014 comprises approximately 50% UG2 Chromitite seam, 45% 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.

Major element chemistry determined from two analyses is as follows:

SiO_2 %	MgO %	Fe_2O3 %	Cr_2O_3 %	AL_2O_3 %	CaO %	Na_2O %
37.45	17.2	15.74	12.77	10.8	3.95	0.905
TiO_2 %	K_2O %	MnO %	V_2O_5 %	P_2O_5 %	S %	LOI %
0.49	0.27	0.2	0.12	0.01	<0.01	-0.07

Appearance: The material is a very fine powder. It is coloured a dark greenish grey (Munsell 10Y 6/1) to light olive grey (Corstor 5YR 6/1).

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. Cr, Co, Cu and Ni. Fusion, ICP-OES or ICP-MS
7. 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: 26 laboratories were each given eight randomly selected packages of sample and results were used for the determinations below. One additional sample of a different certified material was submitted as a QC check. Only 21 laboratories submitted results. Round robin results for the analyses that resulted in Certification are displayed. These include:

- Pt and Pd by the NiS method;
- Pt and Pd analyses by the Pb collection method;
- Cu, Ni, Co and Cr by the aqua regia digestion method (P), the multi-acid digestion method (T), the Fusion ICP method (F) and by XRF.
- SG by either water or gas displacement in a pycnometer.

Lab Code	Pt (NIS) g/t	Pt (Pb Collection) g/t	Pd (NIS) g/t	Pd (Pb Collection) g/t	Ru (NiS) g/t	Cr (XRF) %	Cr (F) %	Ni (XRF) ppm	Specific Gravity g/cc
A	1.970	1.970	1.180	1.250	0.537	8.56	8.74	970	3.25
A	2.040	2.000	1.220	1.260	0.570	8.55	8.64	970	3.31
A	1.960	2.010	1.170	1.250	0.522	8.56	8.57	980	3.28
A	2.060	2.060	1.220	1.270	0.565	8.54	8.60	960	3.29
A	1.940	2.050	1.180	1.280	0.529	8.58	8.62	970	3.28
A	2.030	2.040	1.220	1.270	0.573	8.56	8.64	970	3.27
A	2.040	2.060	1.220	1.270	0.564	8.58	8.63	970	3.28
A	1.960	2.020	1.160	1.260	0.541	8.56	8.61	970	3.25
B	2.060	1.920	1.240	1.230	0.519	8.17	8.12	1006	
B	2.100	1.960	1.230	1.240	0.542	8.17	8.12	1006	
B	2.060	1.980	1.240	1.240	0.503	8.15	8.15	982	
B	2.110	1.900	1.280	1.220	0.563	8.14	8.13	987	
B	2.020	1.920	1.200	1.220	0.530	8.15	8.16	1007	
B	2.180	1.960	1.320	1.260	0.558	8.15	8.19	1018	
B	2.060	1.950	1.240	1.240	0.533	8.15	8.19	1005	
B	1.950	1.930	1.150	1.250	0.497	8.15	8.20	1006	
C	1.915		1.142		0.527		8.19		3.46
C	1.959		1.170		0.536		8.05		3.46
C	2.028		1.209		0.546		8.03		3.47
C	2.015		1.208		0.531		8.25		3.47
C	1.911		1.164		0.522		8.24		3.46
C	1.957		1.172		0.536		8.54		3.46
C	1.952		1.176		0.531		8.21		3.48
C	1.930		1.167		0.528		8.46		3.49
D		1.983		1.192		8.69		903	3.59
D		1.992		1.190		8.69		902	3.60
D		2.008		1.189		8.76		901	3.60
D		2.026		1.184		8.69		895	3.59
D		1.989		1.173		8.76		908	3.58
D		1.984		1.181		8.69		902	3.58
D		1.983		1.179		8.76		910	3.57
D		2.004		1.192		8.76		904	3.58

