

African Mineral Standards

Certificate of Analysis

PGE Reference Material Merensky Reef Low Feed Grade AMIS0009

Recommended Concentrations and two "Between Laboratory" Standard Deviations

Certified Concentrations

Platinum	1.81 ± 0.15 g/t	(NiS Collection)
Platinum	1.80 ± 0.14 g/t	(Pb Collection)
Palladium	0.98 ± 0.06 g/t	(NiS Collection)
Palladium	0.95 ± 0.06 g/t	(Pb Collection)
Rhodium	0.125 ± 0.016 g/t	
Ruthenium	0.248 ± 0.036 g/t	(NiS Collection)
Copper	880 ± 97 ppm	(Total Digestion)
Copper	907 ± 91 ppm	(Partial Digestion)
Copper	904 ± 80 ppm	(XRF)
Nickel	1529 ± 138 ppm	(Total Digestion)
Nickel	1214 ± 133 ppm	(Partial Digestion)
Nickel	1604 ± 95 ppm	(Fusion ICP)
Specific Gravity	3.07 ± 0.22 gm/cc	(Pycnometer)

Provisional Concentrations

Iridium	0.046 ± 0.01 g/t	(NiS Collection)
Gold	0.14 ± 0.02 g/t	(Pb Collection)
Copper	910 ± 48 ppm	(Fusion ICP)
Nickel	1600 ± 53 ppm	(XRF)
Cobalt	425 ± 60 ppm	(Total Digestion)
Cobalt	376 ± 52 ppm	(Partial Digestion)
Cobalt	450 ± 32 ppm	(Fusion ICP)
Chromium	4256 ± 379 ppm	(Fusion ICP)
Chromium	4509 ± 456 ppm	(XRF)

Indicated Means

Gold	0.134 g/t	(NiS Collection)
Chromium	3298 ppm	(Total Digestion)
Co	404 ppm	(XRF)

* Please note that this value difference between the weaker extraction and the 4 acid extraction is due to AAS and ICP calibration at most all laboratories

Intended Use: AMIS-9 is suitable for monitoring the accuracy of a single analysis of PGE, Cu and Ni ores hosted by Merensky Reef or other similar 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 Merensky Reef material supplied by Anglo Platinum Limited from the Western limb of the Bushveld Complex. The Merensky Reef is a Pt/Pd ore. This specific material was collected from the Turfontein Mine ore silo.

Approximate Mineral and Chemical Composition: AMIS-9 comprises approximately 60% Merensky Reef, 30% footwall and 10% hanging wall. The Merensky Reef comprises components of feldspathic pyroxenite, pyroxenite and anorthosite. Peak PGE values are associated with a thin chromitite stringer. Mineralization in this Merensky Reef comprises 2-5% disseminated or net textured magmatic sulphides, predominantly pyrrhotite, pentlandite, chalcopyrite and pyrite. The PGE's occur as micron-sized satellite grains around but rarely within the sulphides.

Fe ₂ O ₃ %	MnO %	Cr ₂ O ₃ %	TiO ₂ %	CaO %	SiO ₂ %	Al ₂ O ₃ %	MgO %	Na ₂ O %	K ₂ O%	S % (S.Q)
9.05	1.19	0.65	0.21	8.22	50.3	14.25	14.6	1.4	0.15	0.19

Appearance: The material is a very fine powder light grey (Munsell N7) to light grey (Corstor 5Y-7/1).

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 99.7% <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, Ni and Co. Multi-acid total digestion, including HF, with ICP-OES finish.
4. Cu, Ni, Co and Cr. Aqua regia digestion with ICP-OES finish.
5. Cr, Co, Cu and Ni. Fusion, ICP-OES or ICP-MS
6. Cr, Co, Cu and Ni. Fusion or Pressed Pellet, XRF.
7. Specific Gravity, water or 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: Nineteen laboratories were each given eight randomly selected packages of sample and various results from the eighteen labs that responded were used for the determinations below. The following round robin results, from which Certified Concentrations were obtained, are displayed:

- Pt and Pd analyses by the NiS collection method;
- Pt and Pd analyses by the Pb collection method;
- Rh and Ru analyses by various methods;
- Cu and Ni by the multi-acid (total) digestion method;
- Cu and Ni by the aqua regia (partial) digestion method.
- Cu by XRF;
- Ni by Fusion ICP and
- Specific Gravity (SG) by water or gas pycnometer.

