

**CERTIFICATE OF ANALYSIS FOR**

**URANIUM-BEARING**

**CERTIFIED REFERENCE MATERIAL**

**OREAS 101a**

**Certified Values for Key Analytes of OREAS 101a.**

Constituent	Certified Values	
	Fusion	4 Acid
Uranium, U (ppm)	422	410
Thorium, Th (ppm)	36.6	35.1
Cerium, Ce (ppm)	1396	1390
Lanthanum, La (ppm)	816	807

Note: Full list of certified elements shown in Table 1 below.

**Table 1. Certified Values, SD's, 95% Confidence and Tolerance Limits for OREAS 101a.**

Constituent	Certified Value	SD	95% Confidence Limits		95% Tolerance Limits	
			Low	High	Low	High
<b>Fusion</b>						
Cerium, Ce (ppm)	1396	131	1311	1481	1357	1435
Cobalt, Co (ppm)	48.8	4.4	46.3	51.2	47.7	49.9
Copper, Cu (ppm)	434	35	407	462	427	442
Dysprosium, Dy (ppm)	33.3	2.3	32.0	34.7	32.1	34.5
Ersium, Er (ppm)	19.5	1.6	18.6	20.5	18.8	20.2
Europium, Eu (ppm)	8.06	0.72	7.65	8.47	7.83	8.29
Iron, Fe (wt.%)	11.06	0.33	11.03	11.10	10.86	11.27
Gadolinium, Gd (ppm)	43.4	5.9	39.9	46.9	41.8	45.0
Holmium, Ho (ppm)	6.46	0.52	6.34	6.59	6.31	6.61
Potassium, K (ppm)	2.34	0.13	2.26	2.42	2.29	2.40
Lanthanum, La (ppm)	816	62	789	843	789	842
Lutetium, Lu (ppm)	2.66	0.19	2.52	2.80	2.61	2.71
Magnesium, Mg (wt.%)	1.23	0.055	1.20	1.25	1.21	1.24
Manganese, Mn (ppm)	964	46	949	978	943	984
Molybdenum, Mo (ppm)	21.9	1.5	21.2	22.5	20.7	23.0
Neodymium, Nd (ppm)	403	40	379	427	388	419
Phosphorous, P (ppm)	1268	126	1201	1335	1234	1302
Praseodymium, Pr (ppm)	134	11.5	127	141	129	139
Samarium, Sm (ppm)	48.8	3.8	47.8	49.9	47.0	50.7
Terbium, Tb (ppm)	5.92	0.71	5.42	6.42	5.68	6.16
Thorium, Th (ppm)	36.6	2.5	35.0	38.3	36.1	37.2
Titanium, Ti (wt.%)	0.395	0.021	0.386	0.404	0.390	0.400
Thulium, Tm (ppm)	2.90	0.22	2.75	3.06	2.78	3.02
Uranium, U (ppm)	422	29	402	441	412	431
Vanadium, V (ppm)	83	9.5	77	89	79	86
Yttrium, Y (ppm)	183	8	178	187	179	187
Ytterbium, Yb (ppm)	17.5	1.7	16.8	18.3	16.9	18.2
<b>4 Acid</b>						
Cerium, Ce (ppm)	1390	110	1304	1476	1345	1435
Cobalt, Co (ppm)	46.9	2.7	45.4	48.4	45.1	48.7
Copper, Cu (ppm)	418	31.20	407	430	411	426
Dysprosium, Dy (ppm)	28.2	3.6	25.2	31.3	27.1	29.4
Ersium, Er (ppm)	16.2	2.0	14.5	17.9	15.5	16.9
Europium, Eu (ppm)	8.4	0.60	7.9	8.9	8.0	8.7
Iron, Fe (wt.%)	10.7	0.83	10.2	11.3	10.4	11.1
Gadolinium, Gd (ppm)	42	5.99	37	47	41	43
Holmium, Ho (ppm)	5.2	0.51	4.8	5.7	5.1	5.4
Potassium, K (ppm)	2.20	0.15	2.12	2.28	2.15	2.26
Lanthanum, La (ppm)	807	67.50	767	846	781	832
Lutetium, Lu (ppm)	1.99	0.23	1.83	2.15	1.90	2.08

Note: intervals may appear asymmetric due to rounding.

Table 1 continued.

Constituent	Certified Value	SD	95% Confidence Limits		95% Tolerance Limits	
			Low	High	Low	High
<b>4 Acid continued</b>						
Magnesium, Mg (wt.%)	1.20	0.07	1.16	1.24	1.18	1.21
Manganese, Mn (ppm)	977	15	948	1006	956	997
Molybdenum, Mo (ppm)	20.4	0.6	19.5	21.2	19.7	21.0
Neodymium, Nd (ppm)	397	11	374	420	380	414
Nickel, Ni (ppm)	8.14	0.28	7.21	9.07	7.55	8.73
Phosphorous, P (ppm)	1159	20	1114	1204	1145	1173
Lead, Pb (ppm)	23	1.0	20	26	21	24
Praseodymium, Pr (ppm)	131	4	122	141	125	137
Samarium, Sm (ppm)	49	1.8	46	53	47	52
Terbium, Tb (ppm)	5.3	0.19	4.7	6.0	5.1	5.6
Thorium, Th (ppm)	35.1	1.1	33.2	37.1	34.2	36.1
Titanium, Ti (wt.%)	0.353	0.006	0.333	0.373	0.346	0.361
Thulium, Tm (ppm)	2.12	0.05	1.96	2.27	2.07	2.17
Uranium, U (ppm)	410	8	396	425	400	420
Vanadium, V (ppm)	77	1.8	73	80	75	79
Yttrium, Y (ppm)	135	3	127	143	132	138
Ytterbium, Yb (ppm)	14.7	0.5	13.4	15.9	14.0	15.4

Note: intervals may appear asymmetric due to rounding.

## INTRODUCTION

OREAS reference materials are intended to provide a low cost method of evaluating and improving the quality of analysis of geological samples. To the geologist they provide a means of implementing quality control in analytical data sets generated in exploration from the grass roots level through to prospect evaluation, and in grade control at 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

OREAS 101a is one of four CRM's prepared by Ore Research & Exploration Pty Ltd from material from the Proterozoic Mt. Gee uranium prospect, Mount Painter Inlier, South Australia. The mineralisation at Mt. Gee lies within the Paralana Mineral System, host to a number of granitic and haematitic breccia bodies extending northeasterly over a distance of 11km. Mt. Gee is believed to be of hydrothermal origin and has been described as an IOCG variant.

## COMMUNITION AND HOMOGENISATION PROCEDURES

The material constituting OREAS 101a was prepared in the following manner:

- a) drying to constant mass at 105<sup>0</sup> C;

- b) crushing;
- c) milling to 100% minus 35 microns;
- d) homogenisation;
- e) packaging into 10g units sealed in laminated foil pouches.

## ANALYTICAL PROGRAM FOR OREAS 101a

Fifteen commercial laboratories participated in the analytical program to certify Ce, Co, Cu, Dy, Er, Eu, Fe, Gd, Ho, K, La, Lu, Mg, Mn, Mo, Nd, Ni, P, Pb, Pr, Sm, Tb, Th, Ti, Tm, U, V, Y and Yb by both fusion and four acid analytical methods. Their results together with uncorrected means, medians, one sigma standard deviations, relative standard deviations and percent deviation of lab means from the corrected mean of means (PDM<sup>3</sup>) are presented in an appendix (Tables A2 – A59). The analytical methods employed by each laboratory are indicated as codes at the head of each laboratory data set and explained in Table A1 of the appendix.

The intent of the certification program was to characterise the analytes by:

- a) fusion methods - sodium peroxide fusion ICPOES/MS, lithium borate fusion ICPOES/MS and lithium borate fusion XRF;
- b) four acid (HF-HCl-HNO<sub>3</sub>-HClO<sub>4</sub>) digest ICPOES/MS

A batch of six 20g pulp samples was submitted to each of the participating laboratories for analysis. The six samples comprising each batch were scoop-split in duplicate from three of fourteen 400g master samples. The three master samples selected for sampling were chosen to maximise their representation and duplicate samples were taken to enable within- and between-unit analysis of variance treatment. The master samples were taken at regular intervals during the bagging stage and immediately following homogenisation. Table 1 (above) presents the certified values together with their associated 1SD's, 95% confidence and tolerance limits. Indicative (uncertified) values are provided in Table 2 for the major and trace elements determined by borate fusion XRF (Al<sub>2</sub>O<sub>3</sub> to Zn) and laser ablation with ICP-MS (Ag to Zr) and are the means of duplicate assays from Bureau Veritas, Perth. Table 3 provides performance gate intervals for the certified values based on their associated standard deviations. The summary statistics are also available in Excel format (**OREAS 101a DataPack.xlsx**).

## STATISTICAL EVALUATION OF OREAS 101a

### Certified Value and Confidence Intervals

The certified value is the mean of means of accepted replicate values of accepted participating laboratories 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  $i$ ;  
 $\bar{x}$  is the mean of means.

The confidence intervals were obtained by calculation of the variance of the consensus value (mean of means) and reference to Student's- $t$  distribution with degrees of freedom ( $p-1$ ).

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

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

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 was primarily 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:

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

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

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  $> 1.5\%$ . 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 entire lab data set outliers have been eliminated a non-iterative 3 standard deviation filter is applied, with those values lying outside this window also relegated to outlying status. Individual outliers and, more rarely, laboratory means

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.

**Table 2. Indicative Values for OREAS 101a.**

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
<b>Laser Ablation ICP-MS</b>								
Ag	ppm	0.400	Ho	ppm	6.88	Sn	ppm	11.0
As	ppm	13.7	In	ppm	0.038	Sr	ppm	21.4
Ba	ppm	165	La	ppm	861	Ta	ppm	2.99
Be	ppm	5.60	Lu	ppm	2.54	Tb	ppm	5.66
Bi	ppm	0.49	Mn	wt.%	0.094	Te	ppm	0.30
Cd	ppm	< 0.1	Mo	ppm	19.5	Th	ppm	36.2
Ce	ppm	1355	Nb	ppm	59	Ti	wt.%	0.393
Co	ppm	48.1	Nd	ppm	401	Tl	ppm	0.20
Cr	ppm	34.5	Ni	ppm	10.0	Tm	ppm	3.19
Cs	ppm	2.39	Pb	ppm	20.5	U	ppm	418
Cu	ppm	422	Pr	ppm	138	V	ppm	78
Dy	ppm	33.7	Rb	ppm	185	W	ppm	18.5
Er	ppm	20.9	Re	ppm	0.080	Y	ppm	188
Eu	ppm	8.88	Sb	ppm	1.05	Yb	ppm	18.4
Ga	ppm	18.3	Sc	ppm	8.95	Zn	ppm	15.0
Gd	ppm	38.7	Se	ppm	6.25	Zr	ppm	367
Hf	ppm	11.0	Sm	ppm	54			
<b>Borate Fusion XRF</b>								
Al <sub>2</sub> O <sub>3</sub>	wt.%	10.34	Fe <sub>2</sub> O <sub>3</sub>	wt.%	15.98	Pb	ppm	20.0
As	ppm	20.0	K <sub>2</sub> O	wt.%	2.75	SiO <sub>2</sub>	wt.%	61.89
Ba	ppm	155	MgO	wt.%	2.04	Sn	ppm	< 10
CaO	wt.%	1.61	MnO	wt.%	0.130	SO <sub>3</sub>	wt.%	0.237
Co	ppm	50	Na <sub>2</sub> O	wt.%	0.100	TiO <sub>2</sub>	wt.%	0.655
Cr	ppm	25.0	Ni	ppm	20.0	U	ppm	405
Cu	ppm	415	P <sub>2</sub> O <sub>5</sub>	wt.%	0.296	Zn	ppm	25.0
<b>Thermogravimetry</b>								
LOI <sup>1000</sup>	wt.%	3.47						

Note: the number of significant figures reported is not a reflection of the level of certainty of stated values. They are instead an artefact of ORE's in-house CRM-specific LIMS.