Lab Code	Pt (NIS) g/t	Pt (Pb Collection) g/t	Pd (NIS) g/t	Pd (Pb Collection) g/t	Ru (NiS) g/t	Cr (XRF) %	Cr (F) %	Ni (XRF) ppm	Specific Gravity g/cc
E		1.700		0.976					
E		1.640		0.964					
E		1.480		0.878					
E		1.560		0.921					
E		1.490		0.898					
E		1.500		0.915					
E		1.740		1.000					
E		1.760		1.010					
F	1.950	1.940	1.170	1.240	0.530	8.36			3.54
F	2.030	2.050	1.170	1.250	0.530	8.42			3.54
F	2.000	2.040	1.160	1.230	0.520	8.28			3.54
F	1.960	2.040	1.180	1.210	0.550	8.47			3.53
F	2.060	2.070	1.220	1.250	0.550	8.53			3.53
F	2.020	2.020	1.210	1.230	0.550	8.14			3.50
F	2.020	1.950	1.220	1.200	0.540	8.36			3.51
F	2.060	2.000	1.230	1.230	0.540	8.39			3.52
G		2.060		1.250			8.60		
G		2.040		1.260			8.62		
G		2.070		1.260			8.69		
G		2.040		1.260			8.68		
G		2.010		1.230			8.53		
G		2.080		1.250			8.60		
G		2.060		1.260			8.72		
G		2.040		1.280			8.59		
H		2.040		1.230		8.37		970	3.67
H		1.970		1.210		8.39		970	3.64
H		1.970		1.190		8.39		960	3.58
H		2.010		1.200		8.42		970	3.66
H		2.040		1.210		8.39		960	3.69
H		2.110		1.270		8.39		960	3.66
H		2.060		1.260		8.40		970	3.64
H		2.110		1.240		8.36		970	3.67
I	2.031	2.008	1.230	1.203	0.547		8.19		3.57
I	2.029	1.928	1.217	1.211	0.545		8.32		3.56
I	2.078	2.052	1.231	1.213	0.548		8.26		3.57
I	2.029	1.979	1.200	1.192	0.548		8.31		3.52
I	2.031	2.019	1.212	1.205	0.543		8.39		3.53
I	2.037	2.035	1.224	1.225	0.547		8.30		3.55
I	2.081	2.031	1.196	1.199	0.544		8.41		3.56
I	2.029	2.032	1.235	1.185	0.534		8.21		3.55
J	2.038		1.237		0.577				
J	2.013		1.192		0.575				
J	2.000		1.212		0.574				
J	1.995		1.204		0.571				
J	1.961		1.153		0.550				
J	2.011		1.207		0.569				
J	2.033		1.221		0.576				
J	2.004		1.219		0.570				
K		1.420					7.65		
K		1.830		1.200			7.72		
K		1.890		1.240			7.69		
K		1.810		1.050			7.61		
K		1.480		0.970			7.49		
K		1.560		1.000			7.68		
K		1.700		0.990			7.67		
K		1.900		1.160			7.63		
L		1.800		1.060			8.67		3.43
L		1.770		1.060			9.07		3.26
L		2.110		1.265			8.88		3.36
L		1.895		1.135			9.19		3.31
L		1.650		1.000			8.76		3.43
L		1.690		1.010			8.81		3.35
L		1.885		1.150			8.29		3.30
L		1.970		1.195			8.22		3.35

