



**CERTIFICATE OF ANALYSIS FOR  
NICKEL LATERITE ORE REFERENCE MATERIAL  
OREAS 186**

Constituent	Certified Value	1SD
<b>Fusion XRF</b>		
Nickel, Ni (wt.%)	1.23	0.02
Cobalt, Co (ppm)	692	25
Aluminium oxide, Al <sub>2</sub> O <sub>3</sub> (wt.%)	5.19	0.06
Calcium oxide, CaO (wt.%)	0.562	0.010
<i>Chlorine, Cl (ppm)</i>	<i>&lt;50</i>	IND
Copper, Cu (ppm)	61	19
Chromium oxide, Cr <sub>2</sub> O <sub>3</sub> (wt.%)	1.42	0.019
Iron oxide, Fe <sub>2</sub> O <sub>3</sub> (wt.%)	32.04	0.37
<i>Potassium oxide, K<sub>2</sub>O (wt.%)</i>	<i>&lt;0.01</i>	IND
Magnesium oxide, MgO (wt.%)	4.89	0.06
Manganese oxide, MnO (wt.%)	0.522	0.010
<i>Sodium oxide, Na<sub>2</sub>O (wt.%)</i>	<i>~0.02</i>	IND
<i>Phosphorus oxide, P<sub>2</sub>O<sub>5</sub> (wt.%)</i>	<i>~0.01</i>	IND
Silicon dioxide, SiO <sub>2</sub> (wt.%)	46.29	0.26
<i>Sulphur oxide, SO<sub>3</sub> (wt.%)</i>	<i>&lt;0.01</i>	IND
Titanium oxide, TiO <sub>2</sub> (wt.%)	0.069	0.005
Zinc, Zn (ppm)	265	23
Loss on ignition, LOI (wt.%)	6.83	0.33
<b>Fusion ICP</b>		
Nickel, Ni (wt.%)	1.22	0.03
Cobalt, Co (ppm)	680	35
Aluminium oxide, Al <sub>2</sub> O <sub>3</sub> (wt.%)	5.11	0.16
Calcium oxide, CaO (wt.%)	0.564	0.037
Copper, Cu (ppm)	57	9
Chromium oxide, Cr <sub>2</sub> O <sub>3</sub> (wt.%)	1.41	0.05
Iron oxide, Fe <sub>2</sub> O <sub>3</sub> (wt.%)	31.72	1.02
<i>Potassium oxide, K<sub>2</sub>O (wt.%)</i>	<i>&lt;0.1</i>	IND
Magnesium oxide, MgO (wt.%)	4.82	0.14
Manganese oxide, MnO (wt.%)	0.519	0.019
<i>Sodium oxide, Na<sub>2</sub>O (wt.%)</i>	<i>&lt;0.01</i>	IND
<i>Phosphorus oxide, P<sub>2</sub>O<sub>5</sub> (wt.%)</i>	<i>&lt;0.02</i>	IND
Silica dioxide, SiO <sub>2</sub> (wt.%)	46.24	1.03
<i>Sulphur oxide, SO<sub>3</sub> (wt.%)</i>	<i>&lt;0.05</i>	IND
Titanium oxide, TiO <sub>2</sub> (wt.%)	0.070	0.002
Zinc, Zn (ppm)	276	32
<b>IR Combustion Furnace</b>		
Carbon, C (wt.%)	0.07	0.02
<i>Sulphur, S (wt.%)</i>	<i>&lt;0.01</i>	IND

Note: italics - indicative values only; IND - indeterminate.

## INTRODUCTION

OREAS reference materials (RM) are intended to provide a low cost method of evaluating and improving the quality of analysis of geological samples. To the explorationist, they provide an important control in analytical data sets related to exploration from the grass roots level through to resource definition. To the mine geologist, they provide a tool for grade control in routine mining operations. To the analyst, they provide an effective means of calibrating analytical equipment, assessing new techniques and routinely monitoring in-house procedures.

## SOURCE MATERIAL

Reference material OREAS 186 is one of a suite of thirteen nickel laterite CRMs (OREAS 182 to OREAS 195) prepared from transitional ore source materials. These were supplied by Anglo American Brazil Limitada from the Barro Alto Nickel Mine located in the state of Goiás and ~300 kms from the port of Santos, Brazil.

## COMMUNITION AND HOMOGENISATION PROCEDURES

The material constituting OREAS 186 was prepared in the following manner:

- a) *drying to constant mass at 105°C;*
- b) *crushing;*
- c) *milling to 99.6% minus 75 microns;*
- d) *homogenisation and bagging into 20kg sublots;*
- e) *collection of 20 representative 300g samples during the bagging stage for the round robin program;*
- f) *packaging into 10g units in laminated foil pouches and 1kg units in wide mouth jars.*

## ANALYTICAL PROGRAM FOR OREAS 186

OREAS 186 is a nickel laterite reference material prepared by Ore Research & Exploration and has been certified for Ni, Co, Al<sub>2</sub>O<sub>3</sub>, C, CaO, Cl, Cu, Cr<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O, MgO, MnO, Na<sub>2</sub>O, P<sub>2</sub>O<sub>5</sub>, SiO<sub>2</sub>, S, SO<sub>3</sub>, TiO<sub>2</sub>, Zn and LOI. Nineteen commercial analytical laboratories participated in the certification program with characterization of this suite of 20 analytes by the following methods:

- Ni, Co, Al<sub>2</sub>O<sub>3</sub>, CaO, Cl, Cu, Cr<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O, MgO, MnO, Na<sub>2</sub>O, P<sub>2</sub>O<sub>5</sub>, SiO<sub>2</sub>, SO<sub>3</sub>, TiO<sub>2</sub> and Zn by lithium borate fusion with X-ray fluorescence (17 laboratories)
- Ni, Co, Al<sub>2</sub>O<sub>3</sub>, CaO, Cu, Cr<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O, MgO, MnO, Na<sub>2</sub>O, P<sub>2</sub>O<sub>5</sub>, SiO<sub>2</sub>, SO<sub>3</sub>, TiO<sub>2</sub> and Zn by lithium borate or sodium peroxide fusion with ICP-OES (12 laboratories)\*
- carbon and sulphur by infra-red combustion furnace (11 laboratories)
- loss on ignition (LOI) at 1000°C (18 laboratories)

\*Departures from a fusion ICP method were Lab G, which used a modified aqua regia digestion with ICP to determine Ni, Co, Cu, SO<sub>3</sub> and Zn, and Lab H, which used 4-acid digestion ICP to determine Co and Cu.

Due to the hygroscopic nature of nickel laterites, the laboratories were instructed to dry all samples thoroughly at 105°C prior to analysis and place in a desiccator with fresh desiccant. The samples were then to be cooled to room temperature before weighing for analysis. Alternatively, all samples could be corrected to dry basis by allowing the samples to equilibrate to lab atmosphere before weighing for analysis and correction for moisture by determination at 105°C of this property on a separate portion.

For the evaluation program a total of twenty 300g test units were taken at predetermined intervals during the bagging stage and are considered representative of the entire batch. To evaluate and compensate for the effects of batch-to-batch variation at individual laboratories, samples were submitted to the laboratories in three batches of four 20g sample pulps at weekly intervals. The four samples received by each laboratory were obtained by taking two 20g scoop splits from each of two separate 300g test units.

All results, together with uncorrected means, medians, standard deviations, relative standard deviations and percent deviation of lab means from the corrected mean of means (PDM<sup>3</sup>) are presented in the Appendix (Tables A2 to A37). The analytical methods employed by each laboratory are given in the table captions and described in Table A1 of the Appendix. The parameter PDM<sup>3</sup> is a measure of laboratory accuracy while the relative standard deviation is an effective measure of analytical precision where homogeneity of the test material has been confirmed.

## STATISTICAL EVALUATION OF ANALYTICAL DATA FOR OREAS 186

### Certified Value and Confidence Interval

Each batch of results is treated as a separate data set in testing for outliers. The certified value is determined from the mean of lab means after filtering of individual and batch outliers. It is computed according to the formulae

$$\bar{x}_i = \frac{1}{n_i} \sum_{j=1}^{n_i} x_{ij}$$

$$\bar{\bar{x}} = \frac{1}{p} \sum_{i=1}^p \bar{x}_i$$

where

$x_{ij}$  is the  $j$ th result reported by laboratory  $i$ ;

$p$  is the number of participating laboratories;

$n_i$  is the number of results reported by laboratory  $i$ ;

$\bar{x}_i$  is the mean for laboratory  $i$ ;

$\bar{\bar{x}}$  is the mean of means.

The confidence intervals are obtained by calculation of the variance ( $\hat{V}$ ) of the consensus value ( $\bar{\bar{x}}$ ) (mean of means) and reference to Student's- $t$  distribution with degrees of freedom ( $p-1$ ).

$$\hat{V}(\bar{\bar{x}}) = \frac{1}{p(p-1)} \sum_{i=1}^p (\bar{x}_i - \bar{\bar{x}})^2$$

$$\text{Confidence Interval} = \ddot{x} \pm t_{1-x/2}(p-1)(\hat{V}(\ddot{x}))^{1/2}$$

where

$t_{1-x/2}(p-1)$  is the  $1-x/2$  fractile of the  $t$ -distribution with  $(p-1)$  degrees of freedom.

The distribution of the values is assumed to be symmetrical about the mean in the calculation of the confidence interval.

The test for rejection of individual outliers from each laboratory data set is based on  $z$  scores (rejected if  $|z_i| > 2.5$ ) computed from the robust estimators of location and scale,  $T$  and  $S$ , respectively, according to the formulae

$$S = 1.483 \frac{\text{median}_{j=1,\dots,n} |x_j - \text{median}_{i=1,\dots,n}(x_i)|}{}$$

$$z_i = \frac{x_i - T}{S}$$

where

$T$  is the median value in a data set;

$S$  is the median of all absolute deviations from the sample median multiplied by 1.483, a correction factor to make the estimator consistent with the usual parameter of a normal distribution.

The  $z$ -score test is used in combination with a second method of individual outlier detection that determines the percent deviation of the individual value from the median. Outliers in general are selected on the basis of  $z$ -scores  $> 2.5$  and with percent deviations  $> 1.5\%$  (XRF) and  $> 3.0\%$  (other methods). In certain instances statistician's prerogative has been employed in discriminating outliers.

Each laboratory data set is tested for outlying status based on  $z$ -score discrimination and rejected if  $|z_i| > 2.5$ . After individual and laboratory data set (batch) outliers have been eliminated a non-iterative 3 standard deviation filter is applied, with individual values lying outside this window also relegated to outlying status. Individual outliers and, more rarely, laboratory data sets (batches) deemed to be outlying are shown left justified and in bold in the tabulated results (see Appendix) and have been omitted in the determination of certified values.

The magnitude of the confidence interval is inversely proportional to the number of participating laboratories and interlaboratory agreement. It is a measure of the reliability of the certified value, i.e. the narrower the confidence interval the greater the certainty in the certified value (see Table 1).

Table 1. Certified Values and 95% Confidence Intervals for OREAS 186.

Constituent	Certified Value	95% Confidence Interval	
		Low	High
<b>Fusion XRF</b>			
Nickel, Ni (wt.%)	1.23	1.22	1.24
Cobalt, Co (ppm)	692	681	702
Aluminium oxide, Al <sub>2</sub> O <sub>3</sub> (wt.%)	5.19	5.16	5.21
Calcium oxide, CaO (wt.%)	0.562	0.558	0.566
<i>Chlorine, Cl (ppm)</i>	<50	IND	IND
Copper, Cu (ppm)	61	49	72
Chromium oxide, Cr <sub>2</sub> O <sub>3</sub> (wt.%)	1.42	1.41	1.43
Iron oxide, Fe <sub>2</sub> O <sub>3</sub> (wt.%)	32.04	31.85	32.23
<i>Potassium oxide, K<sub>2</sub>O (wt.%)</i>	<0.01	IND	IND
Magnesium oxide, MgO (wt.%)	4.89	4.86	4.91
Manganese oxide, MnO (wt.%)	0.522	0.518	0.526
<i>Sodium oxide, Na<sub>2</sub>O (wt.%)</i>	~0.02	IND	IND
<i>Phosphorus oxide, P<sub>2</sub>O<sub>5</sub> (wt.%)</i>	~0.01	IND	IND
Silicon dioxide, SiO <sub>2</sub> (wt.%)	46.29	46.22	46.37
<i>Sulphur oxide, SO<sub>3</sub> (wt.%)</i>	<0.01	IND	IND
Titanium oxide, TiO <sub>2</sub> (wt.%)	0.069	0.067	0.072
Zinc, Zn (ppm)	265	254	276
Loss on ignition, LOI (wt.%)	6.83	6.65	7.01
<b>Fusion ICP</b>			
Nickel, Ni (wt.%)	1.22	1.20	1.24
Cobalt, Co (ppm)	680	663	697
Aluminium oxide, Al <sub>2</sub> O <sub>3</sub> (wt.%)	5.11	5.03	5.19
Calcium oxide, CaO (wt.%)	0.564	0.540	0.589
Copper, Cu (ppm)	57	55	60
Chromium oxide, Cr <sub>2</sub> O <sub>3</sub> (wt.%)	1.41	1.39	1.43
Iron oxide, Fe <sub>2</sub> O <sub>3</sub> (wt.%)	31.72	31.09	32.34
<i>Potassium oxide, K<sub>2</sub>O (wt.%)</i>	<0.1	IND	IND
Magnesium oxide, MgO (wt.%)	4.82	4.74	4.91
Manganese oxide, MnO (wt.%)	0.519	0.509	0.529
<i>Sodium oxide, Na<sub>2</sub>O (wt.%)</i>	<0.01	IND	IND
<i>Phosphorus oxide, P<sub>2</sub>O<sub>5</sub> (wt.%)</i>	<0.02	IND	IND
Silica dioxide, SiO <sub>2</sub> (wt.%)	46.24	45.67	46.81
<i>Sulphur oxide, SO<sub>3</sub> (wt.%)</i>	<0.05	IND	IND
Titanium oxide, TiO <sub>2</sub> (wt.%)	0.070	0.069	0.071
Zinc, Zn (ppm)	276	257	295
<b>IR Combustion Furnace</b>			
Carbon, C (wt.%)	0.07	0.06	0.08
<i>Sulphur, S (wt.%)</i>	<0.01	IND	IND

Note - italics: indicative value; IND: indeterminate; intervals may appear asymmetric due to rounding.

## Statement of Homogeneity

The standard deviation of each laboratory data set includes error due to both the imprecision of the analytical method employed and to possible inhomogeneity of the material analysed. The standard deviation of the pooled individual analyses of all participating laboratories includes error due to the imprecision of each analytical method, to possible inhomogeneity of the material analysed and, in particular, to deficiencies in accuracy of each analytical method. In determining tolerance intervals that component of error attributable to measurement inaccuracy was eliminated by transformation of the individual results of each data set to a common mean (the uncorrected grand mean) according to the formula

$$x'_{ij} = x_{ij} - \bar{x}_i + \frac{\sum_{i=1}^p \sum_{j=1}^{n_i} x_{ij}}{\sum_{i=1}^p n_i}$$

where

$x_{ij}$  is the  $j$ th raw result reported by laboratory  $i$ ;  
 $x'_{ij}$  is the  $j$ th transformed result reported by laboratory  $i$ ;  
 $n_i$  is the number of results reported by laboratory  $i$ ;  
 $p$  is the number of participating laboratories;  
 $\bar{x}_i$  is the raw mean for laboratory  $i$ .

The homogeneity of each constituent was determined from tables of factors for two-sided tolerance limits for normal distributions (ISO 3207) in which

$$\begin{aligned} \text{Lower limit is } \bar{x} - k'_2(n, p, 1 - \alpha) s_g'' \\ \text{Upper limit is } \bar{x} + k'_2(n, p, 1 - \alpha) s_g'' \end{aligned}$$

where

$n$  is the number of results;  
 $1 - \alpha$  is the confidence level;  
 $p$  is the proportion of results expected within the tolerance limits;  
 $k'_2$  is the factor for two – sided tolerance limits ( $m, \alpha$  unknown);  
 $s_g''$  is the corrected grand standard deviation.

The meaning of these tolerance limits may be illustrated for nickel by lithium borate fusion XRF, where 99% of the time at least 95% of subsamples will have concentrations lying between 1.23 and 1.24 wt.%. Put more precisely, this means that if the same number of subsamples were taken and analysed in the same manner repeatedly, 99% of the tolerance intervals so constructed would cover at least 95% of the total population, and 1% of the tolerance intervals would cover less than 95% of the total population (ISO Guide 35). The corrected grand standard deviation,  $s_g''$ , used to compute the tolerance intervals is the weighted means of standard deviations of all data sets for a particular constituent according to the formula

$$s_g'' = \frac{\sum_{i=1}^p (s_i (1 - \frac{s_i}{s_g'}))}{\sum_{i=1}^p (1 - \frac{s_i}{s_g'})}$$

where

$1 - (\frac{s_i}{2s_g'})$  is the weighting factor for laboratory  $i$  ;

$s_g'$  is the grand standard deviation computed from the transformed (i.e. means - adjusted) results

according to the formula

$$s_g' = \left[ \frac{\sum_{i=1}^p \sum_{j=i}^{n_i} (x'_{ij} - \bar{x}'_i)^2}{\sum_{i=1}^p n_i - 1} \right]^{1/2}$$

where  $\bar{x}'_i$  is the transformed mean for laboratory  $i$

The weighting factors were applied to compensate for the considerable variation in analytical precision amongst participating laboratories. Hence, weighting factors for each data set have been constructed so as to be inversely proportional to the standard deviation of that data set. Individual outliers (shown in bold in Tables A2 to A37) were removed prior to the calculation of tolerance intervals and a weighting factor of zero was applied to those data sets where  $s_i/2s_g' > 1$  (i.e. where the weighting factor  $1 - s_i/2s_g' < 0$ ). Data sets displaying poor resolution (i.e. where the ratio of the reading increment divided by the measured value is  $< 1/20$ ) were also omitted.

