

Certificate of Analysis

Reference Material OxP50

Recommended Gold Concentration: 14.89 µg/g
95% Confidence Interval: +/- 0.33 µg/g

The above values apply only to product in jars or sachets which have an identification number within the following range: *The number range is not published on the website.*

Prepared and Certified By:

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Date of Certification:

19 December 2005

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:

Feldspars with minor quantities of finely divided gold-containing minerals that have been screened to ensure there is no gold nugget effect.

Supplier of Reference Material:

ROCKLABS Ltd
P O Box 18 142
Auckland
NEW ZEALAND
Email: sales@rocklabs.com
Website: www.rocklabs.com
Telephone: +64 9 634 7696

Description:

The component minerals have been well mixed and a homogeneity test carried out after the entire batch was packaged into wide-mouthed jars to ascertain that the gold is evenly distributed throughout the reference material. 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	67.07
Al ₂ O ₃	18.99
Na ₂ O	8.05
K ₂ O	4.26
CaO	0.17
MgO	0.14
TiO ₂	0.03
MnO	0.01
P ₂ O ₅	0.11
Fe ₂ O ₃	0.65
L O I	0.32

Intended Use:

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

Stability:

The container (jar or sachet) and its contents should not be heated to temperatures higher than 50 °C. The reference material is stable, with weight changes of less than 0.5 % at extremes of naturally occurring temperature and humidity conditions.

Method of Preparation:

Pulverized feldspar minerals were blended with finely pulverized and screened, gold-containing minerals. Once the powders were uniformly mixed the composite was placed into 1303 wide-mouthed jars, each bearing a unique number. 40 jars were randomly selected from the packaging run and material from these jars was used for both homogeneity and consensus testing.

Homogeneity Assessment:

An independent laboratory carried out all gold analyses by fire assay of 30 g portions, using a gravimetric finish with a balance capable of reading to one microgram. Steps were taken to minimize laboratory method variation in order to better detect any variation in the reference material.

Homogeneity Assessment After Packaging

The contents of five randomly selected jars were compacted by vibration (to simulate the effect of freighting) and five samples removed successively from top to bottom

from each jar. In addition, five samples were removed from the last jar in the series. A sample was removed from the top of each of the 40 jars randomly selected from the 1303 jars in the batch. The results of analysis of 70 samples produced a coefficient of variation of 0.4 %.

Analytical Methodology:

Once homogeneity had been established, eight 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 the 40 randomly selected jars with each laboratory receiving sub-samples from eight different jars. Indicative concentration ranges were given. The laboratories were selected on the basis of good performance for high gold samples in previous consensus rounds we have carried out.

Calculation of Certified Value:

11 sets of results for gold were returned from 11 laboratories. Statistical analysis to identify outliers for both within and between laboratories was carried out using the principles detailed in sections 7.3.2 – 7.3.4, ISO 5725-2: 1994. Details of the criteria used in these examinations are available on request. No results were excluded as a result of these statistical analyses and thus all results received were used to assign a gold concentration value to this reference material. The recommended value was thus calculated from the average of the $n = 11$ sets of replicate results for gold. 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 for gold is provided at the beginning of the certificate in $\mu\text{g/g}$ (ppm) units. A summary of the results used to calculate the recommended value and the names of the laboratories that submitted results are listed on page 4.

Summary of Results Used to Calculate Gold Value

(in order of laboratory average, not related to order of laboratories listed below)

Lab	Method									Laboratory Average ppm	Within Laboratory standard deviation ppm	Within Laboratory coefficient of variation %
		1	fa/AAS	13.7	14.2	14.3	13.2	13.9	14.1	13.9	14	13.913
2	fa/grav	13.8	14.4	14.2	14.4	14.3	14	14.5	14.8	14.300	0.307	2.15%
3	fa/AAS	14.9	15.1	14.5	14.8	14.7	14.6	14.5	14.8	14.738	0.207	1.40%
4	fa/grav	14.65	14.45	15.1	14.7	14.95	15	14.25	15.1	14.775	0.315	2.13%
5	fa/grav	14.85	14.74	14.9	14.79	14.81	14.88	14.9	14.9	14.846	0.058	0.39%
6	fa/AAS	15.01	14.97	14.75	14.78	15.01	14.89	14.97	14.93	14.914	0.100	0.67%
7	fa/grav	14.9	14.95	15.05	15.05	15.05	14.9	14.85	14.9	14.956	0.082	0.55%
8	fa/grav	15.06	15.06	15.00	15.02	15.00	15.08	15.04	15.00	15.033	0.032	0.21%
9	fa/grav	15.13	15.13	15.11	15.23	15.10	15.16	15.04	15.19	15.137	0.059	0.39%
10	fa/AAS	15.5	15.2	15.85	15.65	15.6	15.0	15.55	15.4	15.469	0.267	1.73%
11	fa/grav	15.67	15.89	15.92	16.01	15.39	15.64	15.72	15.43	15.708	0.226	1.44%
Overall Mean										14.890		
Between Laboratory Standard Deviation											0.493	
Between Laboratory Coefficient of Variation												3.31%

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

Participating Laboratories

Acme Analytical Laboratories Ltd, British Columbia
 ALS Chemex, British Columbia
 ALS Chemex, Nevada
 Amdel Laboratories, Perth
 Barrick Goldstrike Mines Inc, Nevada
 Bournlamaque Assay Laboratories Ltd, Quebec
 Mintek, Analytical Services Division, South Africa
 OMAC Laboratories Ltd, Ireland
 SGS Australia, Perth
 SGS New Zealand Ltd, Waihi
 Standard and Reference Laboratories, Perth

Instructions and Recommendations for Use:

Weigh out quantity usually used for analysis and analyze for total gold by normal procedure. Homogeneity testing has shown that consistent results are obtainable for gold when 30g portions are taken for analysis. Homogeneity cannot be guaranteed for gold if smaller weights 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 testing.

Some customer laboratories in the past have misinterpreted this confidence interval as an indication of how different their own test result will be from the declared value. Some even mistakenly use this interval 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. ISO 5725 - Accuracy (trueness and precision) of measurement methods and results, is the international standard that we use to design and analyse the interlaboratory trials for characterizing our reference materials. This standard defines two estimates of variability that will be indicative of the variations a reasonable laboratory might experience using the reference material.

The two sources of variability are:-

1) Repeatability – the variation between single results of the same material, tested at the same time, under the same conditions. This is estimated from the pooled within laboratory variation from the trial (ie the variation between the 8 different samples of the same reference material, tested at the same time). Our estimate of the approximate 95% Repeatability Confidence Interval from this trial is +/- 0.425 ppm. This figure may have limited value in this exercise, where not all laboratories used the same analytical method and we observed significant differences in repeatabilities between the laboratories.

2) Reproducibility – the variation between single results of the same material, tested by different laboratories, at possibly different times, and possibly different conditions. This is estimated from the between laboratory component of variation from this trial, combined with the repeatability measure defined above. This is a useful indicator of how far from the declared value a **single value** from a good laboratory, similar to those included in this study, might vary. Our estimate of the approximate 95% Reproducibility Confidence Interval from this trial is +/- 1.186 ppm.

Note: A much better way of determining the laboratory performance for testing 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 more simply for themselves, 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, Malcolm Smith Reference Materials 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 Malcolm Smith.

Certifying Officer

M G Smith BSc, FNZIC

Independent Statistician

A handwritten signature in black ink that reads "Tim Ball". The signature is written in a cursive, flowing style with a long horizontal stroke at the end of the word "Ball".

Tim Ball BSc (Hons)