### 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 the 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

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

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

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 intervals may be illustrated for uranium by fusion, where 99% of the time at least 95% of subsamples will have concentrations lying between 412 and 431 ppm (see Table 1). 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

$1 - \left( \frac{s_i}{2s'_g} \right)$  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. Outliers 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 1 are considered to confirm a high level of homogeneity for this CRM.

### Performance Gates

Performance gates provide an indication of a level of performance that might reasonably be expected for a particular analyte from a laboratory being monitored by this standard in a QA/QC program. They incorporate errors attributable to measurement (analytical bias and precision) and standard variability.

For an effective standard the contribution of the latter should be negligible in comparison to measurement errors. Two methods have been employed to calculate performance gates.

The first method uses the standard deviation of the pooled individual analyses generated from the certification program after removal of all individual and lab dataset (batch) outliers as well as application of a non-iterative 3 standard deviation filter. These outliers can only be removed if they can be confidently deemed to be analytical rather than arising from inhomogeneity of the CRM. Performance gates have been calculated for one, two and three standard deviations of the accepted pool of certification data and are presented in Table 3. As a guide these intervals may be regarded as informational (1SD), warning or rejection for multiple outliers (2SD), or rejection for individual outliers (3SD) in QC monitoring although their precise application should be at the discretion of the QC manager concerned. It is important to note that performance gates calculated from a single submission round robin, as in the present case, do not take reproducibility errors (batch-to-batch bias) into consideration. This omission is offset, however, by the inclusion of errors associated with inter-lab bias as these are generally of greater magnitude than reproducibility errors.



Table 3. Performance gates for OREAS 101a.

Constituent	Certified Value	Performance Gates						
		1SD	2SD		3SD		5%	
			Low	High	Low	High	Low	High
<b>Fusion</b>								
Ce (ppm)	1396	131	1133	1659	1002	1790	1326	1466
Co (ppm)	48.8	4.4	40.0	57.6	35.6	61.9	46.4	51.2
Cu (ppm)	434	35	365	504	330	539	413	456
Dy (ppm)	33.3	2.3	28.7	37.9	26.4	40.3	31.6	35.0
Er (ppm)	19.5	1.6	16.3	22.8	14.7	24.4	18.6	20.5
Eu (ppm)	8.06	0.72	6.61	9.51	5.89	10.2	7.66	8.46
Fe (wt.%)	11.06	0.33	10.41	11.72	10.08	12.05	10.51	11.62
Gd (ppm)	43.4	5.9	31.7	55.1	25.8	61.0	41.2	45.6
Ho (ppm)	6.46	0.52	5.41	7.51	4.89	8.04	6.14	6.79
K (wt.%)	2.34	0.13	2.09	2.60	1.96	2.73	2.23	2.46
La (ppm)	816	62	692	940	630	1001	775	857
Lu (ppm)	2.66	0.19	2.27	3.04	2.08	3.24	2.53	2.79
Mg (wt.%)	1.23	0.05	1.12	1.34	1.06	1.39	1.16	1.29
Mn (ppm)	964	46	871	1056	825	1103	915	1012
Mo (ppm)	21.9	1.5	18.9	24.8	17.4	26.3	20.8	22.9
Nd (ppm)	403	40	323	484	283	524	383	424
P (ppm)	1268	126	1015	1521	889	1648	1205	1332
Pr (ppm)	134	12	111	157	99	168	127	141
Sm (ppm)	48.8	3.8	41.2	56.5	37.4	60.3	46.4	51.3
Tb (ppm)	5.92	0.71	4.50	7.33	3.80	8.04	5.62	6.21
Th (ppm)	36.6	2.5	31.7	41.6	29.3	44.0	34.8	38.5
Ti (wt.%)	0.395	0.021	0.352	0.438	0.331	0.459	0.375	0.415
Tm (ppm)	2.90	0.22	2.47	3.33	2.26	3.55	2.76	3.05
U (ppm)	422	29	364	480	335	508	401	443
V (ppm)	83	10	64	102	54	112	79	87
Y (ppm)	183	8	167	199	159	207	174	192
Yb (ppm)	17.5	1.7	14.2	20.9	12.5	22.6	16.6	18.4
<b>4 Acid</b>								
Ce (ppm)	1390	110	1170	1609	1060	1719	1320	1459
Co (ppm)	46.9	2.7	41.4	52.4	38.7	55.1	44.6	49.2
Cu (ppm)	418	31.20	356	481	325	512	397	439
Dy (ppm)	28.2	3.6	21.0	35.5	17.4	39.1	26.8	29.7
Er (ppm)	16.2	2.0	12.2	20.2	10.2	22.2	15.4	17.0
Eu (ppm)	8.4	0.6	7.2	9.6	6.6	10.2	8.0	8.8
Fe (wt.%)	10.7	0.8	9.1	12.4	8.2	13.2	10.2	11.3
Gd (ppm)	42	6	30	54	24	60	40	44
Ho (ppm)	5.2	0.5	4.2	6.3	3.7	6.8	5.0	5.5
K (wt.%)	2.20	0.15	1.90	2.51	1.74	2.66	2.09	2.31
La (ppm)	807	67.50	672	942	604	1009	766	847
Lu (ppm)	1.99	0.23	1.54	2.44	1.31	2.67	1.89	2.09
Mg (wt.%)	1.20	0.07	1.06	1.34	0.99	1.41	1.14	1.26
Mn (ppm)	977	15	948	1006	933	1020	928	1025
Mo (ppm)	20.4	0.6	19.2	21.5	18.7	22.1	19.3	21.4
Nd (ppm)	397	11	375	419	364	430	377	417
Ni (ppm)	8.14	0.28	7.57	8.70	7.29	8.99	7.73	8.55
P (ppm)	1159	20	1118	1199	1098	1220	1101	1217
Pb (ppm)	23	1	21	25	20	26	22	24
Pr (ppm)	131	4	124	139	120	143	125	138
Sm (ppm)	49	2	46	53	44	55	47	52
Tb (ppm)	5.3	0.2	5.0	5.7	4.8	5.9	5.1	5.6
Th (ppm)	35.1	1.1	33.0	37.3	32.0	38.3	33.4	36.9
Ti (wt.%)	0.353	0.006	0.341	0.365	0.336	0.371	0.336	0.371
Tm (ppm)	2.12	0.05	2.01	2.22	1.96	2.27	2.01	2.22
U (ppm)	410	8	394	427	385	435	390	431
V (ppm)	77	2	73	80	71	82	73	81
Y (ppm)	135	3	129	142	126	145	129	142
Yb (ppm)	14.7	0.5	13.7	15.6	13.2	16.1	13.9	15.4

Note: Intervals may appear asymmetric due to rounding

For the second method a simple  $\pm 5\%$  error bar on the certified value is used as the window of acceptability (refer Table 3).

Both methods should be used with caution when concentration levels approach lower limits of detection of the analytical methods employed, as performance gates calculated from standard deviations tend to be excessively wide whereas those determined by the 5% method are too narrow.

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Web: [www.ore.com.au](http://www.ore.com.au)  
Email: [info@ore.com.au](mailto:info@ore.com.au)

It is available in unit sizes of 10g (single-use laminated foil pouches).

## INTENDED USE

OREAS 101a is a reference material intended for the following:

- i) for the monitoring of laboratory performance in the analysis of Ce, Co, Cu, Dy, Er, Eu, Fe, Gd, Ho, K, La, Lu, Mg, Mn, Mo, Nd, Ni, P, Pb, Pr, Sm, Tb, Th, Ti, Tm, U, V, Y and Yb in geological samples;

- ii) for the calibration of instruments used in the determination of the concentration of Ce, Co, Cu, Dy, Er, Eu, Fe, Gd, Ho, K, La, Lu, Mg, Mn, Mo, Nd, Ni, P, Pb, Pr, Sm, Tb, Th, Ti, Tm, U, V, Y and Yb;
- iii) for the verification of analytical methods for Ce, Co, Cu, Dy, Er, Eu, Fe, Gd, Ho, K, La, Lu, Mg, Mn, Mo, Nd, Ni, P, Pb, Pr, Sm, Tb, Th, Ti, Tm, U, V, Y and Yb
- iv) for the preparation of secondary reference materials of similar composition;

## **STABILITY AND STORAGE INSTRUCTIONS**

OREAS 101a has been prepared from uranium-bearing granitic and haematitic breccias. It has been packaged in robust foil laminate pouches and is considered to have long-term stability under normal storage conditions.

## **INSTRUCTIONS FOR CORRECT USE**

The certified values for OREAS 101a refer to the concentration levels of Ce, Co, Cu, Dy, Er, Eu, Fe, Gd, Ho, K, La, Lu, Mg, Mn, Mo, Nd, Ni, P, Pb, Pr, Sm, Tb, Th, Ti, Tm, U, V, Y and Yb after drying at 105°C. The material should therefore be dried at 105°C prior to weighing and analysis or the values corrected for moisture content.

## **HANDLING INSTRUCTIONS**

Fine powders pose a risk to eyes and lungs and therefore standard precautions such as the use of safety glasses and dust masks are advised.

## **TRACEABILITY**

The analytical samples were selected in a manner to represent the entire batch of prepared CRM. This 'representivity' was maintained in each submitted laboratory sample batch and ensures the user that the data is traceable from sample selection through to the analytical results that underlie the consensus values. Each analytical data set has been validated by its assayer through the inclusion of internal reference materials and QC checks during analysis. The laboratories were chosen on the basis of their competence (from past performance in inter-laboratory programs) for a particular analytical method, analyte or analyte suite, and sample matrix. Most of these laboratories have and maintain ISO 17025 accreditation. The certified and non-certified (indicative) values presented in this report are calculated from the means of accepted data following robust statistical treatment as detailed in this report.

## **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.

## QMS ACCREDITED

ORE Pty Ltd is accredited to ISO 9001:2008 by Lloyd's Register Quality Assurance Ltd for its quality management system including development, manufacturing, certification and supply of CRMs.



## CERTIFYING OFFICER

A handwritten signature in blue ink, appearing to read 'S. Hamlyn'.

September 22, 2008

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Craig Hamlyn (B.Sc. Hons - Geology), Technical Manager - ORE P/L

## REFERENCES

ISO Guide 30 (1992), Terms and definitions used in connection with reference materials.

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.

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

## **APPENDIX**

### **Analytical Results for OREAS 101a**

Table A1. Explanation of abbreviations used in Tables A2 – A59.