It should be noted that estimates of tolerance by this method are considered conservative as a significant proportion of the observed variance, even in those laboratories exhibiting the best analytical precision, can presumably be attributed to measurement error. Despite the limitations of this method, the tolerance intervals presented in Table 2 are considered to confirm a high level of homogeneity for this CRM.

Table 2. Certified Values and Tolerance Limits for OREAS 186.

Constituent	Certified Value	Tolerance limits 1- $\alpha$ =0.99, $\rho$ =0.95	
		Low	High
<b>Fusion XRF</b>			
Nickel, Ni (wt.%)	1.23	1.23	1.24
Cobalt, Co (ppm)	692	676	707
Aluminium oxide, Al <sub>2</sub> O <sub>3</sub> (wt.%)	5.19	5.16	5.22
Calcium oxide, CaO (wt.%)	0.562	0.556	0.568
<i>Chlorine, Cl (ppm)</i>	<50	IND	IND
Copper, Cu (ppm)	61	IND	IND
Chromium oxide, Cr <sub>2</sub> O <sub>3</sub> (wt.%)	1.42	1.41	1.43
Iron oxide, Fe <sub>2</sub> O <sub>3</sub> (wt.%)	32.04	31.94	32.15
<i>Potassium oxide, K<sub>2</sub>O (wt.%)</i>	<0.01	IND	IND
Magnesium oxide, MgO (wt.%)	4.89	4.87	4.91
Manganese oxide, MnO (wt.%)	0.522	0.520	0.524
<i>Sodium oxide, Na<sub>2</sub>O (wt.%)</i>	~0.02	IND	IND
<i>Phosphorus oxide, P<sub>2</sub>O<sub>5</sub> (wt.%)</i>	~0.01	IND	IND
Silicon dioxide, SiO <sub>2</sub> (wt.%)	46.29	46.11	46.48
<i>Sulphur oxide, SO<sub>3</sub> (wt.%)</i>	<0.01	IND	IND
Titanium oxide, TiO <sub>2</sub> (wt.%)	0.069	0.065	0.073
Zinc, Zn (ppm)	265	258	272
Loss on ignition, LOI (wt.%)	6.83	6.75	6.91
<b>Fusion ICP</b>			
Nickel, Ni (wt.%)	1.22	1.20	1.23
Cobalt, Co (ppm)	680	668	691
Aluminium oxide, Al <sub>2</sub> O <sub>3</sub> (wt.%)	5.11	5.05	5.17
Calcium oxide, CaO (wt.%)	0.564	0.548	0.581
Copper, Cu (ppm)	57	50	65
Chromium oxide, Cr <sub>2</sub> O <sub>3</sub> (wt.%)	1.41	1.39	1.43
Iron oxide, Fe <sub>2</sub> O <sub>3</sub> (wt.%)	31.72	31.41	32.02
<i>Potassium oxide, K<sub>2</sub>O (wt.%)</i>	<0.1	IND	IND
Magnesium oxide, MgO (wt.%)	4.82	4.76	4.89
Manganese oxide, MnO (wt.%)	0.519	0.511	0.526
<i>Sodium oxide, Na<sub>2</sub>O (wt.%)</i>	<0.01	IND	IND
<i>Phosphorus oxide, P<sub>2</sub>O<sub>5</sub> (wt.%)</i>	<0.02	IND	IND
Silica dioxide, SiO <sub>2</sub> (wt.%)	46.24	45.75	46.73
<i>Sulphur oxide, SO<sub>3</sub> (wt.%)</i>	<0.05	IND	IND
Titanium oxide, TiO <sub>2</sub> (wt.%)	0.070	0.068	0.072
Zinc, Zn (ppm)	276	262	290
<b>IR Combustion Furnace</b>			
Carbon, C (wt.%)	0.07	IND	IND
<i>Sulphur, S (wt.%)</i>	<0.01	IND	IND

Note - intervals may appear asymmetric due to rounding; IND = indeterminate; italics = indicative value



## ANOVA Study

All laboratories and all 3 rounds of sample submission were included in the ANOVA study for nickel, cobalt, iron oxide and magnesium oxide. The sampling format for OREAS 186 was structured to enable nested ANOVA treatment of the round robin results. During the bagging stage, immediately following homogenization, twenty 300g samples were taken at regular intervals representative of the entire batch of OREAS 186. For each round of sample submissions, each laboratory received paired samples from two different, non-adjacent 300g samples. For example, the samples that any one of the seventeen (XRF) laboratories could have received are:

Round 1 (week 1)	Round 2 (week 2)	Round 3 (week 3)
Sample 1: Unit 1	Sample 1: Unit 10	Sample 1: Unit 6
Sample 2: Unit 11	Sample 2: Unit 20	Sample 2: Unit 16
Sample 3: Unit 1	Sample 3: Unit 10	Sample 3: Unit 6
Sample 4: Unit 11	Sample 4: Unit 20	Sample 4: Unit 16

The purpose of the ANOVA investigation was to compare the within-unit variance with that of the between-unit variance. This approach permitted an assessment of homogeneity across the entire batch of OREAS 186. The test was performed using the following parameters:

- Significance Level  $\alpha = P$  (type I error) = 0.05
- Null Hypothesis,  $H_0$ : Between-unit variance is no greater than within-unit variance (reject  $H_0$  if p-value < 0.05)
- Alternative Hypothesis,  $H_1$ : Between-unit variance is greater than within-unit variance

P-values are a measure of probability whereby values less than 0.05 indicate a greater than 95% probability that the observed differences in within-unit and between-unit variances are real. The dataset was filtered for both individual and batch (lab round) outliers prior to the calculation of the p-value. This process derived p-values of 1.00 for nickel, 1.00 for cobalt, 1.00 for iron oxide and 0.989 for magnesium oxide and indicates no evidence that between-unit variance is greater than within-unit variance. Conclusion: do not reject  $H_0$ .

Note that ANOVA is not an absolute measure of homogeneity. Rather, it establishes that the metals are distributed in a similar manner throughout OREAS 186 and that the variance between two subsamples from the same unit is statistically indistinguishable to the variance from two subsamples taken from any two separate units.

## Performance Gates

Performance gates provide an indication of a level of performance that might reasonably be expected from a laboratory being monitored by this CRM in a QA/QC program. They take into account errors attributable to measurement and CRM variability. For an effective CRM the contribution of the latter should be negligible in comparison to measurement errors. Sources of measurement error include inter-lab bias, analytical precision (repeatability) and inter-batch bias (reproducibility).

Two methods have been employed to calculate performance gates. The first method uses the same filtered data set used to determine the certified value, i.e. after removal of all individual, lab dataset (batch) and 3SD outliers (single iteration). These outliers can only be removed after the absolute homogeneity of the CRM has been independently established, i.e. the outliers must be confidently deemed to be analytical rather than arising from inhomogeneity of the CRM. The standard deviation is then calculated for each analyte from the pooled individual analyses generated from the certification program. Table 3 shows performance gates calculated for two and three standard deviations. As a guide these intervals may be regarded as warning or rejection for multiple 2SD outliers, or rejection for

individual 3SD outliers in QC monitoring, although their precise application should be at the discretion of the QC manager concerned.

Standard deviation is also shown in relative percent for one, two and three relative standard deviations (1RSD, 2RSD and 3RSD) to facilitate an appreciation of the magnitude of these numbers.

Table 3. Performance Gates for OREAS 186

Constituent	Certified Value	Absolute Standard Deviations					Relative Standard Deviations		
		1SD	2SD Low	2SD High	3SD Low	3SD High	1RSD	2RSD	3RSD
<b>Fusion XRF</b>									
Ni (wt.%)	1.23	0.02	1.19	1.28	1.17	1.30	1.76%	3.51%	5.27%
Co (ppm)	692	25	641	742	616	768	3.65%	7.31%	10.96%
Al <sub>2</sub> O <sub>3</sub> (wt.%)	5.19	0.06	5.07	5.30	5.01	5.36	1.11%	2.23%	3.34%
CaO (wt.%)	0.562	0.010	0.541	0.583	0.531	0.593	1.83%	3.66%	5.49%
Cl (ppm)	<50	IND	IND	IND	IND	IND	IND	IND	IND
Cu (ppm)	61	19	22	99	3	118	31.67%	63.34%	95.01%
Cr <sub>2</sub> O <sub>3</sub> (wt.%)	1.42	0.019	1.39	1.46	1.37	1.48	1.32%	2.63%	3.95%
Fe <sub>2</sub> O <sub>3</sub> (wt.%)	32.04	0.37	31.31	32.77	30.94	33.14	1.14%	2.28%	3.42%
K <sub>2</sub> O (wt.%)	<0.01	IND	IND	IND	IND	IND	IND	IND	IND
MgO (wt.%)	4.89	0.06	4.77	5.01	4.71	5.07	1.23%	2.46%	3.69%
MnO (wt.%)	0.522	0.010	0.502	0.541	0.493	0.551	1.86%	3.71%	5.57%
Na <sub>2</sub> O (wt.%)	~0.02	IND	IND	IND	IND	IND	IND	IND	IND
P <sub>2</sub> O <sub>5</sub> (wt.%)	~0.01	IND	IND	IND	IND	IND	IND	IND	IND
SiO <sub>2</sub> (wt.%)	46.29	0.26	45.78	46.81	45.52	47.06	0.55%	1.11%	1.66%
SO <sub>3</sub> (wt.%)	<0.01	IND	IND	IND	IND	IND	IND	IND	IND
TiO <sub>2</sub> (wt.%)	0.069	0.005	0.059	0.080	0.054	0.085	7.41%	14.83%	22.24%
Zn (ppm)	265	23	218	312	195	335	8.80%	17.60%	26.40%
LOI (wt.%)	6.83	0.33	6.17	7.49	5.84	7.82	4.82%	9.65%	14.47%
<b>Fusion ICP</b>									
Ni (wt.%)	1.22	0.03	1.15	1.28	1.12	1.32	2.71%	5.41%	8.12%
Co (ppm)	680	35	609	750	574	786	5.19%	10.38%	15.57%
Al <sub>2</sub> O <sub>3</sub> (wt.%)	5.11	0.16	4.80	5.42	4.64	5.58	3.05%	6.11%	9.16%
CaO (wt.%)	0.564	0.037	0.490	0.639	0.453	0.676	6.57%	13.15%	19.72%
Cu (ppm)	57	9	40	75	31	83	15.17%	30.34%	45.51%
Cr <sub>2</sub> O <sub>3</sub> (wt.%)	1.41	0.05	1.31	1.51	1.26	1.56	3.60%	7.20%	10.80%
Fe <sub>2</sub> O <sub>3</sub> (wt.%)	31.72	1.02	29.68	33.75	28.67	34.77	3.21%	6.41%	9.62%
K <sub>2</sub> O (wt.%)	<0.1	IND	IND	IND	IND	IND	IND	IND	IND
MgO (wt.%)	4.82	0.14	4.54	5.11	4.40	5.25	2.96%	5.93%	8.89%
MnO (wt.%)	0.519	0.019	0.481	0.556	0.463	0.575	3.60%	7.21%	10.81%
Na <sub>2</sub> O (wt.%)	<0.01	IND	IND	IND	IND	IND	IND	IND	IND
P <sub>2</sub> O <sub>5</sub> (wt.%)	<0.02	IND	IND	IND	IND	IND	IND	IND	IND
SiO <sub>2</sub> (wt.%)	46.24	1.03	44.18	48.30	43.15	49.33	2.23%	4.45%	6.68%
SO <sub>3</sub> (wt.%)	<0.05	IND	IND	IND	IND	IND	IND	IND	IND
TiO <sub>2</sub> (wt.%)	0.070	0.002	0.067	0.073	0.065	0.075	2.36%	4.72%	7.08%
Zn (ppm)	276	32	212	340	180	372	11.59%	23.18%	34.76%
<b>IR Combustion Furnace</b>									
C (wt.%)	0.07	0.02	0.03	0.11	0.01	0.12	27.89%	55.79%	83.68%
S (wt.%)	<0.01	IND	IND	IND	IND	IND	IND	IND	IND

Note - intervals may appear asymmetric due to rounding; IND = indeterminate; italics = indicative value

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Activation Laboratories, Ancaster, Ontario, Canada  
ALS, Callao, Lima, Peru  
ALS, Malaga, WA, Australia  
ALS, Stafford, QLD, Australia  
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BV Amdel, Stirling, SA, Australia  
BV Ultra Trace, Canning Vale, WA, Australia  
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UIS Analytical Services, Centurion, South Africa

## PREPARER AND SUPPLIER OF THE REFERENCE MATERIAL

Nickel laterite ore reference material OREAS 186 has been prepared and certified and is supplied by:

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6-8 Gatwick Road  
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OREAS 186 is packaged in unit sizes of 10g (single-use laminated foil pouches) and 1kg (wide mouthed plastic jars).

## INTENDED USE

OREAS 186 is intended for the following uses:

- i) for the monitoring of laboratory performance in the analysis of Ni, Co, Al<sub>2</sub>O<sub>3</sub>, CaO, Cl, Cu, Cr<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O, MgO, MnO, Na<sub>2</sub>O, P<sub>2</sub>O<sub>5</sub>, SiO<sub>2</sub>, SO<sub>3</sub>, TiO<sub>2</sub>, Zn, LOI, C and S in geological samples
- ii) for the verification of analytical methods for Ni, Co, Al<sub>2</sub>O<sub>3</sub>, CaO, Cl, Cu, Cr<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O, MgO, MnO, Na<sub>2</sub>O, P<sub>2</sub>O<sub>5</sub>, SiO<sub>2</sub>, SO<sub>3</sub>, TiO<sub>2</sub>, Zn, LOI, C and S
- iii) for the calibration of instruments used in the determination of the concentration of Ni, Co, Al<sub>2</sub>O<sub>3</sub>, CaO, Cl, Cu, Cr<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O, MgO, MnO, Na<sub>2</sub>O, P<sub>2</sub>O<sub>5</sub>, SiO<sub>2</sub>, SO<sub>3</sub>, TiO<sub>2</sub>, Zn, LOI, C and S

## **STABILITY AND STORAGE INSTRUCTIONS**

OREAS 186 has been sourced from a sample of transitional nickel ore. It has been packaged in robust laminated foil pouches and plastic jars. In its unopened state and under normal conditions of storage it has a shelf life beyond ten years. Once opened the jars should be re-sealed after sampling and the contents consumed within two years.

## **INSTRUCTIONS FOR THE CORRECT USE OF THE REFERENCE MATERIAL**

All certified values are reported on a dry basis after removal of hygroscopic moisture by drying in air at 105 °C to constant mass. Users departing from these conventions should correct for moisture content.

## **LEGAL NOTICE**

Ore Research & Exploration Pty Ltd has prepared and statistically evaluated the property values of this reference material to the best of its ability. The Purchaser by receipt hereof releases and indemnifies Ore Research & Exploration Pty Ltd from and against all liability and costs arising from the use of this material and information.

## **CERTIFYING OFFICER**

Craig Hamlyn (B.Sc. Hons - Geology), Technical Manager

## **REFERENCES**

ISO Guide 35 (2006), Certification of reference materials - General and statistical principals.

ISO Guide 31 (2000), Reference materials – Contents of certificates and labels.

ISO Guide 3207 (1975), Statistical interpretation of data - Determination of a statistical tolerance interval.

**APPENDIX**

**Analytical Data for OREAS 186**

Table A1. Key to abbreviations used in Tables A2 – A37.

Abbreviation	Explanation
Std.Dev.	one sigma standard deviation
Rel.Std.Dev.	one sigma relative standard deviation
PDM <sup>3</sup>	percent deviation of lab mean from corrected mean of means
NR	not reported
BF	lithium metaborate fusion
PF	sodium peroxide fusion
4A	four acid (HF–HNO <sub>3</sub> –HClO <sub>4</sub> –HCl) digestion
MAR	modified aqua regia digestion
ICP	inductively coupled plasma OES or MS (unspecified)
OES	inductively coupled plasma optical emission spectrometry
XRF	x-ray fluorescence
LOI	loss on ignition
IRC	infra-red combustion furnace

Individual and batch outliers are left justified and in bold. Replicates 1 – 4 correspond to the first batch of samples submitted to labs, replicates 5 – 8 correspond to the second batch and replicates 9 – 12 correspond to the third batch.