Lab Code	NiS collection Pt, g/t	Pb collection Pt, g/t	NiS collection Pd, g/t	Pb collection Pd, g/t	Rh g/t	Ru g/t	Total Digestion Cu, ppm	Partial Digestion Cu, ppm	XRF Cu ppm	Total Digestion Ni ppm	Partial Digestion Ni ppm	Fusion ICP Ni ppm	SG
A	1.780	1.830	0.977	1.000	0.120	0.282	890	912	970	1580	1150	1600	2.93
A	1.770	1.820	0.965	0.980	0.116	0.278	910	888	990	1570	1110	1600	2.96
A	1.850	1.790	0.980	0.990	0.122	0.269	905	910	975	1560	1150	1550	2.98
A	1.830	1.780	1.020	1.000	0.128	0.296	905	898	975	1580	1160	1550	2.95
A	1.840	1.830	0.977	1.000	0.122	0.289	910	908	975	1560	1160	1550	2.96
A	1.820	1.780	0.971	1.000	0.118	0.277	930	888	970	1580	1140	1650	2.93
A	1.830	1.790	0.972	1.000	0.120	0.269	935	884	975	1600	1110	1600	2.95
A	1.770	1.780	0.974	0.995	0.115	0.273	910	898	980	1560	1130	1650	2.92
B	1.887	1.786	0.959	0.916	0.127	0.251	867	893	891	1609	1151		
B	1.891	1.879	0.957	0.949	0.126	0.248	831	859	887	1535	1110		
B	1.878	1.846	0.964	0.927	0.127	0.243	895	883	886	1662	1128		
B	1.869	1.809	0.951	0.906	0.126	0.248	847	879	892	1567	1127		
B	1.869	1.753	0.954	0.882	0.126	0.241	850	888	885	1576	1131		
B	1.833	1.848	0.946	0.949	0.126	0.242	849	886	883	1551	1129		
B	1.824	1.863	0.932	0.947	0.124	0.241	865	855	885	1607	1101		
B	1.825	1.788	0.938	0.941	0.126	0.246	863	874	872	1582	1116		
C		1.855		0.968			950	998		1550	1350	1580	
C		1.800		0.944			943	1005		1555	1355	1600	
C		1.715		0.907			940	1005		1555	1345	1590	
C		1.770		0.914			945	977		1555	1315	1600	
C		1.760		0.920			932	981		1540	1325	1570	
C		1.730		0.910			896	990		1475	1340	1600	
C		1.785		0.924			913	998		1515	1335	1570	
C		1.885		0.982			915	998		1505	1350	1590	

Lab Code	NiS collection Pt, g/t	Pb collection Pt, g/t	NiS collection Pd, g/t	Pb collection Pd, g/t	Rh g/t	Ru g/t	Total Digestion Cu, ppm	Partial Digestion Cu, ppm	XRF Cu ppm	Total Digestion Ni ppm	Partial Digestion Ni ppm	Fusion ICP Ni ppm	SG
D	1.990	1.900	1.030	0.993	0.141	0.265	827	855	885	1500	1190	1550	
D	1.910	1.930	0.994	0.997	0.134	0.245	843	851	885	1520	1180	1540	
D	2.100	1.950	1.090	1.010	0.152	0.278	840	854	890	1510	1180	1560	
D	1.690	1.860	1.030	0.971	0.145	0.256	845	855	881	1500	1190	1550	
D	1.920	1.920	0.987	0.990	0.135	0.247	828	858	882	1510	1190	1560	
D	2.000	1.890	1.050	0.987	0.143	0.272	821	854	896	1480	1180	1550	
D	1.980	1.870	1.020	0.984	0.138	0.259	820	860	890	1480	1190	1550	
D	1.840	1.720	0.955	0.905	0.130	0.236	836	861	888	1510	1190	1550	
E	1.140	1.770	0.530	0.990	0.100	0.200							3.06
E	1.450	1.780	0.710	0.990	0.130	0.260							3.07
E	1.260	1.720	0.590	0.950	0.100	0.210							3.05
E	1.260	1.740	0.610	0.970	0.110	0.220							3.04
E	1.390	1.700	0.630	0.940	0.130	0.250							3.03
E	1.180	1.760	0.520	0.980	0.100	0.190							3.04
E	1.450	1.760	0.660	0.980	0.120	0.240							3.06
E	1.730	1.610	0.980	0.890	0.110	0.240							3.05
F		1.730		0.876	0.078		850	878		1530	1200		
F		1.740		0.919	0.074		825	856		1510	1220		
F		1.780		0.909	0.078		830	859		1510	1200		
F		1.780		0.918	0.076		831	848		1530	1200		
F		1.840		0.916	0.073		830	855		1510	1210		
F		1.770		0.913	0.075		849	861		1530	1220		
F		1.720		0.889	0.073		822	852		1510	1210		
F		1.820		0.925	0.075		815	873		1510	1210		
G		1.690		0.900			935	914		1645	1230	1650	
G		1.710		0.900			903	920		1660	1235	1620	
G		1.910		0.960			927	921		1685	1287	1660	
G		1.870		0.950			930	923		1646	1305	1630	
G		1.850		0.950			906	918		1680	1244	1680	
G		1.830		0.900			887	933		1684	1248	1610	
G		1.910		0.970			894	899		1675	1251	1590	
G		1.870		0.940			905	907		1662	1251	1630	
H	1.670	1.670	0.870	0.950	0.120	0.230	899	850		1713	1055		2.96
H	1.500	1.630	0.820	0.919	0.120	0.240	906	860		1759	1054		2.95
H	1.650	1.651	0.810	0.942	0.110	0.230	904	860		1742	1042		2.96
H	1.310	1.632	0.770	0.937	0.100	0.220	959	860		1710	1062		2.95
H	1.380	1.673	0.800	0.942	0.110	0.210	956	860		1765	1066		2.96
H	1.440	1.685	0.790	0.945	0.110	0.210	908	860		1672	1040		2.94
H	1.580	1.616	0.820	0.918	0.110	0.210	890	860		1680	1041		2.96
H	1.600	1.612	0.830	0.928	0.120	0.240	902	860		1771	1054		2.98

