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Certificate of Analysis

Reference Material HiSilP3

Recommended Gold Concentration: 12.24 µg/g
95% Confidence Interval: +/- 0.071 µg/g

The above values apply only to product in jars or sachets which have an identification number within the following range: ***429000– 429807.***

Prepared and Certified By:

Brett Coombridge, M.Phil. Chemistry
Rocklabs Reference Materials
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Date of Certification: 12 June 2015

Certificate Status: Original

Available Packaging: This reference material has been packed in wide-mouthed jars that contain 2.5 kg of product. The contents of some jars may be subsequently repacked into sealed polyethylene sachets.

Origin of Reference Material: A highly siliceous matrix with minor quantities of clay, iron pyrites and finely divided gold-containing minerals that have been screened to ensure there is no gold nugget effect.

Supplier of Reference Material:

ROCKLABS
P O Box 18 142
Glen Innes
Auckland 1743
NEW ZEALAND
Email: reference-materials@rocklabs.com
Website: www.rocklabs.com

Description: The reference material is a light grey powder that has been well mixed and a homogeneity test carried out after the entire batch was packaged into wide-mouthed jars. There is no soil component. The product contains crystalline quartz and therefore dust from it should not be inhaled.

The approximate chemical composition is**:**

(Uncertified Values)	
SiO_2	90.35
Al_2O_3	2.98
Na_2O	0.08
K_2O	0.22
CaO	0.06
MgO	0.06
TiO_2	0.14
MnO	0.01
P_2O_5	0.02
Fe_2O_3	0.75
Fe	1.8
S	2.0

Intended Use: This reference material is designed to be included with every batch of samples analysed and the results plotted for quality monitoring and assessment purposes.

Stability: The container (jar or sachet) and its contents should not be heated to temperatures higher than 50 °C. Iron pyrites are likely to oxidize in the air but tests have shown that the increase in weight of an exposed reference material of similar matrix, in the Auckland climate, is less than 0.1% per year.

Method of Preparation: A highly siliceous matrix containing minor quantities of clay and barren iron pyrites were blended with finely pulverized and screened gold-containing minerals. Once the powders were uniformly mixed the composite was placed into 807 wide-mouthed jars, each bearing a unique number. 24 jars were randomly selected from the packaging run and material from these jars was used for both homogeneity and consensus testing.

Homogeneity Assessment:

Sampling was performed by Rocklabs Reference Materials and an independent laboratory carried out gold analysis by fire assay of 30 g portions, using a gravimetric

finish. Steps were taken to minimize laboratory method variation in order to better detect any variation in the candidate reference material.

Homogeneity: A sample was removed from the top of each of the 24 jars randomly selected from the 807 jars in the batch. The results of analysis of the 24 samples (randomly ordered then consecutively numbered before being sent to the laboratory) indicated 2 test results were anomalously low. Analysis of the slags and crucibles related to these samples showed excessive gold had been retained, so the results for these 2 samples were discarded. The test results for the remaining 22 samples produced a relative standard deviation of 0.9%.

Settling: The contents of 3 randomly selected jars were compacted by vibration (to simulate the effect of freighting) and 5 samples were removed successively from top to bottom from each jar. In addition, 5 samples were removed from the last jar in the series. No top to bottom gradation in the gold values was observed neither was there a significant difference between the last jar and the other jars.

Analytical Methodology:

Once homogeneity had been established, two sub-samples were submitted to a number of well-recognized laboratories in order to assign a gold value by consensus testing. The sub-samples were drawn from 24 randomly selected jars and each laboratory received samples from two different jars.

The samples were analysed for gold by all participating laboratories using fire assay followed by either gravimetric or instrument finish (AAS or ICP). Each laboratory was instructed to analyse the samples for gold using the method they believed would give the best results. Indicative concentration ranges were provided.

The amount of sample used in the analyses varied between laboratories, (range 10 - 50g).