Table A2. Fusion XRF results for Ni in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A BF*XRF	Lab B BF*XRF	Lab C BF*XRF	Lab D BF*XRF	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*XRF	Lab H BF*XRF	Lab I BF*XRF	Lab J BF*XRF	Lab K BF*XRF	Lab L BF*XRF	Lab N BF*XRF	Lab O BF*XRF	Lab P BF*XRF	Lab Q BF*XRF	Lab R BF*XRF
1	1.22	1.24	1.22	1.23	1.27	1.21	1.25	1.28	1.25	<b>1.29</b>	1.22	1.23	1.24	1.23	1.25	1.24	1.21
2	1.24	1.24	1.23	1.23	1.28	1.22	1.22	1.26	1.25	<b>1.29</b>	1.21	1.22	1.26	1.24	1.25	1.24	1.21
3	1.22	1.24	1.23	1.23	1.27	1.22	1.25	1.26	1.24	<b>1.29</b>	1.20	1.22	1.19	1.23	1.25	1.24	1.21
4	1.24	1.24	1.23	1.23	1.29	1.22	1.25	1.25	1.25	<b>1.29</b>	1.22	1.22	<b>1.17</b>	1.23	1.25	1.24	1.21
5	1.22	1.25	1.22	1.21	1.26	1.21	1.24	1.24	1.24	1.27	1.20	1.23	1.19	1.23	NR	NR	NR
6	1.22	1.25	1.22	1.22	1.27	1.23	1.24	1.26	1.24	1.28	1.20	1.24	1.19	1.24	NR	NR	NR
7	1.22	1.24	1.22	1.23	1.29	1.23	1.24	1.23	1.24	1.27	1.20	1.22	1.18	1.23	NR	NR	NR
8	1.23	1.25	1.23	1.22	1.27	1.21	1.24	1.24	1.24	1.27	1.21	1.21	1.19	1.24	NR	NR	NR
9	1.20	1.25	1.23	1.22	1.21	1.22	1.22	1.26	1.24	<b>1.28</b>	1.19	1.22	1.21	1.23	NR	NR	NR
10	1.20	1.26	1.22	1.21	1.22	1.23	1.25	1.28	1.25	<b>1.30</b>	1.19	1.24	1.21	1.23	NR	NR	NR
11	1.21	1.25	1.23	1.21	1.21	1.22	1.23	1.27	1.25	<b>1.30</b>	1.19	1.23	1.21	1.23	NR	NR	NR
12	1.22	1.26	1.23	1.22	<b>1.28</b>	1.22	1.20	1.26	1.24	<b>1.30</b>	1.21	1.22	1.20	1.22	NR	NR	NR
Mean	1.22	1.25	1.23	1.22	1.26	1.22	1.24	1.26	1.24	1.28	1.20	1.23	1.20	1.23	1.25	1.24	1.21
Median	1.22	1.25	1.23	1.22	1.27	1.22	1.24	1.26	1.24	1.29	1.20	1.22	1.20	1.23	1.25	1.24	1.21
Std.Dev.	0.01	0.01	0.01	0.01	0.03	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.03	0.00	0.00	0.00	0.00
Rel.Std.Dev.	1.01%	0.51%	0.47%	0.68%	2.27%	0.73%	1.27%	1.17%	0.41%	0.88%	0.84%	0.74%	2.14%	0.40%	0.00%	0.18%	0.00%
PDM <sup>3</sup>	-1.15%	1.04%	-0.61%	-0.91%	1.96%	-1.12%	0.24%	2.01%	0.91%	4.20%	-2.50%	-0.64%	-2.50%	-0.20%	1.39%	0.60%	-1.86%

Table A3. Fusion XRF results for Co in OREAS 186 (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A BF*XRF	Lab B BF*XRF	Lab C BF*XRF	Lab D BF*XRF	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*XRF	Lab H BF*XRF	Lab I BF*XRF	Lab J BF*XRF	Lab K BF*XRF	Lab L BF*XRF	Lab N BF*XRF	Lab O BF*XRF	Lab P BF*XRF	Lab Q BF*XRF	Lab R BF*XRF
1	680	733	660	700	700	660	NR	<b>860</b>	720	740	670	700	<b>340</b>	690	700	663	<b>600</b>
2	700	750	670	700	710	670	NR	<b>850</b>	720	670	680	700	<b>330</b>	700	700	659	700
3	680	750	670	700	710	680	NR	<b>850</b>	720	660	670	700	<b>680</b>	690	700	674	<b>600</b>
4	690	750	670	690	730	670	NR	<b>840</b>	730	760	680	700	<b>660</b>	700	700	661	700
5	660	750	660	690	690	670	NR	<b>830</b>	710	750	670	700	670	690	NR	NR	NR
6	660	700	660	680	700	680	NR	<b>830</b>	710	770	680	700	660	690	NR	NR	NR
7	670	700	660	700	720	680	NR	<b>830</b>	720	740	670	700	670	690	NR	NR	NR
8	670	700	670	700	690	670	NR	<b>830</b>	700	<b>840</b>	680	700	680	680	NR	NR	NR
9	660	750	670	690	710	670	NR	<b>840</b>	720	750	660	700	690	700	NR	NR	NR
10	670	700	660	680	720	680	NR	<b>840</b>	720	720	660	700	690	700	NR	NR	NR
11	670	700	670	680	720	680	NR	<b>860</b>	710	630	660	700	690	690	NR	NR	NR
12	670	700	670	690	730	670	NR	<b>840</b>	710	660	680	700	680	690	NR	NR	NR
Mean	673	724	666	692	711	673		<b>842</b>	716	724	672	700	620	693	700	664	650
Median	670	717	670	690	710	670		840	720	740	670	700	675	690	700	662	650
Std.Dev.	12	25	5	8	14	7		11	8	59	8	0	134	6	0	7	58
Rel.Std.Dev.	1.83%	3.47%	0.77%	1.21%	1.94%	0.97%		1.32%	1.11%	8.19%	1.24%	0.00%	21.54%	0.90%	0.00%	1.01%	8.88%
PDM <sup>3</sup>	-2.65%	4.62%	-3.74%	0.00%	2.77%	-2.65%		21.68%	3.49%	4.70%	-2.89%	1.20%	-10.36%	0.12%	1.20%	-3.97%	-6.03%

Table A4. Fusion XRF results for Al<sub>2</sub>O<sub>3</sub> in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A BF*XRF	Lab B BF*XRF	Lab C BF*XRF	Lab D BF*XRF	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*XRF	Lab H BF*XRF	Lab I BF*XRF	Lab J BF*XRF	Lab K BF*XRF	Lab L BF*XRF	Lab N BF*XRF	Lab O BF*XRF	Lab P BF*XRF	Lab Q BF*XRF	Lab R BF*XRF
1	5.17	<b>5.05</b>	5.17	5.22	5.25	5.10	5.17	5.24	5.14	5.11	5.18	5.19	5.19	5.17	5.28	5.23	5.21
2	5.17	<b>4.98</b>	5.19	5.22	5.27	5.14	<b>5.05</b>	5.18	5.18	5.11	5.19	5.20	5.28	5.18	5.24	5.25	5.20
3	5.11	<b>5.02</b>	5.17	5.22	5.26	5.18	5.16	5.20	5.29	5.10	5.22	5.21	5.02	5.19	5.27	5.20	5.19
4	5.17	<b>4.98</b>	5.21	5.21	5.25	5.16	5.17	5.28	5.27	<b>5.19</b>	5.21	5.21	5.05	5.19	5.23	5.16	5.19
5	5.22	<b>5.00</b>	5.12	5.18	5.17	5.12	5.17	5.17	5.26	<b>4.93</b>	5.11	5.18	5.13	5.18	NR	NR	NR
6	5.23	<b>4.98</b>	5.17	5.17	5.14	5.16	5.16	5.16	5.28	<b>4.93</b>	5.15	5.20	5.18	5.19	NR	NR	NR
7	5.24	<b>4.97</b>	5.16	5.16	5.14	5.21	5.18	5.17	5.33	<b>5.16</b>	5.16	5.18	5.10	5.21	NR	NR	NR
8	5.24	<b>5.01</b>	5.25	5.17	5.17	5.14	5.15	5.18	5.23	<b>5.07</b>	5.13	5.18	5.18	5.22	NR	NR	NR
9	5.21	<b>5.01</b>	5.18	5.19	<b>5.42</b>	5.15	5.07	5.19	5.27	5.15	5.10	5.21	5.17	5.24	NR	NR	NR
10	5.18	<b>5.00</b>	5.17	5.20	<b>5.39</b>	5.14	5.05	5.22	5.34	5.17	5.15	5.23	5.14	5.30	NR	NR	NR
11	5.23	<b>4.99</b>	5.16	5.22	<b>5.45</b>	5.18	5.05	5.27	5.23	5.03	5.11	5.22	5.17	5.26	NR	NR	NR
12	5.22	<b>5.03</b>	5.19	5.20	<b>5.29</b>	5.13	5.03	5.17	5.30	5.03	5.11	5.20	5.17	5.25	NR	NR	NR
Mean	5.20	<b>5.00</b>	5.18	5.20	5.27	5.15	5.12	5.20	5.26	5.08	5.15	5.20	5.15	5.22	5.26	5.21	5.20
Median	5.22	5.00	5.17	5.20	5.26	5.15	5.16	5.19	5.27	5.10	5.15	5.20	5.17	5.20	5.26	5.22	5.20
Std.Dev.	0.04	0.02	0.03	0.02	0.11	0.03	0.06	0.04	0.06	0.09	0.04	0.02	0.07	0.04	0.02	0.04	0.01
Rel.Std.Dev.	0.76%	0.48%	0.60%	0.43%	2.02%	0.58%	1.18%	0.79%	1.10%	1.72%	0.80%	0.31%	1.31%	0.76%	0.45%	0.72%	0.18%
PDM <sup>3</sup>	0.23%	-3.59%	-0.17%	0.18%	1.53%	-0.72%	-1.34%	0.29%	1.40%	-2.04%	-0.69%	0.26%	-0.76%	0.54%	1.31%	0.48%	0.20%



Table A5. Fusion XRF results for CaO in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A BF*XRF	Lab B BF*XRF	Lab C BF*XRF	Lab D BF*XRF	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*XRF	Lab H BF*XRF	Lab I BF*XRF	Lab J BF*XRF	Lab K BF*XRF	Lab L BF*XRF	Lab N BF*XRF	Lab O BF*XRF	Lab P BF*XRF	Lab Q BF*XRF	Lab R BF*XRF
1	0.570	0.547	0.560	0.570	0.550	0.545	0.570	0.560	0.580	0.549	0.570	0.550	<b>0.428</b>	0.570	0.560	0.574	0.560
2	0.580	0.555	0.560	0.570	0.550	0.546	0.560	0.560	0.590	<b>0.606</b>	0.570	0.550	<b>0.434</b>	0.570	0.560	0.548	0.560
3	0.570	0.545	0.560	0.570	0.550	0.548	0.570	0.560	0.570	0.561	0.580	0.560	<b>0.567</b>	0.570	0.570	<b>0.524</b>	0.560
4	0.570	0.550	0.570	0.560	0.550	0.547	0.570	0.560	0.580	0.575	0.570	0.550	<b>0.559</b>	0.560	0.570	0.540	0.560
5	0.560	0.550	0.560	0.570	0.550	0.550	0.570	0.550	0.590	<b>0.531</b>	0.560	0.570	0.574	0.570	NR	NR	NR
6	0.560	0.555	0.560	0.570	0.550	0.552	0.570	0.550	0.580	0.554	0.560	0.560	0.568	0.560	NR	NR	NR
7	0.560	0.550	0.550	0.570	0.550	0.552	0.570	0.550	0.580	0.565	0.560	0.570	0.574	0.570	NR	NR	NR
8	0.560	0.550	0.560	0.570	0.560	0.546	0.560	0.550	0.580	0.554	0.560	0.570	0.574	0.570	NR	NR	NR
9	0.560	0.555	0.560	0.560	0.560	0.549	0.550	0.560	0.570	0.558	0.550	0.570	0.579	0.570	NR	NR	NR
10	0.560	0.550	0.560	0.560	0.560	0.552	0.550	0.560	0.590	0.568	0.560	0.580	0.575	0.570	NR	NR	NR
11	0.560	0.560	0.560	0.560	0.560	0.553	0.550	0.560	0.580	0.558	0.550	0.580	0.577	0.570	NR	NR	NR
12	0.570	0.550	0.560	0.560	0.560	0.548	0.550	0.560	0.580	0.558	0.560	0.570	0.578	0.570	NR	NR	NR
Mean	0.565	0.551	0.560	0.566	0.554	0.549	0.562	0.557	0.581	0.561	0.563	0.565	0.549	0.568	0.565	0.546	0.560
Median	0.560	0.550	0.560	0.570	0.550	0.549	0.565	0.560	0.580	0.558	0.560	0.570	0.574	0.570	0.565	0.544	0.560
Std.Dev.	0.007	0.004	0.004	0.005	0.005	0.003	0.009	0.005	0.007	0.018	0.009	0.011	0.055	0.004	0.006	0.021	0.000
Rel.Std.Dev.	1.19%	0.75%	0.76%	0.91%	0.93%	0.50%	1.67%	0.88%	1.15%	3.16%	1.54%	1.92%	10.09%	0.68%	1.02%	3.84%	0.00%
PDM <sup>3</sup>	0.53%	-1.89%	-0.36%	0.68%	-1.40%	-2.31%	-0.06%	-0.95%	3.35%	-0.11%	0.09%	0.53%	-2.33%	1.13%	0.53%	-2.78%	-0.36%

Table A6. Fusion XRF results for Cl in OREAS 186 (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A BF*XRF	Lab B BF*XRF	Lab C BF*XRF	Lab D BF*XRF	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*XRF	Lab H BF*XRF	Lab I BF*XRF	Lab J BF*XRF	Lab K BF*XRF	Lab L BF*XRF	Lab N BF*XRF	Lab O BF*XRF	Lab P BF*XRF	Lab Q BF*XRF	Lab R BF*XRF
1	<b>80</b>	NR	NR	<50	<10	NR	NR	NR	NR	NR	<50	<50	NR	NR	<50	<50	NR
2	<b>&lt;50</b>	NR	NR	<50	<10	NR	NR	NR	NR	NR	<50	<50	NR	NR	<50	<50	NR
3	<b>280</b>	NR	NR	50	<10	NR	NR	NR	NR	NR	<50	<50	NR	NR	<50	<50	NR
4	<b>50</b>	NR	NR	50	10	NR	NR	NR	NR	NR	<50	<50	NR	NR	<50	<50	NR
5	<50	NR	NR	50	<b>160</b>	NR	NR	NR	NR	NR	<50	NR	NR	NR	NR	NR	NR
6	<50	NR	NR	50	<b>160</b>	NR	NR	NR	NR	NR	<50	NR	NR	NR	NR	NR	NR
7	<50	NR	NR	<50	<b>150</b>	NR	NR	NR	NR	NR	<50	NR	NR	NR	NR	NR	NR
8	<50	NR	NR	<50	<b>130</b>	NR	NR	NR	NR	NR	<50	NR	NR	NR	NR	NR	NR
9	<50	NR	NR	50	20	NR	NR	NR	NR	NR	<50	NR	NR	NR	NR	NR	NR
10	<50	NR	NR	<50	20	NR	NR	NR	NR	NR	<50	NR	NR	NR	NR	NR	NR
11	<50	NR	NR	<50	20	NR	NR	NR	NR	NR	<50	NR	NR	NR	NR	NR	NR
12	<50	NR	NR	50	60	NR	NR	NR	NR	NR	<50	NR	NR	NR	NR	NR	NR
Mean	137			50	81												
Median	80			50	60												
Std.Dev.	125			0	67												
Rel.Std.Dev.	91.49%			0.00%	83.04%												
PDM <sup>3</sup>	259%			31.58%	113%												

Table A7. Fusion XRF results for Cu in OREAS 186 (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A BF*XRF	Lab B BF*XRF	Lab C BF*XRF	Lab D BF*XRF	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*XRF	Lab H BF*XRF	Lab I BF*XRF	Lab J BF*XRF	Lab K BF*XRF	Lab L BF*XRF	Lab N BF*XRF	Lab O BF*XRF	Lab P BF*XRF	Lab Q BF*XRF	Lab R BF*XRF
1	70	38	<50	65	80	52	60	80	100	<100	50	80	NR	50	<100	42	NR
2	70	42	<50	65	70	53	70	60	100	<100	40	80	NR	50	<100	39	NR
3	60	30	<50	60	80	56	70	100	90	<100	30	70	NR	50	<100	49	NR
4	70	42	<50	65	100	54	80	80	100	<100	20	90	NR	50	<100	39	NR
5	60	40	<50	55	60	53	60	30	90	<100	20	70	NR	60	NR	NR	NR
6	70	43	<50	55	80	58	60	30	100	<100	30	80	NR	50	NR	NR	NR
7	60	40	<50	60	100	56	50	40	90	<100	30	80	NR	60	NR	NR	NR
8	70	<30	<50	55	80	54	60	30	100	<100	30	90	NR	60	NR	NR	NR
9	70	36	<50	65	80	54	50	60	60	<100	40	70	NR	70	NR	NR	NR
10	70	41	<50	60	90	56	70	40	<50	<100	50	80	NR	60	NR	NR	NR
11	70	41	<50	60	90	55	50	60	<50	<100	40	80	NR	60	NR	NR	NR
12	70	32	<50	65	100	53	50	70	<50	<100	40	70	NR	60	NR	NR	NR
Mean	68	38		61	84	54	61	57	92		35	78		57		42	
Median	70	40		60	80	54	60	60	100		35	80		60		41	
Std.Dev.	5	4		4	12	2	10	23	13		10	7		7		5	
Rel.Std.Dev.	6.70%	10.87%		6.86%	14.73%	3.16%	16.38%	40.75%	14.11%		28.57%	9.16%		11.49%		11.16%	
PDM <sup>3</sup>	11.38%	-36.62%		0.38%	38.88%	-10.26%	0.38%	-6.50%	52.17%		-42.25%	29.25%		-6.50%		-30.29%	