Abbreviation	Explanation
Std.Dev.	one standard deviation
Rel.Std.Dev.	one relative standard deviation (%)
PDM <sup>3</sup>	percent deviation of lab mean from corrected mean of means
NR	not reported
PF	sodium peroxide fusion
BF	lithium metaborate fusion
4A	four acid (HF–HNO <sub>3</sub> –HClO <sub>4</sub> –HCl) digest
OES	inductively coupled plasma optical emission spectrometry
MS	inductively coupled plasma mass spectrometry
XRF	x-ray fluorescence
NA	not applicable – these results had to be excluded from the report

Table A2. Analytical results for fusion U in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*OES	Lab B PF*MS	Lab C PF*OES	Lab D PF*MS	Lab E PF*MS	Lab F PF*MS	Lab G -	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	414	442	381	386	464	410	NR	NR	421	429	447	NR	NR	475	408
2	420	424	378	388	457	410	NR	NR	423	416	444	NR	NR	471	387
3	416	426	374	389	447	410	NR	NR	<b>433</b>	408	443	NR	NR	479	393
4	424	<b>394</b>	381	392	468	410	NR	NR	<b>439</b>	420	456	NR	NR	468	408
5	<b>402</b>	424	386	397	<b>569</b>	410	NR	NR	420	390	449	NR	NR	465	401
6	420	412	386	395	463	400	NR	NR	423	408	450	NR	NR	480	398
Mean	416	420	381	391	478	408			427	412	448			473	399
Median	418	424	381	391	464	410			423	412	448			473	399
Std.Dev.	8	16	5	4	45	4			8	13	5			6	8
Rel.Std.Dev.	1.93%	3.82%	1.19%	1.09%	9.48%	1.00%			1.80%	3.23%	1.05%			1.24%	2.12%
PDM <sup>3</sup>	-1.34%	-0.32%	-9.69%	-7.23%	13.4%	-3.16%			1.15%	-2.33%	6.29%			12.1%	-5.35%

Table A3. Analytical results for fusion Ce in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*MS	Lab B PF*MS	Lab C PF*MS	Lab D PF*OES	Lab E PF*MS	Lab F PF*MS	Lab G -	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	1255	1410	1426	1530	1735	1300	NR	NA	1340	1345	1520	NR	NR	1244	1267
2	1272	1480	1391	1490	1677	1300	NR	1395	1280	1320	1510	NR	NR	1250	<b>1207</b>
3	1266	1510	1375	1460	1720	1200	NR	1459	1280	1310	1505	NR	NR	1237	1282
4	1272	1470	1443	1550	<b>1526</b>	1300	NR	1373	1340	1315	1520	NR	NR	<b>1204</b>	1290
5	1229	1430	1428	1480	1703	1300	NR	1492	1320	<b>1245</b>	<b>1550</b>	NR	NR	1256	1298
6	1250	1500	1492	1520	1610	1300	NR	1550	1320	1285	1490	NR	NR	1257	1290
Mean	1257	1467	1426	1505	1662	1283		1454	1313	1303	1516			1241	1272
Median	1260	1475	1427	1505	1690	1300		1459	1320	1313	1515			1247	1286
Std.Dev.	17	39	41	34	80	41		72	27	34	20			20	34
Rel.Std.Dev.	1.32%	2.68%	2.89%	2.25%	4.81%	3.18%		4.96%	2.08%	2.64%	1.33%			1.58%	2.64%
PDM <sup>3</sup>	-9.95%	5.06%	2.14%	7.81%	19.0%	-8.07%		4.15%	-5.92%	-6.64%	8.58%			-11.1%	-8.86%

Table A4. Analytical results for fusion Co in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*MS	Lab B PF*OES	Lab C PF*MS	Lab D PF*MS	Lab E PF*MS	Lab F PF*MS	Lab G -	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O -
1	50.0	40.0	<b>51.0</b>	52.0	54.5	53.0	NR	44.9	48.0	<b>50.5</b>	47.6	NR	NR	49.4	NR
2	<b>52.0</b>	60.0	49.0	52.0	52.7	<b>60.0</b>	NR	41.8	47.0	47.1	48.4	NR	NR	49.2	NR
3	49.0	40.0	48.0	53.0	54.3	53.0	NR	43.1	48.0	46.0	48.4	NR	NR	<b>48.2</b>	NR
4	49.0	40.0	49.0	54.0	<b>47.8</b>	54.0	NR	41.1	49.0	46.9	48.2	NR	NR	49.4	NR
5	50.0	40.0	49.0	54.0	54.0	54.0	NR	44.7	46.0	45.2	49.0	NR	NR	49.1	NR
6	50.0	40.0	50.0	53.0	52.0	54.0	NR	43.4	49.0	45.7	47.8	NR	NR	<b>49.9</b>	NR
Mean	50.0	43.3	49.3	53.0	52.6	54.7		43.2	47.8	46.9	48.2			49.2	
Median	50.0	40.0	49.0	53.0	53.4	54.0		43.3	48.0	46.5	48.3			49.3	
Std.Dev.	1.1	8.2	1.0	0.9	2.5	2.7		1.5	1.2	1.9	0.5			0.6	
Rel.Std.Dev.	2.19%	18.8%	2.09%	1.69%	4.78%	4.86%		3.51%	2.44%	4.06%	1.03%			1.14%	
PDM <sup>3</sup>	2.47%	-11.2%	1.11%	8.62%	7.72%	12.0%		-11.5%	-1.97%	-3.88%	-1.15%			0.83%	

Table A5. Analytical results for fusion Cu in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*MS	Lab B PF*OES	Lab C PF*MS	Lab D PF*MS	Lab E PF*OES	Lab F PF*MS	Lab G -	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N -	Lab O -
1	463	440	515	430	401	<b>420</b>	NR	NA	<b>409</b>	420	392	NR	NR	NR	NR
2	450	420	507	440	399	430	NR	<b>450</b>	403	404	393	NR	NR	NR	NR
3	456	420	<b>551</b>	440	398	440	NR	466	400	398	400	NR	NR	NR	NR
4	461	440	524	440	<b>370</b>	440	NR	<b>434</b>	402	402	395	NR	NR	NR	NR
5	454	440	515	450	399	450	NR	470	400	385	404	NR	NR	NR	NR
6	457	400	<b>614</b>	440	402	440	NR	468	402	393	395	NR	NR	NR	NR
Mean	457	427	538	440	395	437		458	403	400	397				
Median	457	430	520	440	399	440		466	402	400	395				
Std.Dev.	5	16	40	6	12	10		15	3	12	5				
Rel.Std.Dev.	1.03%	3.83%	7.5%	1.44%	3.13%	2.37%		3.3%	0.83%	2.95%	1.16%				
PDM <sup>3</sup>	5.15%	-1.80%	23.8%	1.27%	-9.14%	0.51%		5.32%	-7.32%	-7.86%	-8.74%				

Table A6. Analytical results for fusion Dy in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*MS	Lab B PF*MS	Lab C PF*MS	Lab D PF*MS	Lab E PF*MS	Lab F PF*MS	Lab G PF*OES	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	32.7	36.0	35.5	32.3	39.3	34.0	<b>37.0</b>	NA	33.2	33.0	33.2	NR	NR	31.3	31.5
2	32.8	34.5	36.8	31.4	38.4	34.0	34.0	31.2	32.3	31.4	32.8	NR	NR	31.0	28.8
3	32.3	36.5	32.9	30.3	39.1	33.0	<b>27.0</b>	32.7	32.3	30.8	33.4	NR	NR	31.0	28.2
4	31.2	34.0	35.9	32.6	<b>34.8</b>	34.0	35.0	34.8	34.6	32.3	33.5	NR	NR	30.2	29.2
5	31.7	36.0	34.7	31.5	38.7	34.0	34.0	33.6	33.3	29.3	33.3	NR	NR	31.9	30.2
6	32.2	35.5	34.5	32.3	36.5	34.0	34.0	35.7	32.9	30.9	32.8	NR	NR	32.6	30.0
Mean	32.2	35.4	35.1	31.7	37.8	33.8	33.5	33.6	33.1	31.3	33.2			31.3	29.7
Median	32.3	35.8	35.1	31.9	38.5	34.0	34.0	33.6	33.1	31.2	33.3			31.2	29.6
Std.Dev.	0.6	1.0	1.3	0.9	1.8	0.4	3.4	1.8	0.9	1.3	0.3			0.8	1.2
Rel.Std.Dev.	1.89%	2.74%	3.84%	2.68%	4.73%	1.21%	10.1%	5.22%	2.57%	4.12%	0.91%			2.68%	3.96%
PDM <sup>3</sup>	-3.47%	6.33%	5.23%	-4.73%	13.5%	1.58%	0.58%	0.90%	-0.62%	-6.08%	-0.42%			-5.92%	-10.9%



Table A7. Analytical results for fusion Er in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*MS	Lab B PF*MS	Lab C PF*MS	Lab D PF*MS	Lab E PF*MS	Lab F PF*MS	Lab G PF*OES	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	18.5	22.5	20.1	17.4	23.6	21.0	<b>21.0</b>	NA	19.7	20.4	20.9	NR	NR	18.9	18.5
2	19.3	20.5	20.7	17.1	22.9	20.0	19.0	16.7	19.6	20.2	20.4	NR	NR	18.5	17.1
3	18.6	22.5	18.5	17.4	23.4	21.0	<b>15.0</b>	17.3	19.4	19.8	20.7	NR	NR	18.8	17.5
4	19.1	19.5	20.6	17.4	<b>20.6</b>	21.0	20.0	17.4	<b>20.6</b>	19.6	20.6	NR	NR	18.0	17.6
5	18.6	21.5	19.6	17.4	22.9	21.0	19.0	18.3	18.8	19.1	20.7	NR	NR	18.7	17.9
6	19.1	21.0	19.8	17.2	21.6	21.0	19.0	18.0	19.2	19.9	20.6	NR	NR	19.1	17.9
Mean	18.9	21.3	19.9	17.3	22.5	20.8	18.8	17.5	19.6	19.8	20.7			18.7	17.8
Median	18.9	21.3	20.0	17.4	22.9	21.0	19.0	17.4	19.5	19.9	20.7			18.8	17.7
Std.Dev.	0.3	1.2	0.8	0.1	1.2	0.4	2.0	0.6	0.6	0.5	0.2			0.4	0.4
Rel.Std.Dev.	1.79%	5.52%	4.04%	0.77%	5.26%	1.96%	10.8%	3.6%	3.10%	2.40%	0.80%			2.15%	2.49%
PDM <sup>3</sup>	-3.46%	8.7%	1.74%	-11.4%	15.2%	6.60%	-3.63%	-10.3%	0.03%	1.44%	5.66%			-4.48%	-9.12%

Table A8. Analytical results for fusion Eu in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*MS	Lab B PF*MS	Lab C PF*MS	Lab D PF*MS	Lab E PF*MS	Lab F PF*MS	Lab G PF*OES	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	7.90	9.40	9.10	7.80	9.78	8.00	<b>8.30</b>	NA	8.90	8.55	8.01	NR	NR	8.14	<b>6.94</b>
2	8.00	8.80	9.50	7.70	9.53	8.00	7.50	7.46	8.55	8.55	7.90	NR	NR	8.14	6.65
3	<b>7.50</b>	8.80	8.40	7.50	9.85	8.00	<b>6.00</b>	7.87	8.46	8.62	8.23	NR	NR	8.20	<b>5.80</b>
4	8.00	8.60	9.30	7.90	<b>8.50</b>	8.00	7.60	7.55	8.83	8.29	8.14	NR	NR	<b>7.80</b>	6.59
5	7.90	9.20	8.80	7.70	9.80	8.00	7.30	8.01	8.02	8.27	8.09	NR	NR	8.18	6.61
6	8.00	9.00	8.70	7.90	9.12	8.00	7.40	8.25	8.53	8.26	7.82	NR	NR	<b>8.34</b>	6.72
Mean	7.88	8.97	8.97	7.75	<b>9.43</b>	8.00	7.35	7.83	8.55	8.42	8.03			8.13	6.55
Median	7.95	8.90	8.95	7.75	9.65	8.00	7.45	7.87	8.54	8.42	8.05			8.16	6.63
Std.Dev.	0.19	0.29	0.41	0.15	0.53	0.00	0.75	0.33	0.31	0.17	0.15			0.18	0.39
Rel.Std.Dev.	2.46%	3.28%	4.55%	1.96%	5.61%	0.00%	10.2%	4.2%	3.66%	1.98%	1.91%			2.20%	5.94%
PDM <sup>3</sup>	-2.20%	11.2%	11.2%	-3.86%	17.0%	-0.76%	-8.8%	-2.9%	6.05%	4.50%	-0.36%			0.90%	-18.7%