Lab Code	Pt (NIS) g/t	Pt (Pb Collection) g/t	Pd (NIS) g/t	Pd (Pb Collection) g/t	Ru (NiS) g/t	Cr (XRF) %	Cr (F) %	Ni (XRF) ppm	Specific Gravity g/cc
M		1.826		1.155		8.56		1000	3.42
M		1.761		1.114		8.57		992	3.42
M		1.802		1.176		8.47		989	3.43
M		1.845		1.148		8.33		1030	3.49
M		1.885		1.212		8.43		953	3.40
M		1.875		1.215		8.53		1010	2.86
M		1.873		1.212		8.56		977	3.33
M		1.905		1.197		8.59		983	3.26
N	2.030	1.900	1.230	1.140	0.503	10.10		1010	
N	2.043	1.880	1.231	1.120	0.490	10.10		1010	
N	2.011	1.800	1.234	1.090	0.505	10.10		1010	
N	2.033	1.750	1.233	1.030	0.530	10.10		1010	
N	1.997	1.870	1.211	1.100	0.495	10.10		1000	
N	1.946	1.690	1.170	0.995	0.514	10.10		1010	
N	2.001	1.830	1.203	1.070	0.522	10.10		1010	
N	1.946	1.680	1.174	0.993	0.526	10.20		1020	
O	2.060	2.067	1.210	1.271	0.557	8.71	8.57	942	3.27
O	1.970	1.988	1.180	1.201	0.546	8.67	8.54	942	3.27
O	1.939	2.032	1.170	1.226	0.544	8.72	8.59	971	3.41
O	1.893	1.923	1.109	1.162	0.527	8.73	8.59	943	3.41
O	1.879	1.887	1.150	1.147	0.536	8.72	8.59	956	3.30
O	2.050	1.958	1.220	1.183	0.578	8.71	8.59	949	3.32
O	2.081	1.920	1.220	1.147	0.557	8.69	8.57	956	3.34
O	1.970	1.953	1.150	1.176	0.515	8.72	8.55	954	3.33
P									
P									
P									
P									
P									
P									
P									
P									
Q	1.861		1.129		0.552		8.58		
Q	1.852		1.121		0.547		8.63		
Q	1.847		1.103		0.529		9.84		
Q	1.827		1.110		0.535		8.79		
Q	1.916		1.129		0.540		8.72		
Q	1.874		1.125		0.536		7.93		
Q	1.889		1.124		0.543		7.85		
Q	1.896		1.132		0.539		7.51		
R	1.720	1.820	1.070	1.230	0.520	9.03	8.56	1026	3.42
R	1.970	1.820	1.220	1.230	0.590	8.97	8.54	1003	3.43
R	1.780	1.740	1.090	1.110	0.520	9.01	8.50	1042	3.43
R	2.170	1.930	1.360	1.270	0.690	8.95	8.56	1027	3.42
R	1.880	1.980	1.160	1.270	0.570	8.95	8.42	1018	3.44
R	1.830	1.830	1.150	1.190	0.560	9.00	8.55	1028	3.42
R	1.890	1.970	1.170	1.270	0.570	8.95	8.55	975	3.42
R	1.850	2.000	1.170	1.290	0.560	8.95	8.57	1026	3.42
S		1.745		1.030			8.51		
S		1.860		1.105			8.44		
S		1.840		1.090			8.50		
S		1.730		1.060			8.64		
S		1.805		1.035			8.54		
S		1.835		1.085			8.52		
S		1.820		1.030			8.66		
S		1.860		1.110			8.55		

Lab Code	Pt (NIS) g/t	Pt (Pb Collection) g/t	Pd (NIS) g/t	Pd (Pb Collection) g/t	Ru (NiS) g/t	Cr (XRF) %	Cr (F) %	Ni (XRF) ppm	Specific Gravity g/cc
T		1.919		1.241		7.28	7.84	894	
T		1.925		1.251		7.33	7.82	898	
T		1.969		1.303		7.22	7.83	885	
T		2.161		1.419		7.30	7.76	886	
T		2.154		1.414		7.24	7.85	878	
T		2.155		1.427		7.22	7.92	884	
T		2.040		1.358		7.33	8.09	884	
T		2.286		1.476		7.30	7.68	878	
U		1.840		1.150				1040	
U		2.040		1.240				1040	
U		2.002		1.210				1040	
U		2.150		1.230				1030	
U		2.020		1.210				1040	
U		1.820		1.130				1040	
U		2.000		1.220				1050	
U		1.940		1.180				1040	

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 (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: The 21 laboratories that submitted results were (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).
Assayers Canada.
Barplats Laboratory (South Africa).
Becquerrel Laboratories Inc. (Canada).
Eastern Bushveld Research Laboratory (EBRL, Anglo Platinum, South Africa).
Genalysis Laboratory Services (Pty) Ltd. (Australia).
Geoscience Laboratories (Geo Labs, Canada).
Geological Survey of Finland (GTK) Geoservices, Assay Laboratory.
Mintek (South Africa).
RPM Laboratory (Anglo Platinum, South Africa).
Set Point Laboratories (Pty) Ltd. (South Africa).
SGS Welshpool Minerals (Pty) Ltd. (Australia).
SGS Lakefield Research Africa (Pty) Ltd. (South Africa).
SGS Lakefield Research (Canada).
Tati Nickel Laboratory (Botswana).
Ultra Trace (Pty) Ltd. (Australia).

Availability: This product is available in Laboratory Packs containing 1kg of material and Explorer Packs containing custom weights (from 50 to 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.

10 September 2006

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