Table A8. Fusion XRF results for Cr<sub>2</sub>O<sub>3</sub> in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A BF*XRF	Lab B BF*XRF	Lab C BF*XRF	Lab D BF*XRF	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*XRF	Lab H BF*XRF	Lab I BF*XRF	Lab J BF*XRF	Lab K BF*XRF	Lab L BF*XRF	Lab N BF*XRF	Lab O BF*XRF	Lab P BF*XRF	Lab Q BF*XRF	Lab R BF*XRF
1	1.43	1.40	1.42	1.43	1.42	1.42	<b>2.10</b>	<b>1.48</b>	1.40	<b>1.51</b>	<b>1.39</b>	1.43	1.42	1.43	1.41	1.45	1.45
2	1.41	1.40	1.43	1.42	1.39	1.44	<b>2.06</b>	<b>1.48</b>	1.41	<b>1.50</b>	1.42	1.43	1.42	1.43	1.41	1.43	1.43
3	1.38	1.39	1.42	1.43	1.40	1.44	<b>2.10</b>	<b>1.48</b>	1.44	<b>1.50</b>	1.41	1.43	1.41	1.43	1.42	1.44	1.44
4	1.41	1.39	1.42	1.42	1.43	1.44	<b>2.10</b>	<b>1.47</b>	1.41	<b>1.51</b>	1.42	1.44	<b>1.39</b>	1.43	1.41	1.44	1.44
5	1.44	1.40	1.41	1.43	1.40	1.44	1.43	1.46	1.39	<b>1.49</b>	1.39	1.46	1.43	1.43	NR	NR	NR
6	1.41	1.39	1.41	1.43	1.43	1.44	1.43	1.46	1.41	<b>1.50</b>	1.40	1.45	1.43	1.43	NR	NR	NR
7	1.43	1.40	1.42	1.42	1.42	1.45	1.44	1.44	1.43	<b>1.47</b>	1.40	1.43	1.43	1.44	NR	NR	NR
8	1.43	1.40	1.42	1.43	1.39	1.43	1.44	1.45	1.38	<b>1.48</b>	1.42	1.40	1.44	1.43	NR	NR	NR
9	1.41	1.40	1.43	1.44	1.45	1.43	1.41	<b>1.48</b>	1.40	<b>1.53</b>	<b>1.37</b>	1.41	1.46	1.42	NR	NR	NR
10	1.40	1.39	1.42	1.43	1.42	1.44	1.40	<b>1.49</b>	1.40	<b>1.51</b>	1.40	1.44	1.44	1.42	NR	NR	NR
11	1.42	1.39	1.42	1.44	1.46	1.44	1.40	<b>1.47</b>	1.40	<b>1.60</b>	1.41	1.42	1.45	1.42	NR	NR	NR
12	1.41	1.40	1.42	1.43	1.38	1.43	1.39	<b>1.48</b>	1.40	<b>1.52</b>	1.41	1.40	1.44	1.42	NR	NR	NR
Mean	1.41	1.39	1.42	1.43	1.41	1.44	1.64	1.47	1.41	<b>1.51</b>	1.40	1.43	1.43	1.43	1.41	1.44	1.44
Median	1.41	1.40	1.42	1.43	1.42	1.44	1.44	1.48	1.40	1.51	1.40	1.43	1.43	1.43	1.41	1.44	1.44
Std.Dev.	0.02	0.00	0.01	0.01	0.02	0.01	0.33	0.01	0.02	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01
Rel.Std.Dev.	1.08%	0.35%	0.41%	0.49%	1.66%	0.45%	20.28%	1.00%	1.15%	2.22%	1.17%	1.30%	1.22%	0.46%	0.35%	0.52%	0.57%
PDM <sup>3</sup>	-0.75%	-2.06%	-0.27%	0.37%	-0.66%	0.99%	15.47%	3.29%	-1.22%	6.02%	-1.57%	0.37%	0.53%	0.39%	-0.75%	1.13%	1.19%

Table A9. Fusion XRF results for Fe<sub>2</sub>O<sub>3</sub> in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A BF*XRF	Lab B BF*XRF	Lab C BF*XRF	Lab D BF*XRF	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*XRF	Lab H BF*XRF	Lab I BF*XRF	Lab J BF*XRF	Lab K BF*XRF	Lab L BF*XRF	Lab N BF*XRF	Lab O BF*XRF	Lab P BF*XRF	Lab Q BF*XRF	Lab R BF*XRF
1	31.50	32.11	32.37	32.26	31.70	31.49	32.33	32.31	32.17	31.18	32.00	31.97	31.74	32.20	32.80	32.27	32.40
2	31.80	32.11	32.55	32.24	31.80	31.68	<b>31.72</b>	32.11	32.29	31.22	31.90	31.92	31.82	32.30	32.90	32.25	32.40
3	31.40	32.13	32.45	32.31	31.70	31.90	32.29	32.09	32.38	31.14	31.80	31.98	31.47	32.20	32.70	32.26	32.30
4	31.70	32.07	32.52	32.28	32.00	31.85	32.46	32.00	32.21	31.30	32.00	32.00	31.11	32.30	32.90	32.23	32.30
5	31.70	32.25	32.31	32.22	31.40	31.63	32.33	31.54	32.05	<b>30.79</b>	31.60	32.07	31.50	32.30	NR	NR	NR
6	31.80	32.15	32.36	32.27	31.50	32.11	32.34	31.81	32.03	<b>30.85</b>	31.70	32.11	31.57	32.00	NR	NR	NR
7	31.90	32.15	32.43	32.36	31.80	32.16	32.37	31.48	32.02	<b>30.62</b>	31.50	32.03	31.47	32.20	NR	NR	NR
8	32.00	32.20	32.44	32.22	31.60	31.71	32.33	31.70	32.01	<b>30.88</b>	31.70	31.90	31.77	32.20	NR	NR	NR
9	31.40	32.22	32.36	32.39	32.00	31.83	31.81	32.01	32.15	30.98	31.40	32.12	31.98	32.30	NR	NR	NR
10	31.40	32.24	32.45	32.29	31.80	31.98	31.83	32.38	32.25	31.36	31.30	32.20	31.91	32.30	NR	NR	NR
11	31.70	32.22	32.50	32.37	31.90	31.91	31.87	32.17	32.10	31.38	31.50	32.29	32.01	32.20	NR	NR	NR
12	31.70	32.24	32.53	32.38	31.90	31.70	31.50	32.12	32.22	31.33	31.50	32.07	31.81	32.20	NR	NR	NR
Mean	31.67	32.17	32.44	32.30	31.76	31.83	32.10	31.98	32.16	31.08	31.66	32.06	31.68	32.23	32.83	32.25	32.35
Median	31.70	32.17	32.45	32.29	31.80	31.84	32.31	32.05	32.16	31.16	31.65	32.05	31.76	32.20	32.85	32.25	32.35
Std.Dev.	0.20	0.06	0.08	0.06	0.19	0.20	0.33	0.29	0.12	0.25	0.23	0.11	0.26	0.09	0.10	0.02	0.06
Rel.Std.Dev.	0.64%	0.19%	0.24%	0.19%	0.59%	0.62%	1.02%	0.90%	0.37%	0.81%	0.73%	0.36%	0.83%	0.27%	0.29%	0.05%	0.18%
PDM <sup>3</sup>	-1.17%	0.40%	1.24%	0.80%	-0.88%	-0.66%	0.18%	-0.20%	0.36%	-2.99%	-1.20%	0.04%	-1.13%	0.57%	2.44%	0.66%	0.96%

Table A10. Fusion XRF results for K<sub>2</sub>O in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A BF*XRF	Lab B BF*XRF	Lab C BF*XRF	Lab D BF*XRF	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*XRF	Lab H BF*XRF	Lab I BF*XRF	Lab J BF*XRF	Lab K BF*XRF	Lab L BF*XRF	Lab N BF*XRF	Lab O BF*XRF	Lab P BF*XRF	Lab Q BF*XRF	Lab R BF*XRF
1	<0.01	<0.01	<0.01	0.002	<0.001	NR	<0.001	<0.01	0.010	<0.01	<0.01	<0.01	NR	0.010	<0.01	0.010	<0.01
2	<0.01	<0.01	<0.01	0.002	<0.001	NR	<0.001	<0.01	0.010	<0.01	<0.01	<0.01	NR	0.010	<0.01	0.005	<0.01
3	<0.01	<0.01	<0.01	0.002	<0.001	NR	<0.001	<0.01	<0.01	<0.01	<0.01	<0.01	NR	0.010	<0.01	0.004	<0.01
4	<0.01	<0.01	<0.01	0.002	<0.001	NR	<0.001	<0.01	0.010	<0.01	<0.01	<0.01	NR	0.010	<0.01	0.005	<0.01
5	<0.01	<0.01	<0.05	0.001	0.001	NR	<0.001	<0.01	0.010	<0.01	<0.01	<0.01	NR	0.010	NR	NR	NR
6	<0.01	<0.01	<0.05	0.001	0.002	NR	<0.001	<0.01	0.010	<0.01	<0.01	<0.01	NR	0.010	NR	NR	NR
7	<0.01	<0.01	<0.05	0.001	0.004	NR	<0.001	<0.01	0.010	<0.01	<0.01	<0.01	NR	0.010	NR	NR	NR
8	<0.01	<0.01	<0.05	0.001	0.003	NR	<0.001	<0.01	<0.01	<0.01	<0.01	<0.01	NR	0.010	NR	NR	NR
9	<0.01	<0.01	<0.01	0.003	<0.001	NR	<0.001	<0.01	0.010	<0.01	<0.01	<0.01	NR	0.010	NR	NR	NR
10	<0.01	<0.01	<0.01	0.003	<0.001	NR	<0.001	<0.01	0.010	<0.01	<0.01	<0.01	NR	0.010	NR	NR	NR
11	<0.01	<0.01	<0.01	0.002	<0.001	NR	<0.001	0.010	<0.01	<0.01	<0.01	<0.01	NR	0.010	NR	NR	NR
12	<0.01	<0.01	<0.01	0.002	<0.001	NR	<0.001	<0.01	<0.01	<0.01	<0.01	<0.01	NR	0.010	NR	NR	NR
Mean				0.002	0.003			0.010	0.010					0.010		0.006	
Median				0.002	0.003			0.010	0.010					0.010		0.005	
Std.Dev.				0.001	0.001				0.000					0.000		0.003	
Rel.Std.Dev.				39.15%	51.64%				0.00%					0.00%		46.99%	
PDM <sup>3</sup>																	

Table A11. Fusion XRF results for MgO in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A BF*XRF	Lab B BF*XRF	Lab C BF*XRF	Lab D BF*XRF	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*XRF	Lab H BF*XRF	Lab I BF*XRF	Lab J BF*XRF	Lab K BF*XRF	Lab L BF*XRF	Lab N BF*XRF	Lab O BF*XRF	Lab P BF*XRF	Lab Q BF*XRF	Lab R BF*XRF
1	4.82	4.86	4.89	4.91	4.81	<b>4.66</b>	<b>4.66</b>	5.02	4.96	4.94	4.85	4.88	4.92	4.96	4.88	4.85	4.89
2	4.82	4.86	4.87	4.92	4.83	<b>4.66</b>	<b>4.69</b>	4.98	4.94	4.94	4.84	4.88	4.92	4.95	4.88	4.84	4.89
3	4.77	4.87	4.88	4.90	4.80	<b>4.66</b>	<b>4.66</b>	4.97	4.88	4.94	4.87	4.89	4.94	4.96	4.89	4.86	4.87
4	4.83	4.89	4.90	4.91	4.82	<b>4.64</b>	<b>4.68</b>	5.01	4.90	4.96	4.85	4.90	4.92	4.94	4.85	4.87	4.86
5	4.82	4.92	4.88	4.91	4.81	<b>4.64</b>	4.85	4.96	4.91	4.83	4.81	4.91	4.93	4.97	NR	NR	NR
6	4.83	4.92	4.87	4.90	4.79	<b>4.68</b>	4.84	4.95	4.91	4.87	4.82	4.92	4.94	4.97	NR	NR	NR
7	4.84	4.91	4.86	4.91	4.79	<b>4.72</b>	4.87	4.95	4.92	4.84	4.89	4.93	4.90	4.96	NR	NR	NR
8	4.85	4.92	4.87	4.89	4.81	<b>4.65</b>	4.85	4.97	4.90	4.85	4.82	4.85	4.95	4.97	NR	NR	NR
9	4.80	4.95	4.86	4.92	5.01	<b>4.72</b>	4.80	4.94	4.89	4.80	4.80	4.88	5.04	4.95	NR	NR	NR
10	4.81	4.94	4.88	4.89	4.98	<b>4.67</b>	4.78	4.99	4.92	4.94	4.82	4.91	4.96	4.98	NR	NR	NR
11	4.85	4.94	4.85	4.89	5.02	<b>4.74</b>	4.79	4.99	4.90	4.84	4.80	4.88	5.04	4.98	NR	NR	NR
12	4.84	4.94	4.84	4.91	5.04	<b>4.69</b>	4.76	4.97	4.87	4.85	4.82	4.87	4.97	4.96	NR	NR	NR
Mean	4.82	4.91	4.87	4.91	4.88	<b>4.68</b>	4.77	4.98	4.91	4.88	4.83	4.89	4.95	4.96	4.88	4.86	4.88
Median	4.83	4.92	4.87	4.91	4.82	4.66	4.79	4.97	4.91	4.86	4.82	4.89	4.94	4.96	4.88	4.86	4.88
Std.Dev.	0.02	0.03	0.02	0.01	0.10	0.03	0.08	0.02	0.02	0.06	0.03	0.02	0.05	0.01	0.02	0.01	0.01
Rel.Std.Dev.	0.47%	0.66%	0.34%	0.22%	2.10%	0.72%	1.65%	0.49%	0.51%	1.16%	0.58%	0.47%	0.92%	0.24%	0.36%	0.29%	0.31%
PDM <sup>3</sup>	-1.33%	0.39%	-0.36%	0.34%	-0.25%	-4.34%	-2.44%	1.77%	0.41%	-0.11%	-1.14%	0.07%	1.28%	1.52%	-0.27%	-0.65%	-0.22%

Table A12. Fusion XRF results for MnO in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A BF*XRF	Lab B BF*XRF	Lab C BF*XRF	Lab D BF*XRF	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*XRF	Lab H BF*XRF	Lab I BF*XRF	Lab J BF*XRF	Lab K BF*XRF	Lab L BF*XRF	Lab N BF*XRF	Lab O BF*XRF	Lab P BF*XRF	Lab Q BF*XRF	Lab R BF*XRF
1	0.507	0.504	0.510	0.520	0.523	0.510	0.540	0.530	0.521	0.536	0.525	0.520	<b>0.485</b>	0.537	0.520	0.523	0.540
2	0.515	0.510	0.520	0.520	0.529	0.514	0.530	0.530	0.524	0.533	0.524	0.520	0.498	0.537	0.520	0.524	0.520
3	0.507	0.505	0.520	0.520	0.523	0.516	0.540	0.520	0.520	0.541	0.520	0.530	0.518	0.537	0.520	0.526	0.530
4	0.514	0.505	0.520	0.510	0.532	0.515	0.540	0.520	0.524	0.532	0.526	0.520	0.505	0.537	0.520	0.526	0.530
5	0.516	0.505	0.510	0.520	0.518	0.513	0.540	0.510	0.521	0.529	0.512	0.520	0.513	0.537	NR	NR	NR
6	0.520	0.505	0.510	0.520	0.518	0.520	0.540	0.520	0.525	0.531	0.517	0.520	0.518	0.538	NR	NR	NR
7	0.523	0.500	0.510	0.520	<b>0.528</b>	0.520	0.540	0.510	0.526	0.523	0.512	0.520	0.513	0.538	NR	NR	NR
8	0.523	0.505	0.520	0.520	0.521	0.512	0.540	0.510	0.520	0.532	0.515	0.520	0.520	0.538	NR	NR	NR
9	0.508	0.515	0.520	0.520	0.512	0.517	0.530	0.520	0.522	0.529	0.515	0.520	0.528	0.537	NR	NR	NR
10	0.510	0.515	0.510	0.520	0.514	0.520	0.530	0.520	0.523	0.548	0.513	0.520	0.528	0.538	NR	NR	NR
11	0.515	0.510	0.520	0.520	0.513	0.518	0.530	0.520	0.519	0.542	0.514	0.520	0.528	0.538	NR	NR	NR
12	0.516	0.513	0.510	0.520	<b>0.526</b>	0.511	0.520	0.520	0.518	0.532	0.519	0.520	0.526	0.536	NR	NR	NR
Mean	0.515	0.508	0.515	0.519	0.521	0.516	0.535	0.519	0.522	0.534	0.518	0.521	0.515	0.538	0.520	0.525	0.530
Median	0.515	0.505	0.515	0.520	0.522	0.516	0.540	0.520	0.522	0.532	0.516	0.520	0.518	0.537	0.520	0.525	0.530
Std.Dev.	0.006	0.005	0.005	0.003	0.007	0.004	0.007	0.007	0.003	0.007	0.005	0.003	0.013	0.001	0.000	0.001	0.008
Rel.Std.Dev.	1.10%	0.94%	1.01%	0.56%	1.26%	0.69%	1.26%	1.29%	0.48%	1.27%	0.98%	0.55%	2.57%	0.16%	0.00%	0.28%	1.54%
PDM <sup>3</sup>	-1.40%	-2.72%	-1.30%	-0.50%	-0.07%	-1.21%	2.53%	-0.50%	0.02%	2.34%	-0.79%	-0.19%	-1.31%	3.02%	-0.34%	0.56%	1.57%