Calculation of Certified Value:

The 54 participating laboratories each returned replicate gold results using one finish method for both samples. Statistical analysis to identify outliers was carried out using the principles detailed in sections 7.3.2 – 7.3.4, ISO 5725-2: 1994. Assessment of each laboratory's performance was carried out on the basis of z-scores, partly based on the concept described in ISO/IEC Guide 43-1. Details of the criteria used in these examinations are available on request. As a result of these statistical analyses, 6 sets of results were excluded for the purpose of assigning a gold concentration value to this reference material. A recommended value was thus calculated from the average of the remaining n = 48 sets of replicate results. The 95% confidence interval was estimated using the formula:

$$X \pm ts/\sqrt{n}$$

(where X is the estimated average, s is the estimated standard deviation of the laboratory averages, and t is the 0.025 tail-value from Student's t-distribution with n-1 degrees of freedom). The recommended value is provided at the beginning of the certificate in µg/g (ppm) units. A summary of the results used to calculate the

recommended value is listed on page 4 and the names of the laboratories that submitted results are listed on page 5. The results are listed in increasing order of the individual laboratory averages.

Statistical analysis of the consensus test results has been carried out by independent statistician, Tim Ball.

Summary of Results Used to Calculate Gold Value

(Listed in increasing order of individual laboratory averages)

Gold (ppm)		
Sample 1	**Sample 2**	**Set Average**
11.518	11.521	11.520
11.70	11.80	11.750
12.2	11.5	11.85
11.70	12.07	11.885
12.00	11.82	11.910
12.013	11.890	11.952
12.05	12.02	12.035
12.16	11.96	12.060
12.084	12.105	12.095
12.04	12.15	12.095
12.05	12.15	12.100
12.134	12.073	12.104
12.092	12.120	12.106
12.00	12.25	12.125
12.2	12.1	12.15
12.19	12.14	12.165
12.20	12.15	12.175
12.15	12.20	12.175
12.2	12.2	12.20
12.25	12.15	12.200
12.300	12.120	12.210
12.30	12.17	12.234
12.2	12.3	12.25
12.250	12.250	12.250
12.2	12.3	12.25
12.259	12.283	12.271
12.40	12.15	12.275
12.25	12.30	12.275
12.478	12.083	12.281
12.3	12.3	12.30
12.15	12.45	12.300
12.40	12.20	12.300
12.250	12.350	12.300
12.280	12.325	12.303
12.450	12.175	12.313
12.30	12.35	12.325
12.394	12.377	12.386
12.304	12.468	12.386
12.55	12.35	12.450
12.65	12.26	12.455
12.5	12.6	12.55
12.70	12.40	12.550
12.500	12.625	12.563
12.588	12.593	12.591
12.845	12.370	12.608
12.55	12.70	12.625
12.615	12.640	12.628
12.95	12.75	12.850

Average of 48 sets	=	12.244 ppm
Standard deviation of 48 sets	=	0.246 ppm
Relative standard deviation	=	2.0 %
95% Confidence interval for average:	=	+/- 0.071 ppm

Note: ***Neither the Standard deviation nor the Confidence interval should be used as a basis to set control limits when plotting individual laboratory results.***
See notes under "Instructions and Recommendations for Use" (pg 6)