Table A9. Analytical results for fusion Fe in OREAS 101a (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A PF*MS	Lab B PF*OES	Lab C PF*OES	Lab D PF*OES	Lab E PF*OES	Lab F PF*OES	Lab G PF*OES	Lab H -	Lab I BF*OES	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	11.62	12.10	11.30	10.90	11.13	11.00	11.40	11.04	11.03	NR	11.10	NR	NR	11.49	11.22
2	11.45	11.70	<b>11.57</b>	11.10	11.00	11.00	11.40	10.94	10.95	NR	11.15	NR	NR	11.38	11.26
3	11.46	12.20	11.27	11.10	10.98	11.00	11.20	11.11	11.16	NR	11.15	NR	NR	11.66	11.13
4	11.63	11.60	11.36	11.40	<b>10.28</b>	11.00	10.60	10.62	11.03	NR	10.95	NR	NR	11.38	11.17
5	11.50	12.30	11.32	11.10	11.06	11.00	10.90	11.46	<b>11.25</b>	NR	10.95	NR	NR	11.73	11.04
6	11.74	11.60	11.33	11.10	11.06	11.00	10.80	11.27	11.04	NR	10.95	NR	NR	11.45	10.99
Mean	<b>11.57</b>	<b>11.92</b>	11.36	11.12	10.92	11.00	11.05	11.07	11.08		11.04			<b>11.51</b>	11.14
Median	11.56	11.90	11.33	11.10	11.03	11.00	11.05	11.08	11.04		11.03			11.47	11.15
Std.Dev.	0.12	0.32	0.11	0.16	0.32	0.00	0.33	0.29	0.11		0.10			0.15	0.11
Rel.Std.Dev.	1.00%	2.68%	0.95%	1.44%	2.89%	0.00%	3.02%	2.57%	1.00%		0.92%			1.28%	0.96%
PDM <sup>3</sup>	4.55%	7.72%	2.67%	0.48%	-1.32%	-0.57%	-0.12%	0.09%	0.14%		-0.19%			4.07%	0.65%

Table A10. Analytical results for fusion Gd in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*MS	Lab B PF*MS	Lab C PF*MS	Lab D PF*MS	Lab E PF*MS	Lab F PF*MS	Lab G PF*OES	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	34.5	40.0	45.8	40.8	51.9	52.0	<b>44.0</b>	NA	<b>36.1</b>	49.8	49.3	NR	NR	36.9	41.7
2	33.5	38.0	47.7	40.0	50.4	52.0	40.0	40.7	41.1	52.6	49.2	NR	NR	37.2	39.7
3	35.0	40.0	42.8	38.9	51.6	52.0	<b>32.0</b>	42.8	42.6	51.7	49.8	NR	NR	36.6	<b>35.3</b>
4	34.0	38.0	47.6	41.5	<b>45.7</b>	52.0	41.0	41.6	42.9	47.8	50.2	NR	NR	35.8	40.5
5	33.2	40.0	43.9	40.0	51.7	53.0	39.0	42.9	<b>33.1</b>	49.5	50.4	NR	NR	36.1	42.4
6	34.2	38.0	44.0	40.9	49.2	52.0	39.0	44.5	42.0	50.5	48.7	NR	NR	38.5	41.9
Mean	34.1	39.0	45.3	40.4	50.1	52.2	39.2	42.5	39.6	50.3	49.6			36.8	40.2
Median	34.1	39.0	44.9	40.4	51.0	52.0	39.5	42.8	41.6	50.2	49.6			36.7	41.1
Std.Dev.	0.7	1.1	2.1	0.9	2.4	0.4	4.0	1.4	4.1	1.7	0.6			1.0	2.6
Rel.Std.Dev.	1.93%	2.81%	4.55%	2.26%	4.73%	0.78%	10.1%	3.40%	10.2%	3.38%	1.31%			2.58%	6.46%
PDM <sup>3</sup>	-21.5%	-10.1%	4.38%	-7.03%	15.4%	20.2%	-9.76%	-2.07%	-8.68%	15.9%	14.3%			-15.1%	-7.28%

Table A11. Analytical results for fusion Ho in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*MS	Lab B PF*MS	Lab C PF*MS	Lab D PF*MS	Lab E PF*MS	Lab F PF*MS	Lab G PF*OES	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N -	Lab O BF*OES
1	6.50	7.80	6.70	6.40	7.86	7.00	6.90	NA	6.50	6.56	6.79	NR	NR	NR	6.20
2	6.40	7.40	6.90	6.30	7.79	7.00	6.20	6.12	6.40	6.44	6.70	NR	NR	NR	5.73
3	6.50	7.60	6.10	<b>6.00</b>	7.83	7.00	<b>5.00</b>	6.40	6.40	6.37	6.85	NR	NR	NR	5.77
4	6.50	7.20	6.80	<b>6.60</b>	<b>7.03</b>	7.00	6.50	6.18	<b>6.80</b>	6.33	6.74	NR	NR	NR	5.78
5	6.50	7.60	6.50	6.30	7.80	7.00	6.30	6.50	6.30	6.14	6.81	NR	NR	NR	5.98
6	6.60	7.40	6.40	6.40	<b>7.42</b>	7.00	6.10	6.64	6.40	6.23	6.78	NR	NR	NR	6.08
Mean	6.50	<b>7.50</b>	6.57	6.33	<b>7.62</b>	<b>7.00</b>	6.17	6.37	6.47	6.35	<b>6.78</b>				<b>5.92</b>
Median	6.50	7.50	6.60	6.35	7.80	7.00	6.25	6.40	6.40	6.35	6.79				5.88
Std.Dev.	0.06	0.21	0.29	0.20	0.33	0.00	0.64	0.22	0.18	0.15	0.05				0.19
Rel.Std.Dev.	0.97%	2.80%	4.48%	3.10%	4.38%	0.00%	10.3%	3.44%	2.71%	2.35%	0.78%				3.24%
PDM <sup>3</sup>	0.57%	16.0%	1.60%	-2.01%	18.0%	8.30%	-4.59%	-1.50%	0.05%	-1.83%	4.87%				-8.38%

Table A12. Analytical results for fusion K in OREAS 101a (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A PF*OES	Lab B PF*OES	Lab C PF*OES	Lab D PF*OES	Lab E PF*OES	Lab F PF*OES	Lab G PF*OES	Lab H BF*MS	Lab I BF*OES	Lab J -	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	2.43	2.30	2.28	<b>2.48</b>	2.12	2.30	<b>2.69</b>	2.37	<b>2.15</b>	NR	2.43	NR	NR	2.27	2.27
2	2.37	2.10	2.34	<b>2.27</b>	2.08	2.50	<b>2.77</b>	2.52	2.29	NR	2.40	NR	NR	2.28	2.27
3	2.38	2.30	2.32	2.59	2.15	2.30	2.44	2.60	2.26	NR	2.41	NR	NR	2.28	2.25
4	2.43	2.20	2.33	2.61	<b>1.94</b>	2.30	2.43	2.61	2.30	NR	2.39	NR	NR	2.29	2.26
5	2.43	2.30	2.29	2.62	2.14	2.30	2.53	2.22	2.32	NR	2.38	NR	NR	2.28	2.25
6	2.47	2.20	2.29	2.60	2.12	2.30	2.41	2.28	2.20	NR	2.36	NR	NR	2.30	2.26
Mean	2.42	2.23	2.31	2.53	2.09	2.33	2.55	2.43	2.25		2.40			2.28	2.26
Median	2.43	2.25	2.31	2.60	2.12	2.30	2.49	2.45	2.27		2.40			2.28	2.26
Std.Dev.	0.04	0.08	0.02	0.14	0.08	0.08	0.15	0.17	0.06		0.02			0.01	0.01
Rel.Std.Dev.	1.53%	3.66%	1.06%	5.40%	3.73%	3.50%	5.94%	6.84%	2.88%		1.01%			0.48%	0.42%
PDM <sup>3</sup>	3.22%	-4.68%	-1.48%	7.91%	-10.8%	-0.41%	8.6%	3.87%	-3.86%		2.22%			-2.54%	-3.56%

Table A13. Analytical results for fusion La in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*MS	Lab B PF*MS	Lab C PF*MS	Lab D PF*OES	Lab E PF*MS	Lab F PF*MS	Lab G -	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	778	<b>953</b>	857	790	1021	830	NR	NA	752	831	888	NR	NR	759	800
2	786	863	831	790	961	830	NR	806	768	835	878	NR	NR	779	749
3	772	905	832	800	1009	830	NR	844	773	817	874	NR	NR	760	783
4	778	834	870	810	889	840	NR	789	801	814	877	NR	NR	745	769
5	<b>749</b>	848	869	780	997	840	NR	860	756	784	892	NR	NR	774	788
6	760	846	897	780	951	840	NR	892	799	804	868	NR	NR	778	799
Mean	770	875	859	792	<b>971</b>	835		838	775	814	880			766	781
Median	775	856	863	790	979	835		844	771	816	878			767	786
Std.Dev.	14	46	25	12	49	5		42	21	19	9			14	20
Rel.Std.Dev.	1.77%	5.21%	2.94%	1.48%	5.01%	0.66%		4.96%	2.70%	2.29%	1.02%			1.77%	2.55%
PDM <sup>3</sup>	-5.56%	7.24%	5.34%	-2.96%	19.1%	2.35%		2.76%	-5.02%	-0.20%	7.81%			-6.14%	-4.22%

Table A14. Analytical results for fusion Lu in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*MS	Lab B PF*MS	Lab C PF*MS	Lab D PF*MS	Lab E PF*MS	Lab F PF*MS	Lab G -	Lab H -	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	2.60	2.80	2.80	2.50	3.15	< 8	NR	NR	2.54	2.57	2.69	NR	NR	2.75	2.46
2	2.66	2.80	2.90	2.40	3.00	< 8	NR	NR	2.55	2.60	2.67	NR	NR	2.75	2.26
3	2.70	2.80	2.60	2.40	3.11	< 8	NR	NR	2.56	2.58	2.63	NR	NR	2.75	2.46
4	2.70	2.80	2.80	2.50	<b>2.65</b>	< 8	NR	NR	<b>2.64</b>	2.48	2.66	NR	NR	<b>2.67</b>	2.42
5	2.56	3.00	2.70	2.40	2.99	< 8	NR	NR	2.56	2.44	2.62	NR	NR	2.73	2.36
6	2.61	2.80	2.70	2.50	2.94	< 8	NR	NR	2.53	2.52	2.67	NR	NR	<b>2.79</b>	2.40
Mean	2.64	2.83	2.75	2.45	2.97				2.56	2.53	2.66			2.74	2.39
Median	2.64	2.80	2.75	2.45	3.00				2.56	2.55	2.67			2.75	2.41
Std.Dev.	0.06	0.08	0.10	0.05	0.18				0.04	0.06	0.03			0.04	0.08
Rel.Std.Dev.	2.18%	2.88%	3.81%	2.24%	5.91%				1.53%	2.48%	1.00%			1.44%	3.19%
PDM <sup>3</sup>	-0.76%	6.57%	3.44%	-7.84%	11.9%				-3.58%	-4.77%	-0.07%			3.06%	-9.98%