Table A13. Fusion XRF results for Na<sub>2</sub>O in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A BF*XRF	Lab B BF*XRF	Lab C BF*XRF	Lab D BF*XRF	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*XRF	Lab H BF*XRF	Lab I BF*XRF	Lab J BF*XRF	Lab K BF*XRF	Lab L BF*XRF	Lab N BF*XRF	Lab O BF*XRF	Lab P BF*XRF	Lab Q BF*XRF	Lab R BF*XRF
1	0.033	0.020	<0.01	NR	0.032	NR	<0.01	0.020	<0.01	<0.1	0.008	<0.01	NR	0.010	<0.01	0.017	<0.01
2	0.042	0.020	<0.01	NR	0.036	NR	<0.01	0.010	<0.01	<0.1	0.005	<0.01	NR	0.010	<0.01	0.011	<0.01
3	0.041	0.020	0.010	NR	0.038	NR	<0.01	0.010	<0.01	<0.1	<0.005	<0.01	NR	0.010	<0.01	<0.01	<0.01
4	0.036	0.015	0.010	NR	0.039	NR	<0.01	0.020	<0.01	<0.1	0.007	<0.01	NR	0.010	<0.01	<0.01	<0.01
5	0.074	0.020	<0.05	NR	0.044	NR	<0.01	<0.01	<0.01	<0.1	<0.005	0.020	NR	0.010	NR	NR	NR
6	0.075	0.020	<0.05	NR	0.047	NR	<0.01	<0.01	<0.01	<0.1	<0.005	0.030	NR	0.010	NR	NR	NR
7	0.076	0.020	<0.05	NR	0.056	NR	<0.01	<0.01	<0.01	<0.1	0.007	0.030	NR	0.010	NR	NR	NR
8	0.078	0.020	0.010	NR	0.046	NR	<0.01	<0.01	<0.01	<0.1	<0.005	<0.01	NR	0.010	NR	NR	NR
9	0.073	0.020	<0.01	NR	0.088	NR	<0.01	0.020	<0.01	<0.1	0.006	<0.01	NR	0.020	NR	NR	NR
10	0.084	0.015	<0.01	NR	0.085	NR	<0.01	0.010	<0.01	<0.1	0.008	0.020	NR	0.020	NR	NR	NR
11	0.079	0.020	0.020	NR	0.082	NR	<0.01	0.030	<0.01	<0.1	<0.005	0.010	NR	0.020	NR	NR	NR
12	0.079	0.020	0.010	NR	0.065	NR	<0.01	<0.01	<0.01	<0.1	0.007	<0.01	NR	0.020	NR	NR	NR
Mean	0.064	0.019	0.012		0.055			0.017			0.007	0.022		0.013		0.014	
Median	0.075	0.020	0.010		0.047			0.020			0.007	0.020		0.010		0.014	
Std.Dev.	0.020	0.002	0.004		0.020			0.008			0.001	0.008		0.005		0.004	
Rel.Std.Dev.	30.63%	10.15%	37.27%		36.97%			44.10%			15.59%	38.03%		36.93%		28.68%	
PDM <sup>3</sup>	158%	-22.92%	-51.74%		120%			-31.06%			-72.42%	-11.53%		-46.38%		-42.49%	

Table A14. Fusion XRF results for P<sub>2</sub>O<sub>5</sub> in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A BF*XRF	Lab B BF*XRF	Lab C BF*XRF	Lab D BF*XRF	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*XRF	Lab H BF*XRF	Lab I BF*XRF	Lab J BF*XRF	Lab K BF*XRF	Lab L BF*XRF	Lab N BF*XRF	Lab O BF*XRF	Lab P BF*XRF	Lab Q BF*XRF	Lab R BF*XRF
1	0.010	0.010	0.012	0.011	0.007	NR	0.010	<0.01	0.010	<b>0.022</b>	0.008	0.010	NR	0.010	0.010	<b>0.005</b>	<0.01
2	0.011	0.010	0.010	0.011	0.008	NR	0.010	<0.01	0.010	<b>0.017</b>	0.008	0.010	NR	0.010	0.010	<b>0.007</b>	0.010
3	0.011	0.010	0.011	0.011	0.008	NR	0.010	0.010	0.010	<b>0.023</b>	0.008	0.010	NR	0.010	0.010	<b>0.008</b>	<0.01
4	0.011	0.010	0.011	0.010	0.008	NR	0.010	0.010	<b>0.020</b>	<b>0.023</b>	0.007	0.010	NR	0.010	0.010	<b>0.006</b>	0.010
5	0.011	0.010	0.009	0.011	0.009	NR	0.010	<0.01	<b>0.020</b>	<0.01	0.009	0.010	NR	0.010	NR	NR	NR
6	0.011	0.010	0.010	0.011	0.009	NR	0.010	<0.01	0.010	0.012	0.010	<0.01	NR	0.010	NR	NR	NR
7	0.011	0.005	0.009	0.011	0.010	NR	0.010	<0.01	0.010	0.011	0.010	0.010	NR	0.010	NR	NR	NR
8	<b>0.018</b>	0.010	0.008	0.012	0.010	NR	0.010	<0.01	0.010	0.010	0.009	<0.01	NR	0.010	NR	NR	NR
9	0.010	<b>0.005</b>	0.010	0.010	0.007	NR	0.010	<0.01	0.010	<0.01	0.008	<0.01	NR	0.010	NR	NR	NR
10	0.010	<b>0.010</b>	0.011	0.009	0.007	NR	0.010	<0.01	0.010	0.010	0.009	<0.01	NR	0.010	NR	NR	NR
11	0.010	<b>0.005</b>	0.010	0.009	0.007	NR	0.010	0.010	0.010	<0.01	0.008	<0.01	NR	0.010	NR	NR	NR
12	0.010	<b>0.005</b>	0.010	0.011	0.009	NR	0.010	0.010	0.010	<0.01	0.008	<0.01	NR	0.010	NR	NR	NR
Mean	0.011	0.008	0.010	0.011	0.008		0.010	0.010	0.012	0.016	0.009	0.010		0.010	0.010	0.007	0.010
Median	0.011	0.010	0.010	0.011	0.008		0.010	0.010	0.010	0.015	0.008	0.010		0.010	0.010	0.007	0.010
Std.Dev.	0.002	0.002	0.001	0.001	0.001		0.000	0.000	0.004	0.006	0.001	0.000		0.000	0.000	0.001	0.000
Rel.Std.Dev.	19.78%	29.54%	10.75%	8.51%	13.80%		0.00%	0.00%	33.36%	37.20%	10.64%	0.00%		0.00%	0.00%	20.38%	0.00%
PDM <sup>3</sup>	13.21%	-15.51%	2.23%	7.30%	-16.36%		1.39%	1.39%	18.28%	62.22%	-13.82%	1.39%		1.39%	1.39%	-33.85%	1.39%

Table A15. Fusion XRF results for SiO<sub>2</sub> in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A	Lab B	Lab C	Lab D	Lab E	Lab F	Lab G	Lab H	Lab I	Lab J	Lab K	Lab L	Lab N	Lab O	Lab P	Lab Q	Lab R
	BF*XRF	BF*XRF	BF*XRF	BF*XRF	BF*XRF	BF*XRF	BF*XRF	BF*XRF	BF*XRF	BF*XRF	BF*XRF	BF*XRF	BF*XRF	BF*XRF	BF*XRF	BF*XRF	BF*XRF
1	46.30	46.33	46.40	46.42	<b>45.50</b>	45.53	<b>47.29</b>	46.60	46.20	<b>45.32</b>	46.70	46.15	<b>45.40</b>	<b>47.10</b>	46.20	46.57	46.30
2	46.30	46.10	46.57	46.51	<b>45.40</b>	45.87	46.35	46.30	46.19	<b>45.14</b>	46.60	46.07	<b>46.12</b>	<b>46.90</b>	46.10	46.30	46.40
3	45.90	46.26	46.49	46.41	<b>45.50</b>	46.07	47.03	46.20	46.64	<b>45.52</b>	46.70	46.21	<b>44.06</b>	<b>47.20</b>	46.20	46.15	46.10
4	46.40	46.20	46.61	46.50	<b>45.50</b>	45.99	46.98	46.70	46.32	<b>45.81</b>	46.60	46.22	<b>44.52</b>	<b>47.00</b>	46.10	46.29	46.20
5	46.30	46.42	46.31	46.32	<b>45.60</b>	45.76	46.12	46.10	46.21	<b>45.10</b>	45.80	45.92	<b>45.19</b>	<b>47.00</b>	NR	NR	NR
6	46.40	46.36	46.34	46.38	<b>45.60</b>	46.20	46.04	46.10	46.25	<b>45.10</b>	46.00	46.12	<b>45.40</b>	<b>47.20</b>	NR	NR	NR
7	46.50	46.50	46.33	46.38	<b>45.40</b>	46.34	46.15	46.00	46.38	<b>45.03</b>	46.30	46.14	<b>45.09</b>	<b>47.20</b>	NR	NR	NR
8	46.50	46.58	46.65	46.35	<b>45.60</b>	45.81	46.01	46.00	46.33	<b>45.38</b>	46.00	46.55	<b>45.53</b>	<b>47.20</b>	NR	NR	NR
9	46.20	46.64	46.45	46.43	46.50	46.00	46.38	46.10	46.12	<b>44.93</b>	45.80	46.34	<b>45.56</b>	<b>47.00</b>	NR	NR	NR
10	46.20	46.78	46.46	46.43	46.20	46.03	46.32	46.60	46.28	<b>45.83</b>	46.10	46.49	<b>45.52</b>	<b>47.20</b>	NR	NR	NR
11	46.70	46.40	46.52	46.49	46.50	46.12	46.43	47.00	46.18	<b>45.32</b>	45.80	46.43	<b>45.69</b>	<b>47.10</b>	NR	NR	NR
12	46.50	46.58	46.40	46.42	46.30	45.72	46.02	46.20	46.34	<b>45.54</b>	45.90	46.36	<b>45.48</b>	<b>47.00</b>	NR	NR	NR
Mean	46.35	46.43	46.46	46.42	45.80	45.95	46.43	46.33	46.29	<b>45.33</b>	46.19	46.25	<b>45.30</b>	<b>47.09</b>	46.15	46.33	46.25
Median	46.35	46.41	46.46	46.42	45.60	46.00	46.34	46.20	46.27	45.32	46.05	46.22	45.44	47.10	46.15	46.30	46.25
Std.Dev.	0.20	0.20	0.11	0.06	0.44	0.23	0.44	0.32	0.14	0.29	0.37	0.19	0.54	0.11	0.06	0.18	0.13
Rel.Std.Dev.	0.44%	0.42%	0.24%	0.13%	0.95%	0.49%	0.94%	0.70%	0.29%	0.65%	0.80%	0.40%	1.20%	0.23%	0.13%	0.38%	0.28%
PDM <sup>3</sup>	0.12%	0.29%	0.36%	0.27%	-1.07%	-0.74%	0.29%	0.07%	-0.02%	-2.07%	-0.22%	-0.09%	-2.15%	1.72%	-0.31%	0.07%	-0.09%

Table A16. Fusion XRF results for SO<sub>3</sub> in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A BF*XRF	Lab B BF*XRF	Lab C BF*XRF	Lab D BF*XRF	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*XRF	Lab H BF*XRF	Lab I BF*XRF	Lab J BF*XRF	Lab K BF*XRF	Lab L BF*XRF	Lab N BF*XRF	Lab O BF*XRF	Lab P BF*XRF	Lab Q BF*XRF	Lab R BF*XRF
1	0.008	<0.01	0.007	0.007	<0.001	NR	0.001	<0.002	NR	NR	0.007	NR	NR	NR	0.010	<0.002	NR
2	0.011	<0.01	0.006	0.007	<0.001	NR	0.001	<0.002	NR	NR	0.007	NR	NR	NR	<0.01	<0.002	NR
3	0.011	<0.01	0.005	0.008	<0.001	NR	<0.001	<0.002	NR	NR	0.009	NR	NR	NR	0.020	<0.002	NR
4	0.010	<0.01	0.005	0.006	<0.001	NR	0.002	<0.002	NR	NR	0.010	NR	NR	NR	0.010	<0.002	NR
5	0.010	0.005	0.006	0.007	<0.001	NR	0.001	<0.002	NR	NR	0.007	NR	NR	NR	NR	NR	NR
6	0.009	<0.01	0.005	0.008	<0.001	NR	0.002	<0.002	NR	NR	0.008	NR	NR	NR	NR	NR	NR
7	0.008	<0.01	0.005	0.009	<0.001	NR	<0.001	<0.002	NR	NR	0.010	NR	NR	NR	NR	NR	NR
8	0.013	<0.01	0.005	0.008	<0.001	NR	0.001	<0.002	NR	NR	0.007	NR	NR	NR	NR	NR	NR
9	0.016	<0.01	0.006	0.006	0.016	NR	0.005	<0.002	NR	NR	0.008	NR	NR	NR	NR	NR	NR
10	0.013	<0.01	0.008	0.007	0.016	NR	0.005	<0.002	NR	NR	0.009	NR	NR	NR	NR	NR	NR
11	0.011	<0.01	0.008	0.006	0.014	NR	0.006	<0.002	NR	NR	0.007	NR	NR	NR	NR	NR	NR
12	0.013	<0.01	0.008	0.007	0.033	NR	0.004	<0.002	NR	NR	0.006	NR	NR	NR	NR	NR	NR
Mean	0.011	0.005	0.006	0.007	0.020		0.003				0.008				0.013		
Median	0.011	0.005	0.006	0.007	0.016		0.002				0.008				0.010		
Std.Dev.	0.002		0.001	0.001	0.009		0.002				0.001				0.006		
Rel.Std.Dev.	21.23%		20.55%	13.08%	44.98%		71.03%				16.56%				43.30%		
PDM <sup>3</sup>	45.11%	-34.54%	-19.26%	-6.17%	158%		-63.34%				3.65%				74.56%		

Table A17. Fusion XRF results for TiO<sub>2</sub> in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A BF*XRF	Lab B BF*XRF	Lab C BF*XRF	Lab D BF*XRF	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*XRF	Lab H BF*XRF	Lab I BF*XRF	Lab J BF*XRF	Lab K BF*XRF	Lab L BF*XRF	Lab N BF*XRF	Lab O BF*XRF	Lab P BF*XRF	Lab Q BF*XRF	Lab R BF*XRF
1	<b>0.090</b>	0.070	0.070	0.068	0.060	NR	0.070	0.070	0.070	0.075	0.070	0.070	NR	<b>0.050</b>	0.070	0.069	0.070
2	<b>0.080</b>	0.070	0.070	0.067	0.070	NR	0.070	0.070	0.070	0.065	0.070	0.070	NR	<b>0.050</b>	0.070	0.059	0.060
3	<b>0.080</b>	0.070	0.070	0.069	0.070	NR	0.070	0.070	0.070	0.075	0.080	0.070	NR	<b>0.060</b>	0.070	0.053	0.070
4	<b>0.070</b>	0.070	0.070	0.068	0.070	NR	0.070	<b>0.100</b>	0.070	0.066	0.070	0.070	NR	<b>0.060</b>	0.070	0.066	0.070
5	<b>0.080</b>	0.080	0.070	0.067	0.060	NR	0.070	<b>0.110</b>	0.070	0.069	0.080	0.080	NR	<b>0.050</b>	NR	NR	NR
6	<b>0.080</b>	0.070	0.070	0.068	0.060	NR	0.070	<b>0.090</b>	0.070	0.066	0.060	0.080	NR	<b>0.050</b>	NR	NR	NR
7	<b>0.080</b>	0.070	0.060	0.070	0.070	NR	0.070	<b>0.110</b>	0.070	0.069	<b>0.100</b>	0.080	NR	<b>0.050</b>	NR	NR	NR
8	<b>0.080</b>	0.075	0.060	0.069	0.060	NR	0.070	<b>0.100</b>	0.070	0.065	0.070	0.070	NR	<b>0.060</b>	NR	NR	NR
9	0.080	0.070	0.060	0.068	0.060	NR	0.070	0.080	0.070	0.072	<b>0.090</b>	0.070	NR	<b>0.060</b>	NR	NR	NR
10	0.080	0.070	0.060	0.066	<b>0.090</b>	NR	0.070	0.060	0.070	0.068	<b>0.100</b>	0.070	NR	<b>0.060</b>	NR	NR	NR
11	0.070	0.075	0.060	0.068	0.070	NR	0.070	0.080	0.070	0.072	<b>0.070</b>	0.070	NR	<b>0.060</b>	NR	NR	NR
12	0.080	0.070	0.070	0.067	0.060	NR	0.070	0.060	0.070	0.076	<b>0.080</b>	0.070	NR	<b>0.060</b>	NR	NR	NR
Mean	0.079	0.072	0.066	0.068	0.067		0.070	0.083	0.070	0.070	0.078	0.073		<b>0.056</b>	0.070	0.062	0.068
Median	0.080	0.070	0.070	0.068	0.065		0.070	0.080	0.070	0.069	0.075	0.070		0.060	0.070	0.062	0.070
Std.Dev.	0.005	0.003	0.005	0.001	0.009		0.000	0.018	0.000	0.004	0.013	0.005		0.005	0.000	0.007	0.005
Rel.Std.Dev.	6.50%	4.54%	7.82%	1.60%	13.31%		0.00%	21.91%	0.00%	5.82%	16.18%	6.24%		9.22%	0.00%	11.85%	7.41%
PDM <sup>3</sup>	14.23%	3.40%	-5.01%	-2.01%	-3.81%		1.00%	20.24%	1.00%	0.76%	13.02%	4.61%		-19.44%	1.00%	-11.16%	-2.61%