Participating Laboratories

Australia	ALS Minerals, Kalgoorlie ALS Minerals, Orange ALS Minerals, Perth ALS Minerals, Townsville Bureau Veritas Amdel, Adelaide Bureau Veritas Amdel, Kalgoorlie Intertek Genalysis Laboratory Services, Perth
Burkina Faso	ALS Minerals, Burkina Faso SEMAFO Burkina Faso S.A.
Canada	ALS Minerals, Val-d'Or ALS Minerals, Vancouver Bourlamaque Assay Laboratories, Quebec Bureau Veritas Commodities Canada Ltd, Vancouver Loring Laboratories (Alberta) Ltd, Calgary Met-Solve Analytical Service Inc., Langley BC SGS Minerals Services, Lakefield, Ontario SGS Minerals Services, Vancouver Techni-Lab S.G.B. Abitibi Inc/Actlabs, Val d'Or Techni-Lab S.G.B. Abitibi Inc/Actlabs, Ste-Germaine-Boule TSL Laboratories Inc, Saskatoon
Chile	Acme Analytical Laboratories, Santiago
Côte d'Ivoire	Bureau Veritas Mineral Laboratories, Abidjan
Ghana	ALS Minerals, Kumasi Performance Laboratories, Obuasi AngloGold SGS Ahafo Laboratory, Kenyasi Brong Ahafo
Ireland	ALS Minerals, Loughrea
Kyrgyz Republic	Stewart Assay and Environmental Laboratories LLC, Kara-Balta
Laos	ALS Geochemistry, Vientiane
Mali	ALS Minerals, Bamako
Mongolia	ALS Minerals, Ulaanbaatar
Namibia	Bureau Veritas- Mineral Laboratories, Swakopmund
New Zealand	SGS New Zealand Ltd, Otago SGS New Zealand Ltd, Reefton SGS New Zealand Ltd, Waihi
Peru	ALS Minerals, Lima Inspectorate Services Perú S.A.C., Callao Minera Yanacocha SRL – Newmont, Lima
Romania	ALS Minerals, Rosia Montana
Russia	Irgiredmet Analytical Centre, Irkutsk
South Africa	Acme, Inspectorate M & M, Rustenburg ALS Minerals, Edenvale - Johannesburg SibanyeGold, Driefontein Operations Performance Laboratories, Barberton Performance Laboratories, Randfontein Performance Laboratories, Allanridge
Turkey	Acme Analitik Laboratuar Hizmetleri Ltd, Sirketi ALS Minerals, Izmir
USA	ALS Minerals, Reno Barrick Goldstrike – Met Services, Nevada Inspectorate, Sparks Newmont Mining Corporation, Carlin Newmont Mining Corporation, Lone Tree Newmont Mining Corporation, Twin Creeks
Zimbabwe	Performance Laboratories, Ruwa

Instructions and Recommendations for Use:

Weigh out quantity usually used for analysis and analyse for total gold by normal procedure. Homogeneity testing has shown that consistent results are obtainable for gold when 30g portions are taken for analysis.

We quote a 95% confidence interval for our estimate of the declared value. This confidence interval reflects our uncertainty in estimating the true value for the gold content of the reference material. The interval is chosen such that, if the same procedure as used here to estimate the declared value were used again and again, then 95% of the trials would give intervals that contained the true value. It is a reflection of how precise the trial has been in estimating the declared value. It **does not** reflect the variability any particular laboratory will experience in its own repetitive testing.

Some users in the past have misinterpreted this confidence interval as a guide as to how different an individual test result should be from the declared value. Some mistakenly use this interval, or the standard deviation from the consensus test, to set limits for control charts on their own routine test results using the reference material. Such use inevitably leads to many apparent out-of-control points, leading to doubts about the laboratory's testing, or of the reference material itself.

A much better way of determining the laboratory performance when analysing the reference material is to accumulate a history of the test results obtained, and plot them on a control chart. The appropriate centre line and control limits for this chart should be based on the average level and variability exhibited in the laboratory's **own** data. This chart will provide a clear picture of the long-term stability or otherwise of the laboratory testing process, providing good clues as to the causes of any problems. To help our customers do this, we can provide a free Excel template that will produce sensible graphs, with intelligently chosen limits, from the customer's own data.

Legal Notice:

This certificate and the reference material described in it have been prepared with due care and attention. However ROCKLABS Ltd, Scott Technology Ltd and Tim Ball Ltd accept no liability for any decisions or actions taken following the use of the reference material.

References:

For further information on the preparation and validation of this reference material please contact Brett Coombridge.

Certifying Officer

Brett Coombridge (M.Phil. Chemistry)

Independent Statistician

Tim Ball BSc (Hons)