Table A15. Analytical results for fusion Mg in OREAS 101a (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A PF*OES	Lab B PF*OES	Lab C PF*OES	Lab D PF*OES	Lab E PF*OES	Lab F PF*OES	Lab G PF*OES	Lab H BF*MS	Lab I BF*OES	Lab J -	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	1.22	1.23	1.24	1.15	<b>1.18</b>	1.10	1.26	1.25	1.22	NR	1.26	NR	NR	1.21	<b>1.31</b>
2	1.23	1.23	1.24	1.15	1.16	1.10	1.29	1.24	1.22	NR	1.26	NR	NR	1.21	1.28
3	1.23	1.25	1.25	1.15	1.16	1.10	1.22	1.25	<b>1.16</b>	NR	1.26	NR	NR	1.21	1.29
4	1.24	1.21	1.23	1.17	<b>1.09</b>	1.10	1.15	1.28	1.23	NR	1.26	NR	NR	1.21	1.27
5	1.23	1.28	1.24	1.15	1.16	1.10	1.21	1.31	<b>1.20</b>	NR	1.27	NR	NR	1.21	1.28
6	<b>1.25</b>	1.21	1.24	1.15	1.16	1.10	1.18	1.28	1.22	NR	1.28	NR	NR	1.22	1.27
Mean	1.23	1.24	1.24	1.15	1.15	<b>1.10</b>	1.22	1.27	1.21		1.27			1.21	1.28
Median	1.23	1.23	1.24	1.15	1.16	1.10	1.22	1.27	1.22		1.26			1.21	1.28
Std.Dev.	0.01	0.03	0.00	0.01	0.03	0.00	0.05	0.03	0.03		0.01			0.01	0.02
Rel.Std.Dev.	0.84%	2.16%	0.38%	0.71%	2.79%	0.00%	4.20%	2.05%	2.10%		0.66%			0.54%	1.26%
PDM <sup>3</sup>	0.60%	0.73%	1.10%	-5.93%	-6.16%	-10.3%	-0.62%	3.55%	-1.20%		3.18%			-1.12%	4.70%

Table A16. Analytical results for fusion Mn in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*OES	Lab B PF*OES	Lab C PF*OES	Lab D PF*MS	Lab E PF*OES	Lab F PF*OES	Lab G PF*OES	Lab H BF*MS	Lab I BF*OES	Lab J -	Lab K BF*MS	Lab L -	Lab M -	Lab N -	Lab O BF*OES
1	977	980	940	<b>1020</b>	907	910	1000	929	968	NR	1000	NR	NR	NR	974
2	964	1000	960	1070	893	940	1000	929	968	NR	1000	NR	NR	NR	977
3	966	1020	950	1060	896	940	1000	1007	960	NR	1000	NR	NR	NR	961
4	975	980	950	1080	<b>837</b>	920	900	929	968	NR	1000	NR	NR	NR	972
5	964	1000	930	1100	903	930	1000	929	976	NR	900	NR	NR	NR	960
6	978	960	940	1070	897	920	900	1007	968	NR	1000	NR	NR	NR	960
Mean	971	990	945	<b>1067</b>	<b>889</b>	927	967	955	968		983				967
Median	971	990	945	1070	896	925	1000	929	968		1000				967
Std.Dev.	7	21	10	27	26	12	52	40	5		41				8
Rel.Std.Dev.	0.69%	2.12%	1.11%	2.49%	2.93%	1.31%	5.34%	4.19%	0.51%		4.15%				0.81%
PDM <sup>3</sup>	0.73%	2.73%	-1.94%	10.7%	-7.75%	-3.84%	0.31%	-0.88%	0.46%		2.04%				0.39%

Table A17. Analytical results for fusion Mo in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*MS	Lab B PF*MS	Lab C PF*MS	Lab D PF*MS	Lab E PF*MS	Lab F PF*MS	Lab G -	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N -	Lab O -
1	21.0	25.0	22.7	<b>23.8</b>	23.5	21.0	NR	<b>22.1</b>	22.0	21.0	23.0	NR	NR	NR	NR
2	23.0	20.0	21.8	23.1	22.2	22.0	NR	19.8	21.0	20.0	22.0	NR	NR	NR	NR
3	20.0	25.0	22.0	22.8	23.7	21.0	NR	20.0	22.0	19.0	22.0	NR	NR	NR	NR
4	22.0	20.0	21.9	22.8	19.7	21.0	NR	19.4	22.0	20.0	22.0	NR	NR	NR	NR
5	22.0	25.0	22.5	<b>21.0</b>	23.0	21.0	NR	20.7	20.0	19.0	22.0	NR	NR	NR	NR
6	23.0	20.0	22.7	23.2	21.8	20.0	NR	20.7	21.0	20.0	23.0	NR	NR	NR	NR
Mean	21.8	22.5	22.3	22.8	22.3	21.0		20.5	21.3	<b>19.8</b>	22.3				
Median	22.0	22.5	22.3	23.0	22.6	21.0		20.3	21.5	20.0	22.0				
Std.Dev.	1.2	2.7	0.4	0.9	1.5	0.6		1.0	0.8	0.8	0.5				
Rel.Std.Dev.	5.35%	12.2%	1.86%	4.16%	6.70%	3.01%		4.71%	3.83%	3.80%	2.31%				
PDM <sup>3</sup>	-0.08%	2.97%	1.90%	4.26%	2.05%	-3.90%		-6.37%	-2.37%	-9.24%	2.20%				

Table A18. Analytical results for fusion Nd in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*MS	Lab B PF*MS	Lab C PF*MS	Lab D PF*MS	Lab E PF*MS	Lab F PF*MS	Lab G PF*OES	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	380	466	448	434	475	390	<b>540</b>	NA	352	350	388	NR	NR	403	370
2	386	418	468	425	463	400	450	373	329	368	385	NR	NR	416	362
3	384	443	417	414	472	400	390	391	321	366	389	NR	NR	409	<b>333</b>
4	389	418	458	443	<b>422</b>	400	500	368	334	345	396	NR	NR	398	366
5	<b>369</b>	440	434	427	469	400	480	400	<b>357</b>	345	391	NR	NR	412	364
6	383	427	434	435	445	400	430	412	329	358	382	NR	NR	411	364
Mean	382	435	443	430	458	398	465	389	337	355	389			408	360
Median	383	434	441	431	466	400	465	391	332	354	389			410	364
Std.Dev.	7	18	19	10	20	4	53	18	14	10	5			6	13
Rel.Std.Dev.	1.80%	4.22%	4.18%	2.33%	4.43%	1.02%	11.4%	4.73%	4.23%	2.88%	1.25%			1.59%	3.70%
PDM <sup>3</sup>	-5.35%	7.92%	9.88%	6.52%	13.4%	-1.25%	15.3%	-3.67%	-16.5%	-11.9%	-3.69%			1.15%	-10.8%

Table A19. Analytical results for fusion Ni in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*OES	Lab B PF*OES	Lab C PF*OES	Lab D PF*MS	Lab E PF*OES	Lab F PF*MS	Lab G -	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O -
1	<20	<50	<b>26.0</b>	10.0	4.9	< 25	NR	<15	8.0	17.0	10.0	NR	NR	<20	NR
2	<20	<50	20.0	20.0	<2	< 25	NR	<15	10.0	<5	13.0	NR	NR	<20	NR
3	<20	<50	20.0	10.0	4.5	< 25	NR	<15	10.0	<5	10.0	NR	NR	<20	NR
4	<20	<50	21.0	10.0	4.1	< 25	NR	<15	10.0	14.0	15.0	NR	NR	<20	NR
5	<20	<50	20.0	20.0	9.0	< 25	NR	<15	10.0	<5	11.0	NR	NR	<20	NR
6	<20	<50	21.0	<20	2.8	< 25	NR	<15	11.0	<5	16.0	NR	NR	<20	NR
Mean	<20	<50	21.3	14.0	5.1	< 25		<15	9.8	15.5	12.5			<20	
Median	<20	<50	20.5	10.0	4.5	< 25		<15	10.0	15.5	12.0			<20	
Std.Dev.	-	-	2.3	5.5	2.3	-		-	1.0	2.1	2.6			-	
Rel.Std.Dev.	-	-	11.0%	39.1%	45.9%	-		-	10.0%	13.7%	20.7%			-	
PDM <sup>3</sup>	-	-	65.6%	8.65%	-60.6%	-		-	-23.7%	20.3%	-2.99%			-	

Table A20. Analytical results for fusion P in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*OES	Lab B PF*OES	Lab C PF*OES	Lab D PF*OES	Lab E PF*OES	Lab F -	Lab G -	Lab H BF*MS	Lab I BF*OES	Lab J -	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	<b>1100</b>	1400	1260	1000	1142	NR	NR	1222	1353	NR	1200	NR	NR	1244	1373
2	1300	1400	1250	900	1201	NR	NR	1135	1309	NR	1200	NR	NR	1205	1259
3	1400	<b>1600</b>	1260	1000	1104	NR	NR	1135	1309	NR	1300	NR	NR	1227	1272
4	1300	1400	<b>1310</b>	900	1062	NR	NR	1091	1309	NR	1300	NR	NR	1279	<b>1094</b>
5	1200	1500	<b>1290</b>	<b>800</b>	1204	NR	NR	1222	1309	NR	1300	NR	NR	1170	1340
6	1300	<b>1200</b>	1260	1000	1105	NR	NR	<b>1353</b>	1309	NR	1300	NR	NR	1261	1354
Mean	1267	1417	1272	<b>933</b>	1136			1193	1317		1267			1231	1282
Median	1300	1400	1260	950	1124			1178	1309		1300			1235	1306
Std.Dev.	103	133	23	82	57			94	18		52			40	103
Rel.Std.Dev.	8.15%	9.38%	1.82%	8.75%	5.0%			7.90%	1.35%		4.08%			3.22%	8.02%
PDM <sup>3</sup>	-0.12%	11.7%	0.28%	-26.4%	-10.4%			-5.94%	3.81%		-0.12%			-2.94%	1.10%

Table A21. Analytical results for fusion Pb in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*MS	Lab B PF*MS	Lab C PF*OES	Lab D PF*MS	Lab E PF*MS	Lab F PF*MS	Lab G -	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N -	Lab O -
1	27.0	20.0	<15	13.0	<b>24.5</b>	32.0	NR	<b>NA</b>	13.0	11.0	20.5	NR	NR	NR	NR
2	33.0	20.0	<15	<b>32.0</b>	17.9	30.0	NR	19.3	7.0	<b>14.0</b>	21.1	NR	NR	NR	NR
3	31.0	20.0	<15	15.0	14.4	26.0	NR	18.1	16.0	12.0	19.2	NR	NR	NR	NR
4	28.0	30.0	<15	15.0	11.9	27.0	NR	17.3	14.0	<b>10.0</b>	21.4	NR	NR	NR	NR
5	28.0	40.0	<15	22.0	13.5	21.0	NR	17.8	9.0	12.0	22.0	NR	NR	NR	NR
6	32.0	<b>50.0</b>	<15	18.0	13.6	22.0	NR	18.8	8.0	12.0	21.8	NR	NR	NR	NR
Mean	29.8	30.0	<15	19.2	16.0	26.3		18.3	11.2	11.8	21.0				
Median	29.5	25.0	<15	16.5	14.0	26.5		18.1	11.0	12.0	21.3				
Std.Dev.	2.5	12.6	-	7.0	4.6	4.3		0.8	3.7	1.3	1.0				
Rel.Std.Dev.	8.32%	42.2%	-	36.7%	29.0%	16.4%		4.38%	32.7%	11.2%	4.90%				
PDM <sup>3</sup>	53.2%	54.1%	-	-1.55%	-18.1%	35.3%		-6.09%	-42.6%	-39.2%	7.87%				