Table A18. Fusion XRF results for Zn in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A BF*XRF	Lab B BF*XRF	Lab C BF*XRF	Lab D BF*XRF	Lab E BF*XRF	Lab F BF*XRF	Lab G BF*XRF	Lab H BF*XRF	Lab I BF*XRF	Lab J BF*XRF	Lab K BF*XRF	Lab L BF*XRF	Lab N BF*XRF	Lab O BF*XRF	Lab P BF*XRF	Lab Q BF*XRF	Lab R BF*XRF
1	240	262	270	270	310	273	220	270	280	260	250	330	NR	290	<b>200</b>	249	NR
2	250	253	270	270	300	279	240	270	280	270	240	320	NR	290	<b>200</b>	252	NR
3	240	258	260	275	310	279	240	280	270	260	230	320	NR	280	<b>200</b>	263	NR
4	250	268	260	270	320	279	200	280	280	260	240	320	NR	280	<b>200</b>	264	NR
5	250	261	260	260	290	278	220	270	280	250	240	250	NR	300	NR	NR	NR
6	260	265	270	260	300	284	250	270	270	250	240	250	NR	290	NR	NR	NR
7	260	263	270	270	310	284	250	260	280	240	230	240	NR	290	NR	NR	NR
8	260	270	250	260	290	278	240	260	<b>170</b>	250	250	230	NR	300	NR	NR	NR
9	230	256	270	270	290	279	210	280	280	250	250	240	NR	290	NR	NR	NR
10	240	260	260	265	300	280	210	280	280	250	240	240	NR	290	NR	NR	NR
11	240	258	270	265	300	280	200	280	270	260	250	240	NR	290	NR	NR	NR
12	240	257	280	270	<b>330</b>	276	<b>170</b>	290	280	240	250	240	NR	280	NR	NR	NR
Mean	247	261	266	267	304	279	221	274	268	253	243	268		289	<b>200</b>	257	
Median	245	260	270	270	300	279	220	275	280	250	240	245		290	200	258	
Std.Dev.	10	5	8	5	12	3	24	9	31	9	8	40		7	0	8	
Rel.Std.Dev.	3.99%	1.86%	2.98%	1.86%	4.08%	1.01%	11.00%	3.28%	11.66%	3.50%	3.11%	15.06%		2.31%	0.00%	2.96%	
PDM <sup>3</sup>	-6.88%	-1.58%	0.36%	0.83%	14.83%	5.32%	-16.63%	3.51%	1.30%	-4.36%	-8.45%	1.30%		9.17%	-24.49%	-2.97%	

Table A19. Results for LOI at 1000°C in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A LOI	Lab B LOI	Lab C LOI	Lab D LOI	Lab E LOI	Lab F LOI	Lab G LOI	Lab H LOI	Lab I LOI	Lab J LOI	Lab K LOI	Lab L LOI	Lab M LOI	Lab O LOI	Lab P LOI	Lab Q LOI	Lab R LOI
1	6.60	7.20	6.68	6.71	6.74	7.36	NR	6.71	6.33	<b>9.04</b>	6.98	7.00	<b>8.80</b>	6.36	6.94	7.11	6.21
2	6.65	7.14	6.69	6.68	6.66	7.27	NR	6.69	6.31	<b>9.31</b>	7.10	7.00	<b>8.98</b>	6.32	7.03	7.18	6.32
3	6.63	7.17	6.63	6.68	6.75	<b>7.09</b>	NR	6.62	6.27	<b>9.16</b>	7.10	7.10	<b>8.61</b>	6.25	7.02	7.18	6.11
4	6.65	7.16	6.61	6.73	<b>6.33</b>	7.28	NR	6.71	6.16	<b>8.60</b>	7.08	7.10	<b>9.11</b>	6.21	6.95	7.25	6.63
5	6.62	7.21	6.69	6.86	7.00	<b>7.95</b>	6.91	<b>7.61</b>	6.39	<b>9.01</b>	<b>8.38</b>	7.10	7.01	6.20	NR	NR	NR
6	6.61	7.22	6.65	6.87	6.97	<b>8.24</b>	6.84	6.72	6.42	<b>9.01</b>	<b>8.07</b>	7.20	7.07	6.22	NR	NR	NR
7	6.56	7.23	6.74	6.81	6.80	<b>7.88</b>	6.82	6.80	6.39	<b>8.98</b>	<b>7.87</b>	7.00	7.15	6.18	NR	NR	NR
8	6.61	7.23	6.70	6.84	6.85	<b>8.01</b>	6.98	6.80	6.44	<b>8.84</b>	<b>8.08</b>	7.00	7.21	6.16	NR	NR	NR
9	6.78	7.32	6.73	6.72	6.40	<b>8.09</b>	6.91	6.92	6.32	<b>9.08</b>	<b>8.69</b>	6.70	<b>8.86</b>	6.16	NR	NR	NR
10	6.76	7.37	6.82	6.70	6.88	<b>7.91</b>	6.99	6.86	6.25	<b>9.21</b>	<b>8.39</b>	6.70	<b>8.93</b>	6.06	NR	NR	NR
11	6.82	7.34	6.82	6.73	6.45	<b>7.83</b>	7.00	6.89	6.37	<b>9.32</b>	<b>8.59</b>	6.70	<b>9.01</b>	6.11	NR	NR	NR
12	6.82	7.37	6.83	6.72	6.76	<b>8.00</b>	6.93	6.83	6.10	<b>9.05</b>	<b>8.34</b>	6.80	<b>8.80</b>	6.13	NR	NR	NR
Mean	6.68	7.25	6.72	6.75	6.72	7.74	6.92	6.85	6.31	9.05	7.89	6.95	8.30	6.20	6.99	7.18	6.32
Median	6.64	7.22	6.70	6.73	6.76	7.89	6.92	6.80	6.33	9.04	8.08	7.00	8.80	6.19	6.99	7.18	6.27
Std.Dev.	0.09	0.08	0.07	0.07	0.22	0.38	0.07	0.26	0.10	0.20	0.65	0.18	0.88	0.08	0.05	0.06	0.23
Rel.Std.Dev.	1.38%	1.13%	1.11%	1.04%	3.25%	4.95%	0.97%	3.75%	1.64%	2.19%	8.22%	2.57%	10.66%	1.37%	0.67%	0.79%	3.57%
PDM <sup>3</sup>	-2.24%	6.10%	-1.66%	-1.10%	-1.66%	13.37%	1.37%	0.26%	-7.56%	32.53%	15.52%	1.77%	21.48%	-9.26%	2.28%	5.15%	-7.49%

Table A20. Fusion ICP results for Ni in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A PF*OES	Lab C PF*OES	Lab D PF*OES	Lab E PF*OES	Lab G MAR*OES	Lab H BF*OES	Lab I PF*ICP	Lab J BF*OES	Lab M PF*OES	Lab O PF*OES	Lab P PF*OES	Lab S PF*OES
1	1.21	1.26	1.19	1.20	1.23	1.21	1.25	1.23	1.27	1.22	1.14	1.22
2	1.21	1.27	1.21	1.20	1.23	1.20	1.25	1.25	1.22	1.24	1.13	1.25
3	1.22	1.24	1.20	1.18	1.20	1.20	1.24	<b>1.13</b>	1.24	1.23	1.20	1.18
4	1.20	1.27	1.20	1.24	1.23	1.21	1.24	1.25	1.24	1.22	1.19	1.19
5	1.19	1.25	1.14	1.21	1.22	1.20	<b>1.29</b>	1.20	1.26	1.23	NR	NR
6	1.19	1.24	1.16	1.22	1.21	1.22	<b>1.30</b>	1.23	<b>1.30</b>	1.23	NR	NR
7	1.20	1.28	1.15	1.24	1.22	1.20	<b>1.28</b>	<b>0.91</b>	1.25	1.24	NR	NR
8	1.20	<b>1.33</b>	1.15	1.26	1.21	1.22	<b>1.31</b>	1.16	1.26	1.23	NR	NR
9	1.20	1.29	1.18	<b>1.15</b>	1.21	1.17	1.25	1.29	1.25	1.22	NR	NR
10	1.20	1.27	1.19	1.21	1.19	1.18	1.27	1.22	1.28	1.20	NR	NR
11	1.20	1.24	1.23	1.23	1.24	1.17	1.25	<b>0.96</b>	1.25	1.23	NR	NR
12	1.20	1.27	1.21	1.22	1.22	1.18	1.25	1.28	1.25	1.22	NR	NR
Mean	1.20	1.27	1.18	1.21	1.22	1.20	1.27	1.18	1.26	1.22	1.17	1.21
Median	1.20	1.27	1.19	1.22	1.22	1.20	1.25	1.23	1.25	1.23	1.17	1.20
Std.Dev.	0.01	0.02	0.03	0.03	0.01	0.02	0.02	0.12	0.02	0.01	0.04	0.03
Rel.Std.Dev.	0.68%	1.91%	2.40%	2.40%	1.17%	1.46%	1.92%	10.46%	1.66%	0.91%	3.01%	2.59%
PDM <sup>3</sup>	-1.47%	4.08%	-2.73%	-0.51%	0.04%	-1.76%	3.91%	-3.37%	3.18%	0.45%	-4.31%	-0.79%



Table A21. Fusion ICP results for Co in OREAS 186 (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*OES	Lab C PF*OES	Lab D PF*OES	Lab E PF*OES	Lab G MAR*OES	Lab H BF*OES	Lab I PF*ICP	Lab J BF*OES	Lab M PF*OES	Lab O PF*OES	Lab P PF*OES	Lab S PF*OES
1	640	645	700	650	679	650	710	778	639	670	623	707
2	650	646	680	650	681	670	700	744	634	680	625	722
3	640	656	680	630	672	700	<b>670</b>	762	630	680	637	693
4	640	670	680	670	675	680	700	756	657	680	632	693
5	660	706	640	700	677	710	690	706	670	690	NR	NR
6	670	706	660	710	685	670	710	709	690	690	NR	NR
7	710	705	660	700	685	720	710	686	664	690	NR	NR
8	680	<b>750</b>	680	740	690	660	720	730	673	690	NR	NR
9	650	740	700	600	704	640	650	746	662	690	NR	NR
10	640	732	720	630	697	660	660	725	676	670	NR	NR
11	650	750	720	680	700	<b>470</b>	630	718	647	690	NR	NR
12	660	769	720	590	698	640	630	724	655	680	NR	NR
Mean	658	706	687	663	687	656	682	732	658	683	629	704
Median	650	706	680	660	685	665	695	728	660	685	629	700
Std.Dev.	21	43	26	46	11	64	32	26	18	8	6	14
Rel.Std.Dev.	3.19%	6.16%	3.79%	6.91%	1.56%	9.76%	4.76%	3.59%	2.75%	1.14%	1.02%	1.98%
PDM <sup>3</sup>	-3.28%	3.89%	1.01%	-2.55%	1.05%	-3.53%	0.27%	7.68%	-3.21%	0.52%	-7.44%	3.52%

Table A22. Fusion ICP results for Al<sub>2</sub>O<sub>3</sub> in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A	Lab C	Lab D	Lab E	Lab G	Lab H	Lab I	Lab J	Lab M	Lab O	Lab P	Lab S
	PF*OES	PF*OES	PF*OES	PF*OES	MAR*OES	BF*OES	PF*ICP	BF*OES	PF*OES	PF*OES	PF*OES	PF*OES
1	4.99	5.17	4.89	4.99	5.41	5.24	5.28	5.10	5.19	5.07	4.95	5.15
2	4.99	5.21	4.91	5.05	5.51	5.20	5.28	5.13	5.36	4.96	4.83	5.25
3	4.98	5.11	4.91	4.91	5.27	5.24	5.19	5.16	5.53	4.96	4.84	5.06
4	4.97	5.26	4.99	5.14	5.37	5.22	5.31	5.20	5.18	5.01	4.93	5.08
5	5.19	5.15	4.93	5.17	5.25	5.19	<b>5.35</b>	4.87	5.26	5.14	NR	NR
6	5.16	5.00	4.91	5.26	5.19	5.21	5.13	4.99	5.30	5.12	NR	NR
7	5.16	5.04	4.87	5.28	5.26	5.22	5.20	4.84	5.23	5.15	NR	NR
8	5.16	5.20	4.80	5.22	5.29	5.22	5.13	4.97	5.26	5.14	NR	NR
9	5.01	5.24	4.91	4.90	5.30	5.07	5.44	5.18	5.22	5.01	NR	NR
10	5.02	5.29	<b>4.72</b>	5.16	5.16	5.05	4.93	4.94	5.13	5.00	NR	NR
11	5.02	5.30	4.91	5.52	5.03	5.06	5.40	5.26	5.15	5.02	NR	NR
12	5.03	5.29	4.87	4.92	5.01	<b>5.20</b>	5.21	5.13	5.22	5.02	NR	NR
Mean	5.06	5.19	4.89	5.13	5.25	5.18	5.24	5.06	5.25	5.05	4.89	5.14
Median	5.02	5.21	4.91	5.15	5.27	5.21	5.25	5.11	5.23	5.02	4.89	5.11
Std.Dev.	0.08	0.10	0.07	0.18	0.14	0.07	0.14	0.14	0.11	0.07	0.06	0.09
Rel.Std.Dev.	1.66%	1.90%	1.40%	3.59%	2.75%	1.39%	2.64%	2.71%	2.04%	1.40%	1.25%	1.70%
PDM <sup>3</sup>	-1.04%	1.54%	-4.40%	0.33%	2.83%	1.31%	2.50%	-0.89%	2.78%	-1.17%	-4.35%	0.50%

Table A23. Fusion ICP results for CaO in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A PF*OES	Lab C PF*OES	Lab D PF*OES	Lab E PF*OES	Lab G MAR*OES	Lab H BF*OES	Lab I PF*ICP	Lab J BF*OES	Lab M PF*OES	Lab O PF*OES	Lab P PF*OES	Lab S PF*OES
1	0.630	0.610	0.600	0.480	0.580	0.560	0.580	0.580	<b>0.484</b>	0.560	0.500	<b>0.668</b>
2	0.570	0.610	0.600	0.510	0.590	0.560	0.590	0.593	<b>0.473</b>	0.570	0.500	<b>0.667</b>
3	0.620	0.590	0.600	0.490	0.570	0.570	0.590	0.598	<b>0.470</b>	0.610	0.500	<b>0.664</b>
4	0.690	0.590	<b>0.700</b>	0.510	0.580	0.560	0.580	<b>0.650</b>	<b>0.501</b>	0.520	0.500	<b>0.659</b>
5	<b>0.740</b>	0.550	0.600	0.530	0.570	0.560	0.590	0.575	0.554	<b>0.460</b>	NR	NR
6	0.690	0.560	0.600	0.520	0.570	0.560	0.580	<b>0.674</b>	0.517	0.550	NR	NR
7	0.580	0.570	<b>0.400</b>	0.570	0.560	0.550	0.580	0.571	0.517	0.540	NR	NR
8	0.580	0.590	0.600	0.540	0.570	0.560	0.580	0.577	0.517	0.550	NR	NR
9	0.560	0.570	0.600	<b>0.430</b>	0.570	0.550	0.590	0.610	<b>0.475</b>	0.560	NR	NR
10	0.590	0.580	0.600	<b>0.480</b>	0.570	0.550	0.550	0.589	<b>0.486</b>	0.620	NR	NR
11	0.640	0.580	0.600	<b>0.530</b>	0.560	0.560	0.590	0.620	<b>0.475</b>	0.510	NR	NR
12	0.670	0.570	0.600	<b>0.450</b>	0.560	0.570	0.590	0.604	<b>0.465</b>	0.560	NR	NR
Mean	0.630	0.581	0.592	0.503	0.571	0.559	0.583	0.603	0.494	0.551	0.500	0.664
Median	0.625	0.580	0.600	0.510	0.570	0.560	0.585	0.596	0.485	0.555	0.500	0.665
Std.Dev.	0.057	0.018	0.067	0.039	0.009	0.007	0.011	0.032	0.027	0.043	0.000	0.004
Rel.Std.Dev.	9.11%	3.15%	11.30%	7.83%	1.58%	1.20%	1.95%	5.22%	5.45%	7.72%	0.00%	0.65%
PDM <sup>3</sup>	11.61%	2.90%	4.82%	-10.83%	1.13%	-0.94%	3.20%	6.90%	-12.41%	-2.41%	-11.42%	17.72%