Lab Code	NiS collection Pt, g/t	Pb collection Pt, g/t	NiS collection Pd, g/t	Pb collection Pd, g/t	Rh g/t	Ru g/t	Total Digestion Cu, ppm	Partial Digestion Cu, ppm	XRF Cu ppm	Total Digestion Ni ppm	Partial Digestion Ni ppm	Fusion ICP Ni ppm	SG
I	1.840	1.810	0.950	0.970	0.130	0.220	830	920		1500	1310	1600	3.13
I	1.850	1.830	0.930	0.960	0.120	0.270	820	950		1400	1330	1700	3.14
I	1.810	1.750	0.980	0.920	0.130	0.250	820	950		1400	1320	1700	3.10
I	1.830	1.850	0.980	0.950	0.120	0.240	820	950		1400	1360	1600	3.15
I	1.850	1.800	0.970	0.930	0.100	0.210	810	960		1500	1320	1800	3.15
I	1.760	1.770	0.970	0.940	0.130	0.250	840	960		1400	1280	1700	3.14
I	1.810	1.800	1.070	0.950	0.130	0.260	840	960		1400	1330	1800	3.14
I	1.740	1.830	1.000	0.960	0.130	0.250	830	960		1400	1170	1700	3.13
J		1.999		0.991	0.135				831				
J		1.958		0.933	0.131								
J		2.010		0.971	0.135				836				
J		1.703		0.950	0.118				831				
J		1.926		0.922	0.129				818				
J		2.074		0.947	0.145								
J		1.703		0.991	0.164				829				
J		2.154		0.880	0.115								
K		1.795		0.929			996	977	940	1540	1185	1570	2.90
K		1.820		0.935			993	964	950	1535	1165	1590	2.99
K		1.750		0.918			1015	960	940	1595	1190	1560	2.94
K		1.765		0.918			1015	967	940	1555	1190	1630	2.95
K		1.735		0.914			975	988	940	1535	1190	1580	3.02
K		1.795		0.934			976	974	940	1545	1205	1530	3.31
K		1.780		0.914			963	977	940	1525	1210	1580	2.96
K		1.850		0.968			995	974		1555	1195	1590	3.11
L	1.790	1.798	1.010	1.015	0.128		819	898		1410	1180		3.14
L	1.780	1.791	0.960	1.004	0.115		839	879		1440	1140		3.15
L	1.730	1.849	0.970	0.968	0.118		832	866		1440	1120		3.17
L	1.800	1.743	1.000	0.975	0.120		822	880		1420	1140		3.08
L	1.730	1.772	1.000	0.985	0.120		824	911		1430	1180		3.17
L	1.700	1.880	0.970	1.019	0.120		837	861		1450	1120		3.19
L	1.710	1.879	0.970	1.001	0.115		824	874		1420	1140		3.17
L	1.680	1.803	0.950	0.981	0.113		810	845		1410	1100		3.20
M	1.804	1.815	0.942	0.946	0.128	0.245	911	901		1556	1240	1564	3.20
M	1.849	1.843	0.952	0.946	0.132	0.250	894	899		1518	1234	1425	3.22
M	1.787	1.780	0.935	0.937	0.127	0.235	884	898		1497	1233	1529	3.23
M	1.814	1.765	0.936	0.939	0.130	0.244	881	899		1499	1230	1594	3.19
M	1.789	1.773	0.952	0.938	0.131	0.246	906	891		1547	1221	1660	3.20
M	1.840	1.720	0.960	0.926	0.132	0.249	903	884		1549	1214	1633	3.17
M	1.854	1.761	0.961	0.945	0.132	0.244	905	883		1540	1210	1546	3.16
M	1.803	1.760	0.939	0.934	0.130	0.244	888	881		1498	1204	1628	3.19