Table A22. Analytical results for fusion Pr in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*MS	Lab B PF*MS	Lab C PF*MS	Lab D PF*MS	Lab E PF*MS	Lab F PF*MS	Lab G PF*OES	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	120	158	153	134	158	130	130	NR	129	127	131	NR	NR	133	126
2	121	149	157	133	152	130	120	NR	121	133	129	NR	NR	136	124
3	123	148	139	130	156	130	<b>98</b>	NR	120	130	131	NR	NR	134	<b>115</b>
4	122	143	156	139	139	140	130	NR	125	123	133	NR	NR	131	126
5	118	153	149	133	158	140	120	NR	<b>141</b>	125	133	NR	NR	136	124
6	122	154	148	136	146	130	120	NR	124	128	129	NR	NR	138	123
Mean	121	151	150	134	151	133	120		127	127	131			135	123
Median	121	151	151	134	154	130	120		125	127	131			135	124
Std.Dev.	2	5	7	3	8	5	12		8	4	2			3	4
Rel.Std.Dev.	1.39%	3.49%	4.41%	2.28%	4.97%	3.87%	9.77%		6.1%	2.75%	1.29%			1.87%	3.18%
PDM <sup>3</sup>	-9.59%	12.7%	12.3%	0.24%	13.1%	-0.38%	-10.6%		-5.36%	-4.87%	-2.25%			0.65%	-8.21%



Table A23. Analytical results for fusion Sm in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*MS	Lab B PF*MS	Lab C PF*MS	Lab D PF*MS	Lab E PF*MS	Lab F PF*MS	Lab G PF*OES	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	48.2	59.0	56.7	50.5	59.3	49.0	<b>50.0</b>	NR	51.1	49.6	49.3	NR	NR	47.3	49.6
2	48.5	53.5	59.8	49.4	58.2	50.0	46.0	NR	49.5	49.6	48.7	NR	NR	48.6	47.6
3	48.9	56.5	52.9	47.9	59.7	50.0	<b>37.0</b>	NR	50.5	49.5	49.7	NR	NR	48.5	<b>42.9</b>
4	49.6	52.5	58.8	51.3	<b>51.9</b>	50.0	47.0	NR	52.0	47.8	50.1	NR	NR	46.9	47.9
5	48.2	56.0	56.0	49.3	58.6	51.0	46.0	NR	<b>47.4</b>	47.1	49.2	NR	NR	48.4	47.0
6	48.7	57.0	55.4	50.2	54.9	50.0	45.0	NR	50.6	48.6	48.7	NR	NR	49.6	48.5
Mean	48.7	<b>55.8</b>	<b>56.6</b>	49.8	<b>57.1</b>	50.0	45.2		50.2	48.7	49.3			48.2	47.3
Median	48.6	56.3	56.4	49.8	58.4	50.0	46.0		50.6	49.1	49.3			48.5	47.7
Std.Dev.	0.5	2.4	2.5	1.2	3.1	0.6	4.4		1.6	1.1	0.6			1.0	2.3
Rel.Std.Dev.	1.08%	4.27%	4.37%	2.36%	5.39%	1.26%	9.64%		3.17%	2.18%	1.12%			2.02%	4.85%
PDM <sup>3</sup>	-0.32%	14.2%	15.9%	1.90%	16.9%	2.38%	-7.52%		2.76%	-0.28%	0.91%			-1.24%	-3.22%

Table A24. Analytical results for fusion Tb in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*MS	Lab B PF*MS	Lab C PF*MS	Lab D PF*MS	Lab E PF*MS	Lab F PF*MS	Lab G -	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	5.10	6.40	6.10	5.50	7.62	< 8	NR	NR	5.60	6.09	6.77	NR	NR	5.63	5.29
2	5.04	6.00	<b>6.50</b>	5.30	7.30	< 8	NR	NR	5.90	5.92	6.68	NR	NR	5.70	5.00
3	4.89	6.40	5.70	<b>5.10</b>	7.59	< 8	NR	NR	6.00	5.86	6.82	NR	NR	5.55	4.69
4	5.17	5.60	6.20	5.50	6.70	< 8	NR	NR	6.10	5.97	6.76	NR	NR	5.43	5.08
5	5.07	6.20	6.00	5.40	7.49	< 8	NR	NR	5.70	<b>5.59</b>	6.76	NR	NR	5.61	5.31
6	4.97	6.00	6.00	5.50	7.10	< 8	NR	NR	6.00	5.88	<b>6.60</b>	NR	NR	5.74	5.24
Mean	5.04	6.10	6.08	5.38	7.30	< 8			5.88	5.89	6.73			5.61	5.10
Median	5.06	6.10	6.05	5.45	7.40	< 8			5.95	5.90	6.76			5.62	5.16
Std.Dev.	0.10	0.30	0.26	0.16	0.35	-			0.19	0.17	0.08			0.11	0.24
Rel.Std.Dev.	1.96%	4.97%	4.34%	2.98%	4.83%	-			3.30%	2.82%	1.17%			1.98%	4.66%
PDM <sup>3</sup>	-14.8%	3.08%	2.80%	-9.03%	23.4%	-			-0.58%	-0.55%	13.8%			-5.20%	-13.8%

Table A25. Analytical results for fusion Th in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*MS	Lab B PF*MS	Lab C PF*MS	Lab D PF*MS	Lab E PF*MS	Lab F PF*MS	Lab G -	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	33.1	37.5	40.3	<b>44.9</b>	40.3	35.0	NR	NR	36.0	38.5	38.1	NR	NR	39.4	34.1
2	33.5	36.5	40.5	32.8	39.2	35.0	NR	NR	36.5	35.6	38.2	NR	NR	<b>42.4</b>	34.6
3	33.5	36.0	<b>40.0</b>	32.9	39.2	35.0	NR	NR	37.2	34.9	38.5	NR	NR	38.6	38.2
4	33.4	34.0	40.4	33.8	40.9	35.0	NR	NR	37.7	36.8	38.7	NR	NR	38.2	35.9
5	<b>32.2</b>	36.0	40.6	33.3	<b>50.5</b>	35.0	NR	NR	38.5	33.0	38.6	NR	NR	37.2	33.9
6	33.4	35.0	40.5	33.4	40.7	35.0	NR	NR	36.5	34.4	38.2	NR	NR	39.1	36.6
Mean	33.2	35.8	40.4	35.2	41.8	35.0			37.1	35.5	38.4			39.2	35.6
Median	33.4	36.0	40.5	33.4	40.5	35.0			36.9	35.3	38.4			38.9	35.3
Std.Dev.	0.5	1.2	0.2	4.8	4.3	0.0			0.9	1.9	0.2			1.8	1.7
Rel.Std.Dev.	1.52%	3.38%	0.53%	13.6%	10.3%	0.00%			2.49%	5.42%	0.65%			4.52%	4.68%
PDM <sup>3</sup>	-9.43%	-2.20%	10.2%	-3.97%	14.1%	-4.47%			1.17%	-3.01%	4.76%			6.86%	-2.92%

Table A26. Analytical results for fusion Ti in OREAS 101a (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A PF*OES	Lab B PF*OES	Lab C PF*OES	Lab D PF*MS	Lab E PF*OES	Lab F PF*OES	Lab G PF*OES	Lab H BF*MS	Lab I BF*OES	Lab J -	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	0.400	0.410	0.393	0.431	0.372	0.410	0.410	NR	0.387	NR	0.410	NR	NR	0.384	0.395
2	0.400	0.400	0.396	0.449	0.367	0.420	0.420	NR	0.385	NR	0.410	NR	NR	0.390	0.396
3	0.390	0.410	0.394	0.453	0.367	0.400	0.400	NR	0.394	NR	0.410	NR	NR	0.390	0.391
4	0.400	<b>0.380</b>	0.395	0.463	<b>0.342</b>	0.410	0.380	NR	0.385	NR	0.410	NR	NR	0.390	0.395
5	0.400	0.410	0.394	0.469	0.369	0.410	0.390	NR	0.391	NR	0.410	NR	NR	0.384	0.390
6	0.400	0.390	0.394	0.458	0.369	0.400	0.390	NR	0.387	NR	0.410	NR	NR	0.384	0.390
Mean	0.398	0.400	0.394	<b>0.454</b>	0.364	0.408	0.398		0.388		0.410			0.387	0.393
Median	0.400	0.405	0.394	0.456	0.368	0.410	0.395		0.387		0.410			0.387	0.393
Std.Dev.	0.004	0.013	0.001	0.013	0.011	0.008	0.015		0.004		0.000			0.003	0.003
Rel.Std.Dev.	1.02%	3.16%	0.26%	2.92%	2.99%	1.84%	3.70%		0.96%		0.00%			0.85%	0.71%
PDM <sup>3</sup>	0.85%	1.28%	-0.16%	14.9%	-7.80%	3.38%	0.85%		-1.67%		3.81%			-2.09%	-0.58%

Table A27. Analytical results for fusion Tm in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*OES	Lab B PF*MS	Lab C PF*MS	Lab D -	Lab E PF*MS	Lab F PF*MS	Lab G PF*OES	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	2.70	3.40	3.00	NR	3.38	< 10	<b>2.90</b>	NR	2.96	2.79	2.83	NR	NR	2.99	2.77
2	2.70	3.20	3.10	NR	3.32	< 10	2.60	NR	2.91	2.83	2.81	NR	NR	3.00	<b>2.46</b>
3	2.80	3.20	2.80	NR	3.34	< 10	<b>2.00</b>	NR	2.84	2.89	2.84	NR	NR	3.06	2.70
4	2.80	3.00	3.00	NR	<b>2.90</b>	< 10	2.70	NR	3.08	2.76	2.86	NR	NR	2.97	2.55
5	2.60	3.20	2.90	NR	3.27	< 10	2.60	NR	2.79	2.67	2.83	NR	NR	3.06	2.71
6	2.70	3.00	2.90	NR	3.23	< 10	2.60	NR	2.86	2.78	2.89	NR	NR	3.08	2.70
Mean	2.72	3.17	2.95		3.24	< 10	2.57		2.91	2.79	2.84			3.03	2.65
Median	2.70	3.20	2.95		3.29	< 10	2.60		2.89	2.79	2.84			3.03	2.70
Std.Dev.	0.08	0.15	0.10		0.18	-	0.30		0.10	0.07	0.03			0.05	0.12
Rel.Std.Dev.	2.77%	4.75%	3.56%		5.47%	-	11.7%		3.55%	2.63%	0.99%			1.50%	4.42%
PDM <sup>3</sup>	-6.37%	9.14%	1.67%		11.7%	-	-11.5%		0.18%	-3.96%	-2.00%			4.31%	-8.77%

Table A28. Analytical results for fusion V in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*OES	Lab B PF*OES	Lab C PF*OES	Lab D PF*OES	Lab E PF*MS	Lab F PF*MS	Lab G -	Lab H BF*MS	Lab I BF*OES	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	72.0	100	75.0	80.0	81.4	90.0	NR	NR	77.0	86.0	101.0	NR	NR	77.0	72.2
2	79.0	100	75.0	80.0	80.3	93.0	NR	NR	79.0	91.0	83.0	NR	NR	77.0	<b>68.7</b>
3	76.0	100	76.0	80.0	80.8	94.0	NR	NR	81.0	90.0	79.0	NR	NR	74.0	71.3
4	76.0	100	74.0	80.0	<b>75.6</b>	95.0	NR	NR	79.0	83.0	93.0	NR	NR	70.0	72.0
5	81.0	100	76.0	90.0	81.4	97.0	NR	NR	76.0	83.0	88.0	NR	NR	73.0	72.4
6	75.0	100	75.0	90.0	80.9	96.0	NR	NR	77.0	91.0	104.0	NR	NR	75.0	70.0
Mean	76.5	<b>100</b>	75.2	83.3	80.1	94.2			78.2	87.3	91.3			74.3	71.1
Median	76.0	100	75.0	80.0	80.8	94.5			78.0	88.0	90.5			74.5	71.7
Std.Dev.	3.1	0	0.8	5.2	2.2	2.5			1.8	3.8	9.9			2.7	1.5
Rel.Std.Dev.	4.11%	0.00%	1.00%	6.20%	2.77%	2.64%			2.35%	4.39%	10.8%			3.58%	2.04%
PDM <sup>3</sup>	-7.82%	20.5%	-9.43%	0.42%	-3.51%	13.5%			-5.81%	5.24%	10.1%			-10.4%	-14.3%