Table A24. Fusion ICP results for Cu in OREAS 186 (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*OES	Lab C PF*OES	Lab D PF*OES	Lab E PF*OES	Lab G MAR*OES	Lab H BF*OES	Lab I PF*ICP	Lab J BF*OES	Lab M PF*OES	Lab O PF*OES	Lab P PF*OES	Lab S PF*OES
1	<50	70	50	50	<50	60	<50	50	63	50	55	60
2	<50	66	100	50	<50	60	<50	63	62	50	56	62
3	<50	62	50	50	80	80	<50	60	69	50	49	76
4	<50	62	100	50	<50	60	<50	37	59	50	80	60
5	<50	51	50	60	50	80	<50	22	53	50	NR	NR
6	<50	45	100	60	50	70	<50	19	59	50	NR	NR
7	<50	46	50	60	50	80	<50	27	57	60	NR	NR
8	<50	47	50	60	50	70	<50	31	59	50	NR	NR
9	<50	59	50	60	60	50	60	32	54	60	NR	NR
10	<50	54	<50	60	60	60	<50	30	56	60	NR	NR
11	<50	63	<50	70	60	40	<50	32	64	80	NR	NR
12	<50	56	<50	60	60	50	<50	31	56	50	NR	NR
Mean		57	67	58	58	63	60	36	59	55	60	65
Median		58	50	60	60	60	60	31	59	50	56	61
Std.Dev.		8	25	6	10	13		14	5	9	14	7
Rel.Std.Dev.		14.55%	37.50%	10.81%	16.82%	20.57%		38.95%	7.87%	16.45%	22.81%	11.41%
PDM <sup>3</sup>		-0.94%	16.37%	0.37%	0.86%	10.55%	4.74%	-37.00%	3.25%	-3.99%	4.74%	12.85%

Table A25. Fusion ICP results for Cr<sub>2</sub>O<sub>3</sub> in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A PF*OES	Lab C PF*OES	Lab D PF*OES	Lab E PF*OES	Lab G MAR*OES	Lab H BF*OES	Lab I PF*ICP	Lab J BF*OES	Lab M PF*OES	Lab O PF*OES	Lab P PF*OES	Lab S PF*OES
1	1.37	1.46	1.46	1.30	1.40	1.39	1.39	1.45	1.38	1.40	1.38	1.46
2	1.36	1.50	1.45	1.32	1.43	1.40	1.39	1.43	1.29	1.42	1.33	1.48
3	1.37	1.46	1.45	1.30	1.37	1.40	1.37	1.44	1.27	1.43	1.35	1.43
4	1.34	1.50	1.45	<b>1.37</b>	1.40	1.40	1.39	1.44	1.37	1.43	1.44	1.43
5	1.45	1.40	1.37	1.33	1.41	1.36	<b>1.58</b>	1.41	1.42	1.43	NR	NR
6	1.45	1.40	1.35	1.35	1.42	1.38	<b>1.59</b>	1.43	1.42	1.40	NR	NR
7	1.43	1.41	1.33	1.37	1.40	<b>1.42</b>	<b>1.58</b>	1.39	1.43	1.43	NR	NR
8	1.43	<b>1.48</b>	1.32	1.36	1.42	1.37	<b>1.60</b>	1.42	1.44	1.45	NR	NR
9	1.40	1.50	1.37	1.33	1.40	1.41	1.50	1.48	1.40	1.42	NR	NR
10	1.40	1.50	<b>1.32</b>	1.40	1.39	1.39	1.52	<b>1.34</b>	1.39	1.40	NR	NR
11	1.40	1.47	1.36	1.49	1.41	1.39	1.50	1.50	1.41	1.43	NR	NR
12	1.40	1.53	1.36	1.32	1.39	1.37	1.49	1.47	1.38	1.42	NR	NR
Mean	1.40	1.47	1.38	1.35	1.40	1.39	1.49	1.43	1.38	1.42	1.38	1.45
Median	1.40	1.47	1.37	1.34	1.40	1.39	1.50	1.44	1.40	1.43	1.37	1.45
Std.Dev.	0.035	0.043	0.054	0.053	0.016	0.017	0.087	0.042	0.053	0.014	0.048	0.027
Rel.Std.Dev.	2.53%	2.93%	3.94%	3.89%	1.13%	1.23%	5.85%	2.90%	3.81%	1.01%	3.49%	1.83%
PDM <sup>3</sup>	-0.69%	4.14%	-1.94%	-4.00%	-0.35%	-1.37%	5.81%	1.65%	-1.80%	0.91%	-2.47%	2.87%

Table A26. Fusion ICP results for Fe<sub>2</sub>O<sub>3</sub> in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A	Lab C	Lab D	Lab E	Lab G	Lab H	Lab I	Lab J	Lab M	Lab O	Lab P	Lab S
	PF*OES	PF*OES	PF*OES	PF*OES	MAR*OES	BF*OES	PF*ICP	BF*OES	PF*OES	PF*OES	PF*OES	PF*OES
1	30.90	33.43	31.50	31.60	31.70	32.54	30.86	33.77	31.99	32.40	29.40	33.35
2	31.00	33.51	31.60	31.70	32.45	32.63	31.20	33.69	31.13	32.50	29.50	<b>34.42</b>
3	31.00	32.87	31.60	31.30	32.39	32.58	31.90	33.38	30.85	32.70	29.30	32.80
4	30.80	33.67	32.00	<b>33.00</b>	32.08	32.71	31.43	33.70	31.97	32.40	30.10	32.76
5	31.30	31.66	31.50	30.00	32.01	32.31	31.48	30.69	33.03	32.50	NR	NR
6	31.30	31.50	31.00	30.40	32.12	32.68	<b>32.85</b>	31.14	32.84	32.50	NR	NR
7	31.30	32.07	30.20	30.70	32.53	32.46	30.98	30.54	33.26	32.70	NR	NR
8	31.40	<b>33.22</b>	30.90	31.10	32.38	32.61	31.00	31.19	32.93	32.60	NR	NR
9	30.00	<b>35.20</b>	31.00	29.70	31.38	32.48	31.79	31.41	31.20	32.20	NR	NR
10	29.80	<b>34.94</b>	31.70	31.20	31.60	32.81	30.89	<b>30.25</b>	31.37	31.80	NR	NR
11	29.80	<b>34.35</b>	32.50	<b>33.70</b>	31.47	33.01	32.26	31.91	31.19	32.50	NR	NR
12	29.80	<b>34.82</b>	32.50	30.00	31.58	32.48	31.90	31.35	31.10	32.20	NR	NR
Mean	30.70	33.44	31.50	31.20	31.97	32.61	31.55	31.92	31.91	32.42	29.58	33.33
Median	30.95	33.47	31.55	31.15	32.05	32.60	31.46	31.38	31.67	32.50	29.45	33.07
Std.Dev.	0.66	1.25	0.66	1.20	0.41	0.18	0.62	1.34	0.89	0.25	0.36	0.77
Rel.Std.Dev.	2.13%	3.75%	2.11%	3.86%	1.29%	0.56%	1.95%	4.21%	2.79%	0.78%	1.22%	2.32%
PDM <sup>3</sup>	-3.20%	5.43%	-0.68%	-1.63%	0.81%	2.81%	-0.54%	0.64%	0.60%	2.21%	-6.75%	5.10%

Table A27. Fusion ICP results for K<sub>2</sub>O in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A PF*OES	Lab C PF*OES	Lab D PF*OES	Lab E PF*OES	Lab G MAR*OES	Lab H BF*OES	Lab I PF*ICP	Lab J BF*OES	Lab M PF*OES	Lab O PF*OES	Lab P PF*OES	Lab S PF*OES
1	<0.1	<0.1	<0.02	<0.1	0.010	<0.01	<0.01	<0.1	<0.01	0.120	<0.2	0.078
2	<0.1	<0.1	<0.02	<0.1	0.010	<0.01	<0.01	<0.1	0.019	<0.1	<0.2	0.078
3	<0.1	<0.1	<0.02	<0.1	0.010	<0.01	<0.01	<0.1	0.026	<0.1	<0.2	0.090
4	<0.1	<0.1	<0.02	<0.1	0.010	<0.01	<0.01	<0.1	<0.01	0.120	<0.2	0.077
5	<0.1	0.100	0.100	<0.1	0.010	<0.01	<0.01	<0.1	<0.01	<0.1	NR	NR
6	<0.1	0.100	0.100	<0.1	0.020	<0.01	<0.01	<0.1	<0.01	0.120	NR	NR
7	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	<0.1	<0.01	0.120	NR	NR
8	<0.1	0.100	<0.1	<0.1	0.010	<0.01	<0.01	<0.1	<0.01	0.120	NR	NR
9	0.100	0.217	<0.1	<0.1	0.020	<0.01	<0.01	0.143	<0.01	0.120	NR	NR
10	0.100	0.205	<0.1	<0.1	<0.01	<0.01	<0.01	0.101	<0.01	0.120	NR	NR
11	0.100	0.265	<0.1	<0.1	0.010	<0.01	<0.01	<0.1	<0.01	0.120	NR	NR
12	0.100	0.217	<0.1	<0.1	0.010	<0.01	<0.01	0.133	<0.01	0.120	NR	NR
Mean	0.100	0.172	0.100		0.012			0.126	0.023	0.120		0.081
Median	0.100	0.205	0.100		0.010			0.133	0.023	0.120		0.078
Std.Dev.	0.000	0.070	0.000		0.004			0.022	0.005	0.000		0.006
Rel.Std.Dev.	0.00%	40.64%	0.00%		35.14%			17.46%	21.52%	0.00%		7.88%
PDM <sup>3</sup>	-4.30%	64.53%	-4.30%		-88.52%			20.26%	-78.41%	15.28%		-22.64%

Table A28. Fusion ICP results for MgO in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A PF*OES	Lab C PF*OES	Lab D PF*OES	Lab E PF*OES	Lab G MAR*OES	Lab H BF*OES	Lab I PF*ICP	Lab J BF*OES	Lab M PF*OES	Lab O PF*OES	Lab P PF*OES	Lab S PF*OES
1	<b>4.44</b>	4.80	4.59	4.77	4.95	5.02	4.81	<b>5.09</b>	4.66	4.73	4.64	4.96
2	<b>4.48</b>	4.86	4.64	4.77	5.07	5.00	4.82	<b>5.18</b>	4.84	4.70	4.72	<b>5.16</b>
3	<b>4.46</b>	4.77	4.64	4.72	4.83	5.00	4.82	<b>5.22</b>	4.97	4.72	4.56	4.99
4	<b>4.45</b>	4.90	4.69	<b>4.95</b>	4.97	5.01	4.83	<b>5.18</b>	4.65	4.70	4.58	4.91
5	4.86	5.03	4.89	4.55	4.96	4.87	4.91	5.07	4.77	4.79	NR	NR
6	4.85	4.99	4.79	4.64	4.81	4.92	<b>4.57</b>	5.12	4.80	4.76	NR	NR
7	4.85	5.14	4.56	4.65	4.88	4.90	4.89	5.00	4.69	4.80	NR	NR
8	4.83	<b>5.34</b>	4.68	4.82	4.88	4.92	4.83	5.12	4.82	4.81	NR	NR
9	4.73	<b>5.24</b>	4.48	4.55	4.82	4.80	4.84	<b>5.28</b>	4.75	4.71	NR	NR
10	4.71	<b>5.19</b>	4.51	4.80	4.83	4.84	<b>4.51</b>	<b>5.06</b>	4.70	4.66	NR	NR
11	4.73	<b>5.07</b>	4.59	5.18	4.77	4.83	4.83	<b>5.33</b>	4.75	4.72	NR	NR
12	4.70	<b>5.19</b>	4.74	4.65	4.79	4.90	4.89	<b>5.27</b>	4.77	4.67	NR	NR
Mean	4.67	5.04	4.65	4.75	4.88	4.92	4.80	5.16	4.76	4.73	4.63	5.01
Median	4.72	5.05	4.64	4.75	4.86	4.91	4.83	5.15	4.76	4.72	4.61	4.98
Std.Dev.	0.17	0.18	0.12	0.18	0.09	0.08	0.12	0.10	0.09	0.05	0.07	0.11
Rel.Std.Dev.	3.63%	3.64%	2.53%	3.73%	1.85%	1.54%	2.59%	1.95%	1.88%	1.04%	1.55%	2.10%
PDM <sup>3</sup>	-3.11%	4.54%	-3.62%	-1.46%	1.15%	1.93%	-0.59%	6.95%	-1.25%	-1.94%	-4.13%	3.76%



Table A29. Fusion ICP results for MnO in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A PF*OES	Lab C PF*OES	Lab D PF*OES	Lab E PF*OES	Lab G MAR*OES	Lab H BF*OES	Lab I PF*ICP	Lab J BF*OES	Lab M PF*OES	Lab O PF*OES	Lab P PF*OES	Lab S PF*OES
1	0.490	0.523	0.506	0.500	0.520	0.520	0.524	0.517	0.507	0.530	0.497	0.538
2	0.490	0.532	0.498	0.500	0.530	0.510	0.534	0.521	0.489	0.530	0.478	<b>0.555</b>
3	0.490	0.525	0.506	0.500	0.510	0.510	0.524	0.528	0.482	0.530	0.484	0.530
4	0.490	0.536	0.512	0.530	0.520	0.510	0.526	0.535	0.499	0.530	0.490	0.530
5	0.520	0.522	0.506	0.490	0.530	0.510	0.537	0.509	0.542	0.530	NR	NR
6	0.530	0.514	0.504	0.500	0.540	0.520	0.545	0.524	0.540	0.540	NR	NR
7	0.520	0.518	0.508	0.490	0.540	0.520	0.523	0.503	0.537	0.540	NR	NR
8	0.520	<b>0.542</b>	0.504	0.500	0.550	0.520	0.519	0.518	0.538	0.530	NR	NR
9	0.500	0.565	0.516	0.480	0.530	0.510	0.542	0.557	0.530	0.530	NR	NR
10	0.490	0.558	0.498	0.510	0.530	0.510	0.518	0.536	0.530	0.520	NR	NR
11	0.500	0.553	0.512	0.540	0.510	0.520	0.542	0.559	0.532	0.540	NR	NR
12	0.500	0.564	0.508	0.490	0.520	0.510	0.531	0.542	0.526	0.530	NR	NR
Mean	0.503	0.538	0.507	0.503	0.528	0.514	0.530	0.529	0.521	0.532	0.487	0.538
Median	0.500	0.534	0.506	0.500	0.530	0.510	0.529	0.526	0.530	0.530	0.487	0.534
Std.Dev.	0.015	0.018	0.005	0.017	0.012	0.005	0.009	0.018	0.021	0.006	0.008	0.012
Rel.Std.Dev.	2.98%	3.41%	1.05%	3.41%	2.30%	1.00%	1.78%	3.31%	4.07%	1.09%	1.67%	2.17%
PDM <sup>3</sup>	-2.95%	3.66%	-2.34%	-3.11%	1.71%	-0.86%	2.28%	2.02%	0.47%	2.52%	-6.05%	3.78%

Table A30. Fusion ICP results for Na<sub>2</sub>O in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A PF*OES	Lab C PF*OES	Lab D PF*OES	Lab E PF*OES	Lab G MAR*OES	Lab H BF*OES	Lab I PF*ICP	Lab J BF*OES	Lab M PF*OES	Lab O PF*OES	Lab P PF*OES	Lab S PF*OES
1	NR	NR	NR	NR	<0.01	<0.01	<0.01	<0.01	0.005	NR	NR	NR
2	NR	NR	NR	NR	0.010	<0.01	<0.01	<0.01	0.005	NR	NR	NR
3	NR	NR	NR	NR	0.010	<0.01	<0.01	<0.01	0.005	NR	NR	NR
4	NR	NR	NR	NR	0.010	<0.01	<0.01	0.071	0.005	NR	NR	NR
5	NR	NR	NR	NR	0.010	<0.01	<0.01	<0.01	0.009	NR	NR	NR
6	NR	NR	NR	NR	0.010	<0.01	<0.01	<0.01	0.004	NR	NR	NR
7	NR	NR	NR	NR	0.010	<0.01	<0.01	<0.01	0.005	NR	NR	NR
8	NR	NR	NR	NR	0.010	<0.01	<0.01	<0.01	0.005	NR	NR	NR
9	NR	NR	NR	NR	<0.01	<0.01	<0.01	<0.01	0.006	NR	NR	NR
10	NR	NR	NR	NR	0.010	<0.01	<0.01	<0.01	0.005	NR	NR	NR
11	NR	NR	NR	NR	<0.01	<0.01	<0.01	0.012	0.005	NR	NR	NR
12	NR	NR	NR	NR	<0.01	<0.01	<0.01	<0.01	0.006	NR	NR	NR
Mean					0.010			0.042	0.006			
Median					0.010			0.042	0.005			
Std.Dev.					0.000			0.042	0.001			
Rel.Std.Dev.					0.00%			100%	19.50%			
PDM <sup>3</sup>					8.66%			350%	-39.05%			