Lab Code	NiS collection Pt, g/t	Pb collection Pt, g/t	NiS collection Pd, g/t	Pb collection Pd, g/t	Rh g/t	Ru g/t	Total Digestion Cu, ppm	Partial Digestion Cu, ppm	XRF Cu ppm	Total Digestion Ni ppm	Partial Digestion Ni ppm	Fusion ICP Ni ppm	SG
N		1.820		0.988			931	875	910	1480	1310		3.20
N		1.850		0.993			941	888	920	1510	1330		3.18
N		1.760		0.973			940	883	890	1510	1320		3.17
N		1.820		0.919			927	916	890	1500	1360		3.22
N		1.890		0.952			926	891	870	1480	1330		3.20
N		1.830		0.988			925	872	860	1490	1310		3.23
N		1.840		0.993			937	882	890	1510	1320		3.24
N		1.860		1.000			930	877	900	1490	1300		3.23
O		1.862		0.962				926			1248	1673	2.80
O		1.856		0.954				920			1225	1692	2.79
O		1.843		0.949				922			1252	1616	2.78
O		1.900		0.990				914			1233	1604	2.70
O		1.830		0.944				920			1246	1594	2.86
O		1.845		0.953				924			1233	1679	2.82
O		1.837		0.961				918			1236	1643	2.82
O		1.837		0.952				922			1243	1619	2.86
P		1.592		1.186	0.123	0.274							
P		1.647		1.196	0.122	0.256							
P		1.643		1.178	0.123	0.261							
P		1.692		1.172	0.125	0.262							
P		1.676		1.169	0.124	0.254							
P		1.637		1.172	0.124	0.251							
P		1.640		1.179	0.124	0.249							
P		1.596		1.166	0.125	0.266							
Q	1.742	1.880	0.999	0.960	0.133	0.245	967	995	925	1581	1169		3.02
Q	1.752	1.900	1.032	0.970	0.123	0.232	1027	978	937	1687	1147		3.00
Q	1.820	1.900	0.993	0.970	0.109	0.250	1022	978	929	1673	1127		3.01
Q	1.719	1.900	0.954	0.980	0.118	0.248	1009	980	922	1638	1154		3.00
Q	1.734	1.870	0.990	0.970	0.134	0.242	1001	1005	928	1624	1186		3.01
Q	1.827	1.900	0.983	0.950	0.137	0.256	966	993	936	1580	1169		3.01
Q	1.795	1.910	0.988	0.990	0.120	0.266	966	998	926	1584	1164		3.00
Q	1.768	1.890	1.003	0.970	0.119	0.249	1001	1008	944	1700	1169		3.00
R		1.767		0.922				1127	868		1215		3.12
R		1.720		0.913				1123	863		1214		3.14
R		1.781		0.923				1139	873		1225		3.12
R		1.785		0.929				1129	865		1229		3.12
R		1.749		0.934				1133	872		1223		3.12
R		1.749		0.952				1128	868		1228		3.13
R		1.767		0.943				1133	863		1226		3.13
R		1.788		0.920				1144	871		1228		3.12

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.

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

1. ACME Analytical Laboratories Ltd., (Canada).
2. ALS Chemex, (Canada).
3. ALS Chemex, South Africa (Pty) Ltd.
4. Anglo American Research Laboratories (Pty) Ltd., (South Africa).
5. Anglo Platinum Research Center (ARC, South Africa).
6. Assayers Canada.
7. Eastern Bushveld Research Laboratory, (EBRL, Anglo Platinum).
8. Genalysis Laboratory Services (Pty) Ltd., (Australia).
9. Geoscience Laboratories (Geol Labs), (Canada).
10. Geological Survey of Finland (GTK) Geoservices, Assay Laboratory.
11. Innovative Metallurgical Products (Pty) Ltd., (South Africa).
12. Mintek, (South Africa).
13. Muoro Analytical Services, (South Africa)
14. OMAC Laboratories Ltd., (Ireland).
15. Set Point Laboratories (Pty) Ltd., (South Africa).
16. SGS Lakefield Research Africa (Pty) Ltd., (South Africa).
17. SGS Welshpool Minerals, (Australia).
18. SGS Lakefield Research, (Canada).
19. 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. Packaging is designed to withstand storage, transport and field abuse. Laboratory Packs contain material sealed in bottles that are sealed in foil pouches with oxygen reducers. The Explorer Packs contain material double packaged in standard geochem envelopes within foil pouches that are nitrogen flushed and vacuum sealed.

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.

21 February, 2006.

Certifying Officers:



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