Table A29. Analytical results for fusion Y in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*OES	Lab B PF*MS	Lab C PF*MS	Lab D PF*MS	Lab E PF*MS	Lab F PF*MS	Lab G -	Lab H BF*MS	Lab I BF*OES	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	178	194	186	188	200	170	NR	NR	178	<b>184</b>	188	NR	NR	177	182
2	<b>183</b>	181	184	189	192	170	NR	NR	176	177	191	NR	NR	179	182
3	175	196	184	193	200	180	NR	NR	181	174	190	NR	NR	176	180
4	176	187	183	195	172	180	NR	NR	179	176	187	NR	NR	<b>172</b>	181
5	176	199	183	192	196	180	NR	NR	<b>197</b>	168	191	NR	NR	179	180
6	177	193	<b>189</b>	191	187	170	NR	NR	178	172	189	NR	NR	181	180
Mean	178	192	185	191	191	175			182	175	189			177	181
Median	177	194	184	192	194	175			179	175	189			178	181
Std.Dev.	3	7	2	3	11	5			8	5	1			3	1
Rel.Std.Dev.	1.69%	3.42%	1.25%	1.35%	5.53%	3.13%			4.28%	3.09%	0.8%			1.71%	0.63%
PDM <sup>3</sup>	-2.80%	4.93%	1.19%	4.75%	4.67%	-4.19%			-0.63%	-4.15%	3.43%			-3.05%	-0.94%

Table A30. Analytical results for fusion Yb in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A PF*OES	Lab B PF*MS	Lab C PF*MS	Lab D PF*MS	Lab E PF*MS	Lab F PF*MS	Lab G -	Lab H BF*MS	Lab I BF*MS	Lab J BF*MS	Lab K BF*MS	Lab L -	Lab M -	Lab N BF*OES	Lab O BF*OES
1	17.1	16.0	21.3	17.4	22.0	18.0	NR	NR	18.7	18.5	19.0	NR	NR	18.1	16.7
2	17.5	15.3	21.8	17.3	21.1	18.0	NR	NR	17.9	17.2	18.8	NR	NR	18.6	<b>15.5</b>
3	17.1	16.3	<b>19.2</b>	<b>16.5</b>	21.5	18.0	NR	NR	18.0	17.1	19.1	NR	NR	17.9	16.5
4	17.6	15.0	21.4	17.7	19.0	19.0	NR	NR	18.4	18.1	19.1	NR	NR	18.2	16.2
5	17.3	15.1	20.6	17.3	21.6	18.0	NR	NR	17.5	15.9	18.8	NR	NR	18.1	16.3
6	17.3	16.1	20.5	17.7	20.5	18.0	NR	NR	18.0	17.3	19.1	NR	NR	<b>18.7</b>	17.1
Mean	17.3	15.6	<b>20.8</b>	17.3	<b>20.9</b>	18.2			18.1	17.3	19.0			18.3	16.4
Median	17.3	15.7	21.0	17.4	21.3	18.0			18.0	17.2	19.0			18.1	16.4
Std.Dev.	0.2	0.6	0.9	0.4	1.1	0.4			0.4	0.9	0.2			0.3	0.6
Rel.Std.Dev.	1.18%	3.61%	4.46%	2.54%	5.25%	2.25%			2.30%	5.33%	0.87%			1.75%	3.41%
PDM <sup>3</sup>	-1.16%	-10.8%	18.7%	-1.16%	19.5%	3.69%			3.21%	-1.12%	8.16%			4.19%	-6.50%

Table A31. Analytical results for 4-acid U in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*OES	Lab H 4A*MS	Lab I 4A*MS	Lab J 4A*MS	Lab K 4A*MS	Lab L 4A*MS	Lab M 4A*MS	Lab N 4A*MS	Lab O 4A*OES
1	421	420	397	411	487	370	<b>418</b>	421	<b>398</b>	340	384	<b>427</b>	335	431	<b>405</b>
2	425	406	397	412	479	370	395	417	430	340	386	377	337	413	411
3	408	422	394	406	487	380	405	422	432	337	<b>372</b>	375	337	442	414
4	426	412	397	417	469	370	405	397	432	<b>332</b>	394	368	330	429	412
5	414	425	<b>382</b>	406	444	380	398	395	417	<b>347</b>	395	387	332	411	<b>428</b>
6	418	415	388	423	443	370	404	399	442	339	395	389	330	439	414
Mean	419	417	393	413	468	373	404	409	425	<b>339</b>	388	387	<b>334</b>	427	414
Median	419	418	396	412	474	370	405	408	431	340	390	382	334	430	413
Std.Dev.	7	7	6	7	20	5	8	13	16	5	9	21	3	13	8
Rel.Std.Dev.	1.60%	1.69%	1.58%	1.60%	4.36%	1.38%	1.96%	3.11%	3.65%	1.44%	2.33%	5.43%	0.98%	3.06%	1.89%
PDM <sup>3</sup>	1.99%	1.54%	-4.35%	0.52%	14.1%	-9.02%	-1.51%	-0.44%	3.6%	-17.3%	-5.53%	-5.65%	-18.7%	4.11%	0.91%

Table A32. Analytical results for 4-acid Ce in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*OES	Lab E 4A*MS	Lab F 4A*OES	Lab G 4A*OES	Lab H 4A*MS	Lab I 4A*MS	Lab J 4A*MS	Lab K 4A*MS	Lab L 4A*MS	Lab M 4A*MS	Lab N 4A*MS	Lab O 4A*OES
1	1255	1410	1442	<b>750</b>	1618	1300	>1000	NR	<b>1140</b>	>500	>500	>500	>500	1300	1414
2	1343	1480	1462	<b>750</b>	1609	1200	>1000	NR	1380	>500	>500	>500	>500	1261	1422
3	1186	1510	1445	1400	1618	1300	>1000	NR	1390	>500	>500	>500	>500	1297	1432
4	1188	1470	1382	1410	1572	1200	>1000	NR	1410	>500	>500	>500	>500	1300	1434
5	1193	1430	1366	1390	<b>1488</b>	1300	>1000	NR	1370	>500	>500	>500	>500	1239	<b>1461</b>
6	1281	1500	1378	1420	<b>1449</b>	1300	>1000	NR	1410	>500	>500	>500	>500	1362	1433
Mean	1241	1467	1413	1187	1559	1267			1350					1293	1433
Median	1224	1475	1412	1395	1590	1300			1385					1299	1432
Std.Dev.	64	39	42	338	73	52			104					42	16
Rel.Std.Dev.	5.13%	2.68%	2.95%	28.5%	4.68%	4.08%			7.71%					3.25%	1.12%
PDM <sup>3</sup>	-10.7%	5.53%	1.64%	-14.6%	12.2%	-8.86%			-2.86%					-6.95%	3.08%

Table A33. Analytical results for 4-acid Co in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*OES	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*OES	Lab G 4A*OES	Lab H 4A*MS	Lab I 4A*OES	Lab J 4A*MS	Lab K 4A*MS	Lab L 4A*MS	Lab M 4A*MS	Lab N 4A*MS	Lab O 4A*OES
1	45.3	50.0	44.5	48.4	52.7	49.0	52.0	NR	47.0	43.2	45.8	<b>49.5</b>	41.4	49.0	46.5
2	45.1	50.0	45.6	49.2	51.8	48.0	49.0	NR	47.0	43.7	46.3	44.7	42.5	48.0	46.9
3	47.6	50.0	44.5	48.7	53.7	47.0	51.0	NR	48.0	<b>41.2</b>	44.7	44.3	42.8	48.0	46.0
4	<b>50.2</b>	50.0	43.7	49.0	51.3	46.0	50.0	NR	49.0	42.4	46.8	43.7	<b>39.1</b>	47.0	48.0
5	46.9	50.0	43.7	47.7	48.5	50.0	49.0	NR	48.0	43.3	47.8	44.9	41.5	48.0	47.6
6	45.3	45.0	44.1	48.9	47.5	49.0	50.0	NR	<b>52.0</b>	42.7	47.0	46.0	42.2	47.0	48.7
Mean	46.7	49.2	44.4	48.7	50.9	48.2	50.2		48.5	42.8	46.4	45.5	41.6	47.8	47.3
Median	46.1	50.0	44.3	48.8	51.6	48.5	50.0		48.0	43.0	46.6	44.8	41.9	48.0	47.3
Std.Dev.	2.0	2.0	0.7	0.5	2.4	1.5	1.2		1.9	0.9	1.1	2.1	1.3	0.8	1.0
Rel.Std.Dev.	4.23%	4.15%	1.60%	1.11%	4.76%	3.06%	2.33%		3.86%	2.08%	2.31%	4.60%	3.21%	1.57%	2.14%
PDM <sup>3</sup>	-0.36%	4.83%	-5.44%	3.73%	8.55%	2.70%	6.96%		3.41%	-8.85%	-1.07%	-2.95%	-11.3%	1.99%	0.77%

Table A34. Analytical results for 4-acid Cu in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*OES	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*OES	Lab F 4A*OES	Lab G 4A*OES	Lab H 4A*MS	Lab I 4A*OES	Lab J 4A*MS	Lab K 4A*MS	Lab L 4A*MS	Lab M 4A*MS	Lab N 4A*MS	Lab O 4A*OES
1	434	420	426	417	380	500	454	NR	391	407	422	<b>447</b>	410	451	427
2	435	418	441	423	381	510	444	NR	409	395	417	400	413	440	431
3	432	424	430	418	380	<b>520</b>	426	NR	403	398	408	397	413	451	433
4	<b>413</b>	418	413	420	384	510	451	NR	386	399	428	392	413	446	432
5	435	418	417	413	377	<b>530</b>	436	NR	402	404	428	397	411	441	<b>449</b>
6	428	418	423	422	384	500	436	NR	434	407	432	410	<b>408</b>	463	437
Mean	430	419	425	419	381	<b>512</b>	441		404	402	423	407	411	448	435
Median	433	418	425	419	381	510	440		403	402	425	399	412	448	432
Std.Dev.	9	2	10	4	3	12	11		17	5	9	20	2	8	8
Rel.Std.Dev.	1.98%	0.58%	2.34%	0.87%	0.68%	2.28%	2.38%		4.17%	1.26%	2.09%	5.01%	0.50%	1.86%	1.74%
PDM <sup>3</sup>	2.67%	0.24%	1.60%	0.12%	-8.87%	22.3%	5.46%		-3.38%	-3.98%	1.00%	-2.67%	-1.67%	7.21%	3.92%

Table A35. Analytical results for 4-acid Dy in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E -	Lab F 4A*MS	Lab G -	Lab H 4A*MS	Lab I 4A*MS	Lab J -	Lab K 4A*MS	Lab L 4A*MS	Lab M -	Lab N -	Lab O -
1	27.1	32.5	26.1	26.5	NR	35.0	NR	NR	<b>23.4</b>	NR	22.6	<b>34.7</b>	NR	NR	NR
2	<b>28.7</b>	30.5	27.1	26.8	NR	34.0	NR	NR	26.1	NR	23.1	31.8	NR	NR	NR
3	25.8	33.2	27.7	26.5	NR	35.0	NR	NR	26.4	NR	21.1	31.0	NR	NR	NR
4	25.9	30.9	28.2	26.2	NR	33.0	NR	NR	26.3	NR	23.4	30.4	NR	NR	NR
5	25.6	30.0	26.4	26.1	NR	34.0	NR	NR	25.6	NR	24.3	31.8	NR	NR	NR
6	26.5	32.3	27.7	26.3	NR	33.0	NR	NR	26.5	NR	23.8	32.0	NR	NR	NR
Mean	26.6	31.6	27.2	26.4		34.0			25.7		23.1	32.0			
Median	26.2	31.6	27.4	26.4		34.0			26.2		23.3	31.8			
Std.Dev.	1.2	1.3	0.8	0.3		0.9			1.2		1.1	1.5			
Rel.Std.Dev.	4.36%	4.04%	3.00%	0.96%		2.63%			4.58%		4.85%	4.62%			
PDM <sup>3</sup>	-5.85%	11.8%	-3.74%	-6.53%		20.4%			-8.95%		-18.4%	13.1%			