Table A31. Fusion ICP results for P<sub>2</sub>O<sub>5</sub> in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A PF*OES	Lab C PF*OES	Lab D PF*OES	Lab E PF*OES	Lab G MAR*OES	Lab H BF*OES	Lab I PF*ICP	Lab J BF*OES	Lab M PF*OES	Lab O PF*OES	Lab P PF*OES	Lab S PF*OES
1	NR	<0.03	<0.02	<0.02	0.020	<0.01	<0.01	<0.01	0.017	NR	NR	0.012
2	NR	<0.03	0.020	<0.02	0.010	0.020	<0.01	<0.01	0.028	NR	NR	0.013
3	NR	<0.03	<0.02	<0.02	0.010	0.010	0.020	<0.01	0.025	NR	NR	0.006
4	NR	<0.03	<0.02	<0.02	0.010	<0.01	0.010	<0.01	0.033	NR	NR	0.007
5	NR	<0.03	<0.02	<0.02	0.010	<0.01	<0.01	<0.01	0.007	NR	NR	NR
6	NR	<0.03	0.020	0.020	0.010	<0.01	<0.01	<0.01	0.007	NR	NR	NR
7	NR	0.030	<0.02	0.020	0.020	0.010	0.020	<0.01	0.009	NR	NR	NR
8	NR	<0.03	<0.02	<0.02	0.010	<0.01	0.030	<0.01	<0.01	NR	NR	NR
9	NR	<0.03	0.020	0.020	0.020	0.020	0.010	<0.01	0.007	NR	NR	NR
10	NR	<0.03	0.020	<0.02	0.030	<0.01	<0.01	<0.01	<0.01	NR	NR	NR
11	NR	<0.03	0.040	0.020	0.020	<0.01	0.010	<0.01	<0.01	NR	NR	NR
12	NR	<0.03	0.020	0.020	0.020	<0.01	0.010	<0.01	<0.01	NR	NR	NR
Mean		0.030	0.023	0.020	0.016	0.015	0.016		0.017			0.010
Median		0.030	0.020	0.020	0.015	0.015	0.010		0.013			0.010
Std.Dev.			0.008	0.000	0.007	0.006	0.008		0.011			0.004
Rel.Std.Dev.			34.99%	0.00%	42.22%	38.49%	50.07%		64.65%			36.97%
PDM <sup>3</sup>		64.36%	27.84%	9.58%	-13.25%	-17.82%	-13.90%		-8.86%			-47.95%

Table A32. Fusion ICP results for SiO<sub>2</sub> in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A	Lab C	Lab D	Lab E	Lab G	Lab H	Lab I	Lab J	Lab M	Lab O	Lab P	Lab S
	PF*OES	PF*OES	PF*OES	PF*OES	MAR*OES	BF*OES	PF*ICP	BF*OES	PF*OES	PF*OES	PF*OES	PF*OES
1	45.90	46.60	45.30	43.50	47.19	46.05	46.77	45.88	45.26	46.70	<b>44.20</b>	48.50
2	45.50	46.50	44.90	43.70	47.61	46.05	47.01	46.37	46.00	46.10	<b>42.80</b>	49.32
3	45.20	46.50	44.90	<b>42.60</b>	46.96	46.12	46.86	46.81	46.41	46.30	<b>43.20</b>	47.58
4	44.50	47.00	45.10	45.10	46.58	45.94	47.08	46.81	44.87	46.50	<b>43.20</b>	47.24
5	45.50	46.70	<b>42.80</b>	45.10	46.91	45.66	46.94	45.24	46.34	47.20	NR	NR
6	44.90	46.40	<b>44.30</b>	45.90	46.40	46.08	46.08	46.92	46.40	47.40	NR	NR
7	47.90	46.80	<b>43.00</b>	46.80	46.65	46.18	47.28	44.77	46.09	47.80	NR	NR
8	47.00	<b>48.40</b>	<b>42.80</b>	47.70	47.33	46.07	46.70	45.60	46.30	47.40	NR	NR
9	<b>42.80</b>	<b>54.80</b>	<b>42.10</b>	<b>41.00</b>	45.26	46.36	47.69	<b>49.67</b>	45.79	44.90	NR	NR
10	<b>42.80</b>	<b>54.60</b>	<b>42.80</b>	<b>43.20</b>	45.15	46.03	<b>43.49</b>	<b>48.42</b>	45.61	44.70	NR	NR
11	<b>42.00</b>	<b>53.70</b>	<b>43.60</b>	<b>47.00</b>	44.27	45.85	47.63	<b>50.64</b>	45.57	45.00	NR	NR
12	<b>41.60</b>	<b>54.30</b>	<b>43.60</b>	<b>42.00</b>	44.70	46.20	48.02	<b>49.34</b>	45.89	45.10	NR	NR
Mean	44.63	49.36	43.77	44.47	46.25	46.05	46.80	47.21	45.88	46.26	43.35	48.16
Median	45.05	46.90	43.60	44.40	46.62	46.06	46.98	46.81	45.95	46.40	43.20	48.04
Std.Dev.	1.97	3.73	1.10	2.13	1.11	0.18	1.16	1.89	0.48	1.10	0.60	0.94
Rel.Std.Dev.	4.41%	7.56%	2.50%	4.79%	2.41%	0.39%	2.48%	3.99%	1.05%	2.38%	1.38%	1.95%
PDM <sup>3</sup>	-3.47%	6.75%	-5.35%	-3.83%	0.02%	-0.41%	1.20%	2.09%	-0.78%	0.04%	-6.25%	4.15%

Table A33. Fusion ICP results for SO<sub>3</sub> in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A PF*OES	Lab C PF*OES	Lab D PF*OES	Lab E PF*OES	Lab G MAR*OES	Lab H BF*OES	Lab I PF*ICP	Lab J BF*OES	Lab M PF*OES	Lab O PF*OES	Lab P PF*OES	Lab S PF*OES
1	<0.02	<0.05	<b>&lt;0.1</b>	<0.02	<0.01	NR	NR	NR	NR	0.050	0.025	NR
2	<0.02	<0.05	<b>&lt;0.1</b>	<0.02	<0.01	NR	NR	NR	NR	0.050	0.050	NR
3	<0.02	<0.05	<b>&lt;0.1</b>	<0.02	<0.01	NR	NR	NR	NR	0.025	0.025	NR
4	<0.02	<0.05	<b>0.100</b>	<0.02	<0.01	NR	NR	NR	NR	0.050	<0.01	NR
5	<0.02	<0.05	<0.02	0.020	NR	NR	NR	NR	NR	0.025	NR	NR
6	0.020	<0.05	<0.02	<0.02	NR	NR	NR	NR	NR	0.050	NR	NR
7	0.020	<0.05	<0.02	<0.02	NR	NR	NR	NR	NR	0.050	NR	NR
8	<0.02	<0.05	<0.02	<0.02	NR	NR	NR	NR	NR	0.050	NR	NR
9	<0.02	<0.05	0.040	0.050	0.025	NR	NR	NR	NR	0.075	NR	NR
10	0.020	<0.05	0.020	0.020	0.025	NR	NR	NR	NR	<0.01	NR	NR
11	<0.02	<0.05	<b>0.080</b>	0.020	0.025	NR	NR	NR	NR	<b>0.100</b>	NR	NR
12	<0.02	<0.05	0.040	0.020	0.025	NR	NR	NR	NR	0.025	NR	NR
Mean	0.020		0.056	0.026	0.025					0.050	0.033	
Median	0.020		0.040	0.020	0.025					0.050	0.025	
Std.Dev.	0.000		0.033	0.013	0.000					0.022	0.014	
Rel.Std.Dev.	0.00%		58.68%	51.60%	0.00%					44.72%	43.30%	
PDM <sup>3</sup>	-34.26%		84.07%	-14.54%	-17.93%					64.15%	9.43%	

Table A34. Fusion ICP results for TiO<sub>2</sub> in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A PF*OES	Lab C PF*OES	Lab D PF*OES	Lab E PF*OES	Lab G MAR*OES	Lab H BF*OES	Lab I PF*ICP	Lab J BF*OES	Lab M PF*OES	Lab O PF*OES	Lab P PF*OES	Lab S PF*OES
1	<b>0.010</b>	0.070	0.070	<b>0.060</b>	0.072	0.070	0.068	<b>0.058</b>	<b>0.065</b>	0.070	<b>0.060</b>	0.072
2	<b>0.030</b>	0.070	0.070	<b>0.060</b>	0.073	0.070	0.068	<b>0.060</b>	<b>0.061</b>	0.070	<b>0.060</b>	0.075
3	<b>0.010</b>	<b>0.060</b>	0.070	<b>0.060</b>	0.071	0.070	0.068	<b>0.062</b>	<b>0.061</b>	0.070	<b>0.060</b>	0.073
4	<b>&lt;0.01</b>	0.070	0.070	<b>0.060</b>	0.071	0.070	0.069	<b>0.064</b>	<b>0.063</b>	0.070	<b>0.060</b>	0.071
5	<b>&lt;0.01</b>	0.070	0.070	<b>0.060</b>	0.071	0.070	0.071	0.067	0.069	0.070	NR	NR
6	<b>&lt;0.01</b>	0.070	0.070	<b>0.060</b>	0.070	0.070	0.069	0.068	0.070	0.070	NR	NR
7	<b>0.060</b>	0.070	0.070	0.070	0.071	0.070	0.069	0.067	0.067	0.070	NR	NR
8	<b>0.040</b>	0.070	0.070	0.070	0.070	0.070	0.068	0.069	0.068	0.070	NR	NR
9	<b>0.020</b>	0.070	0.070	<b>0.060</b>	0.073	0.070	0.070	0.074	0.068	0.070	NR	NR
10	<b>0.010</b>	0.070	0.070	<b>0.060</b>	0.071	0.070	0.065	0.069	0.069	0.070	NR	NR
11	<b>&lt;0.01</b>	0.070	0.070	<b>0.070</b>	0.071	0.070	0.069	0.076	0.067	0.070	NR	NR
12	<b>&lt;0.01</b>	0.070	0.070	<b>0.060</b>	0.070	0.070	0.067	0.073	0.069	0.070	NR	NR
Mean	<b>0.026</b>	0.069	0.070	0.063	0.071	0.070	0.068	0.067	0.066	0.070	0.060	0.073
Median	0.020	0.070	0.070	0.060	0.071	0.070	0.069	0.068	0.067	0.070	0.060	0.073
Std.Dev.	0.019	0.003	0.000	0.005	0.001	0.000	0.002	0.006	0.003	0.000	0.000	0.002
Rel.Std.Dev.	73.98%	4.17%	0.00%	7.24%	1.45%	0.00%	2.20%	8.25%	4.62%	0.00%	0.00%	2.49%
PDM <sup>3</sup>	-63.32%	-1.34%	-0.15%	-10.85%	1.51%	-0.15%	-2.41%	-4.07%	-5.54%	-0.15%	-14.41%	4.12%

Table A35. Fusion ICP results for Zn in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A	Lab C	Lab D	Lab E	Lab G	Lab H	Lab I	Lab J	Lab M	Lab O	Lab P	Lab S
	PF*OES	PF*OES	PF*OES	PF*OES	MAR*OES	BF*OES	PF*ICP	BF*OES	PF*OES	PF*OES	PF*OES	PF*OES
1	300	259	300	300	<b>130</b>	NR	300	268	230	300	<b>123</b>	NR
2	300	267	250	300	<b>130</b>	NR	200	264	211	300	<b>126</b>	NR
3	300	261	250	300	<b>170</b>	NR	200	262	233	300	<b>95</b>	NR
4	300	295	300	300	<b>140</b>	NR	300	<b>330</b>	216	300	<b>131</b>	NR
5	300	289	300	300	<b>180</b>	NR	300	254	<b>161</b>	300	NR	NR
6	300	269	300	300	<b>160</b>	NR	200	259	<b>140</b>	300	NR	NR
7	300	275	250	300	<b>160</b>	NR	300	246	<b>140</b>	300	NR	NR
8	300	284	300	300	<b>170</b>	NR	300	260	<b>140</b>	300	NR	NR
9	300	280	300	200	<b>150</b>	NR	300	266	233	300	NR	NR
10	300	274	300	300	<b>140</b>	NR	200	253	238	300	NR	NR
11	300	271	300	300	<b>150</b>	NR	300	259	248	300	NR	NR
12	300	275	350	200	<b>140</b>	NR	300	261	247	300	NR	NR
Mean	300	275	292	283	152		267	265	203	300	119	
Median	300	275	300	300	150		300	261	223	300	125	
Std.Dev.	0	11	29	39	16		49	21	44	0	16	
Rel.Std.Dev.	0.00%	3.91%	9.90%	13.74%	10.83%		18.46%	7.97%	21.82%	0.00%	13.62%	
PDM <sup>3</sup>	8.70%	-0.39%	5.68%	2.66%	-45.05%		-3.38%	-3.91%	-26.42%	8.70%	-56.97%	

Table A36. Results for C in OREAS 186 (abbreviations as in Table A1; values in wt. %).

Replicate No.	Lab A IRC	Lab C IRC	Lab D IRC	Lab E IRC	Lab H IRC	Lab I IRC	Lab J IRC	Lab K IRC	Lab L IRC	Lab M IRC	Lab O IRC
1	0.070	<b>0.150</b>	0.060	0.030	0.070	0.020	0.089	0.040	0.090	0.072	0.060
2	0.070	0.090	0.060	0.030	0.070	0.060	0.096	0.050	0.090	0.071	0.060
3	0.070	0.080	0.060	0.030	0.070	0.030	0.085	0.040	0.090	0.059	0.060
4	0.060	0.070	0.070	0.040	0.090	0.040	<b>0.126</b>	0.040	0.080	0.060	0.050
5	0.050	0.080	0.060	0.040	0.090	0.120	<b>0.134</b>	0.050	0.090	0.060	0.060
6	0.060	0.100	0.060	0.050	0.090	0.100	<b>0.130</b>	0.050	0.080	0.061	0.060
7	0.060	0.060	0.060	0.050	0.090	0.070	<b>0.104</b>	0.050	0.090	0.070	0.060
8	0.060	0.070	0.060	0.050	0.090	0.060	<b>0.084</b>	0.060	0.090	0.062	0.060
9	0.080	0.090	0.040	0.050	0.100	0.100	<b>0.127</b>	0.050	0.080	0.069	0.050
10	0.060	0.070	0.050	0.060	0.100	0.090	<b>0.130</b>	0.050	0.090	0.064	0.040
11	0.060	0.080	0.040	0.060	0.110	0.060	<b>0.158</b>	0.050	0.070	0.061	0.070
12	0.070	0.070	0.040	0.050	0.080	0.070	<b>0.118</b>	0.050	0.070	0.062	0.050
Mean	0.064	0.084	0.055	0.045	0.088	0.068	0.115	0.048	0.084	0.064	0.057
Median	0.060	0.080	0.060	0.050	0.090	0.065	0.122	0.050	0.090	0.062	0.060
Std.Dev.	0.008	0.024	0.010	0.011	0.013	0.030	0.023	0.006	0.008	0.005	0.008
Rel.Std.Dev.	12.36%	27.96%	18.18%	24.16%	14.72%	44.05%	20.21%	11.95%	9.42%	7.36%	13.74%
PDM <sup>3</sup>	-4.84%	24.82%	-18.43%	-33.26%	29.76%	1.34%	70.67%	-28.32%	24.82%	-4.52%	-15.96%



Table A37. Results for S in OREAS 186 (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A IRC	Lab C IRC	Lab D IRC	Lab E IRC	Lab H IRC	Lab I IRC	Lab J IRC	Lab K IRC	Lab L IRC	Lab M IRC	Lab O IRC
1	<0.01	<0.005	<0.01	<0.01	<0.02	<0.01	0.020	<0.01	<0.01	<0.003	<0.01
2	0.010	<0.005	<0.01	<0.01	<0.02	<0.01	0.020	<0.01	<0.01	0.005	<0.01
3	0.010	<0.005	<0.01	0.010	<0.02	<0.01	0.020	<0.01	<0.01	0.006	<0.01
4	0.010	<0.005	<0.01	<0.01	0.020	<0.01	0.030	<0.01	<0.01	<0.003	<0.01
5	<0.01	0.021	<0.01	0.020	<0.02	<0.01	0.020	0.010	<0.01	0.006	<0.01
6	<0.01	0.021	<0.01	0.010	<0.02	<0.01	0.020	<0.01	<0.01	0.004	<0.01
7	0.010	0.016	<0.01	<0.01	<0.02	<0.01	0.020	<0.01	<0.01	0.003	0.010
8	<0.01	0.020	<0.01	0.010	<0.02	<0.01	0.010	<0.01	<0.01	0.006	<0.01
9	<0.01	<0.005	<0.01	<0.01	<0.02	<0.01	0.010	<0.01	<0.01	0.007	<0.01
10	<0.01	<0.005	<0.01	<0.01	<0.02	<0.01	0.010	<0.01	<0.01	0.007	<0.01
11	<0.01	<0.005	<0.01	<0.01	<0.02	<0.01	0.020	<0.01	<0.01	0.013	<0.01
12	<0.01	<0.005	<0.01	0.010	<0.02	<0.01	0.020	<0.01	<0.01	0.007	<0.01
Mean	0.010	0.020		0.012	0.020		0.018	0.010		0.007	0.010
Median	0.010	0.021		0.010	0.020		0.020	0.010		0.006	0.010
Std.Dev.	0.000	0.002		0.004			0.006			0.003	
Rel.Std.Dev.	0.00%	12.21%		37.27%			31.49%			38.39%	
PDM <sup>3</sup>	-23.36%	49.45%		-8.03%	53.29%		40.51%	-23.36%		-49.19%	-23.36%