Table A36. Analytical results for 4-acid Er in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E -	Lab F 4A*MS	Lab G -	Lab H 4A*MS	Lab I 4A*MS	Lab J -	Lab K 4A*MS	Lab L 4A*MS	Lab M -	Lab N -	Lab O -
1	14.5	16.2	15.3	15.4	NR	21.0	NR	NR	<b>14.9</b>	NR	13.4	<b>20.2</b>	NR	NR	NR
2	14.7	15.3	15.7	15.4	NR	20.0	NR	NR	16.1	NR	13.7	18.4	NR	NR	NR
3	13.8	16.1	15.8	15.6	NR	21.0	NR	NR	17.0	NR	<b>12.4</b>	17.9	NR	NR	NR
4	14.1	15.4	16.6	15.4	NR	19.0	NR	NR	17.0	NR	13.8	17.6	NR	NR	NR
5	14.3	15.0	15.2	<b>15.0</b>	NR	20.0	NR	NR	16.6	NR	14.3	18.2	NR	NR	NR
6	14.2	15.9	15.8	15.6	NR	19.0	NR	NR	16.9	NR	13.9	18.5	NR	NR	NR
Mean	14.3	15.7	15.7	15.4		20.0			16.4		13.6	18.5			
Median	14.2	15.7	15.7	15.4		20.0			16.8		13.7	18.3			
Std.Dev.	0.3	0.5	0.5	0.2		0.9			0.8		0.6	0.9			
Rel.Std.Dev.	2.35%	3.10%	3.30%	1.42%		4.47%			4.98%		4.73%	4.94%			
PDM <sup>3</sup>	-12.0%	-3.51%	-3.01%	-5.05%		23.3%			1.21%		-16.4%	13.8%			

Table A37. Analytical results for 4-acid Eu in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E -	Lab F 4A*MS	Lab G -	Lab H 4A*MS	Lab I 4A*MS	Lab J -	Lab K 4A*MS	Lab L 4A*MS	Lab M -	Lab N -	Lab O -
1	7.70	8.65	8.01	7.56	NR	8.70	NR	NR	<b>7.62</b>	NR	7.85	<b>10.5</b>	NR	NR	NR
2	8.14	8.65	8.15	7.61	NR	8.40	NR	NR	8.56	NR	8.06	9.27	NR	NR	NR
3	7.35	9.25	8.44	7.50	NR	8.80	NR	NR	8.72	NR	<b>7.42</b>	9.27	NR	NR	NR
4	7.38	8.85	8.56	7.47	NR	8.40	NR	NR	8.77	NR	8.22	9.00	NR	NR	NR
5	7.57	8.55	7.91	7.46	NR	9.00	NR	NR	8.52	NR	8.54	9.41	NR	NR	NR
6	7.77	9.00	8.44	7.57	NR	8.60	NR	NR	8.83	NR	8.18	9.51	NR	NR	NR
Mean	7.65	8.83	8.25	7.53		8.65			8.50		8.05	9.49			
Median	7.64	8.75	8.30	7.53		8.65			8.64		8.12	9.34			
Std.Dev.	0.29	0.26	0.27	0.06		0.23			0.45		0.38	0.50			
Rel.Std.Dev.	3.82%	2.99%	3.21%	0.80%		2.71%			5.28%		4.73%	5.30%			
PDM <sup>3</sup>	-8.70%	5.30%	-1.54%	-10.2%		3.21%			1.46%		-4.01%	13.2%			

Table A38. Analytical results for 4-acid Fe in OREAS 101a (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A 4A*OES	Lab B 4A*OES	Lab C 4A*OES	Lab D 4A*OES	Lab E 4A*OES	Lab F 4A*OES	Lab G -	Lab H 4A*MS	Lab I 4A*OES	Lab J 4A*MS	Lab K 4A*MS	Lab L 4A*MS	Lab M 4A*MS	Lab N 4A*MS	Lab O 4A*OES
1	11.96	12.10	10.97	9.41	9.08	11.00	NR	NR	10.40	10.30	11.20	10.50	10.65	11.22	10.98
2	11.78	11.80	11.14	9.25	9.29	12.00	NR	NR	10.80	9.89	10.60	9.75	10.80	10.94	11.02
3	11.97	12.00	11.21	<b>17.30</b>	9.20	11.00	NR	NR	10.80	9.81	10.70	9.47	10.60	11.11	11.13
4	11.48	11.90	10.92	<b>17.59</b>	<b>8.78</b>	12.00	NR	NR	10.50	10.10	11.10	9.36	10.80	11.09	11.10
5	11.88	11.90	10.74	<b>16.58</b>	9.08	12.00	NR	NR	11.30	10.35	11.30	9.74	10.70	10.94	11.37
6	11.57	11.60	11.09	<b>17.30</b>	9.27	11.00	NR	NR	11.90	10.25	11.00	9.91	10.65	11.31	11.17
Mean	11.77	11.88	11.01	14.57	9.12	11.50			10.95	10.12	10.98	9.79	10.70	11.10	11.13
Median	11.83	11.90	11.03	16.94	9.14	11.50			10.80	10.18	11.05	9.75	10.68	11.10	11.11
Std.Dev.	0.21	0.17	0.17	4.07	0.19	0.55			0.56	0.22	0.28	0.40	0.08	0.15	0.14
Rel.Std.Dev.	1.75%	1.45%	1.55%	28.0%	2.07%	4.76%			5.13%	2.22%	2.54%	4.11%	0.78%	1.34%	1.23%
PDM <sup>3</sup>	9.76%	10.8%	2.65%	35.8%	-15.0%	7.21%			2.08%	-5.69%	2.39%	-8.75%	-0.25%	3.49%	3.75%



Table A39. Analytical results for 4-acid Gd in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E -	Lab F 4A*MS	Lab G -	Lab H 4A*MS	Lab I 4A*MS	Lab J -	Lab K 4A*MS	Lab L 4A*MS	Lab M -	Lab N -	Lab O -
1	35.5	<b>39.8</b>	36.8	36.4	NR	52.0	NR	NR	<b>36.3</b>	NR	41.4	53.3	NR	NR	NR
2	<b>37.7</b>	37.2	38.2	36.7	NR	51.0	NR	NR	42.2	NR	42.9	48.4	NR	NR	NR
3	34.5	37.8	39.7	36.5	NR	53.0	NR	NR	42.1	NR	<b>38.9</b>	46.9	NR	NR	NR
4	34.6	37.8	41.4	36.3	NR	50.0	NR	NR	41.6	NR	43.9	46.7	NR	NR	NR
5	34.7	37.0	38.1	<b>35.9</b>	NR	54.0	NR	NR	42.2	NR	44.3	48.3	NR	NR	NR
6	35.6	37.8	40.8	36.3	NR	52.0	NR	NR	42.7	NR	43.7	49.9	NR	NR	NR
Mean	35.4	37.9	39.2	36.4		52.0			41.2		42.5	48.9			
Median	35.1	37.8	39.0	36.4		52.0			42.2		43.3	48.4			
Std.Dev.	1.2	1.0	1.8	0.3		1.4			2.4		2.0	2.4			
Rel.Std.Dev.	3.44%	2.62%	4.50%	0.73%		2.72%			5.87%		4.82%	4.99%			
PDM <sup>3</sup>	-15.2%	-9.33%	-6.31%	-13.0%		24.4%			-1.48%		1.71%	17.0%			

Table A40. Analytical results for 4-acid Ho in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E -	Lab F 4A*MS	Lab G -	Lab H 4A*MS	Lab I 4A*MS	Lab J -	Lab K 4A*MS	Lab L 4A*MS	Lab M -	Lab N -	Lab O -
1	5.28	5.70	4.72	4.68	NR	5.40	NR	NR	<b>5.20</b>	NR	4.31	<b>6.56</b>	NR	NR	NR
2	5.39	5.64	4.86	<b>4.81</b>	NR	5.40	NR	NR	5.80	NR	4.43	5.92	NR	NR	NR
3	5.10	5.76	4.90	4.73	NR	5.50	NR	NR	6.00	NR	<b>4.05</b>	5.78	NR	NR	NR
4	5.01	5.48	5.11	4.69	NR	5.50	NR	NR	6.00	NR	4.51	5.72	NR	NR	NR
5	5.07	5.46	4.69	4.64	NR	<b>5.70</b>	NR	NR	5.80	NR	4.54	5.91	NR	NR	NR
6	5.16	5.36	5.00	4.67	NR	5.40	NR	NR	6.10	NR	4.52	5.94	NR	NR	NR
Mean	5.17	5.57	4.88	4.70		5.48			5.82		4.39	5.97			
Median	5.13	5.56	4.88	4.69		5.45			5.90		4.47	5.92			
Std.Dev.	0.14	0.16	0.16	0.06		0.12			0.33		0.19	0.30			
Rel.Std.Dev.	2.75%	2.81%	3.30%	1.27%		2.13%			5.59%		4.29%	5.04%			
PDM <sup>3</sup>	-1.54%	6.05%	-7.03%	-10.4%		4.46%			10.8%		-16.3%	13.8%			

Table A41. Analytical results for 4-acid K in OREAS 101a (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A 4A*OES	Lab B 4A*OES	Lab C 4A*OES	Lab D 4A*OES	Lab E 4A*OES	Lab F -	Lab G -	Lab H 4A*MS	Lab I 4A*OES	Lab J 4A*MS	Lab K 4A*MS	Lab L 4A*MS	Lab M 4A*MS	Lab N 4A*MS	Lab O 4A*OES
1	2.50	2.24	2.41	2.32	2.15	NR	NR	NR	1.79	2.02	2.24	<b>2.50</b>	2.07	2.22	2.20
2	2.47	2.22	2.44	2.34	2.15	NR	NR	NR	1.94	1.96	2.21	2.21	2.08	2.11	2.26
3	2.49	<b>2.26</b>	2.45	2.31	2.13	NR	NR	NR	2.16	1.98	2.16	2.19	2.08	2.18	2.21
4	<b>2.23</b>	2.23	2.41	2.37	2.16	NR	NR	NR	2.13	1.98	2.26	2.16	2.08	2.13	2.24
5	2.49	2.23	<b>2.32</b>	2.29	<b>2.11</b>	NR	NR	NR	2.35	2.02	2.26	2.22	2.08	2.13	2.34
6	2.46	2.23	2.44	2.36	2.17	NR	NR	NR	2.50	2.03	2.29	2.25	2.06	2.20	2.33
Mean	<b>2.44</b>	2.24	2.41	2.33	2.14				2.15	2.00	2.24	2.26	2.08	2.16	2.26
Median	2.48	2.23	2.42	2.33	2.15				2.15	2.00	2.25	2.22	2.08	2.16	2.25
Std.Dev.	0.10	0.01	0.05	0.03	0.02				0.26	0.03	0.05	0.12	0.01	0.04	0.06
Rel.Std.Dev.	4.26%	0.62%	1.98%	1.31%	1.00%				12.1%	1.43%	2.05%	5.49%	0.40%	2.06%	2.66%
PDM <sup>3</sup>	10.8%	1.48%	9.46%	5.86%	-2.64%				-2.61%	-9.27%	1.55%	2.38%	-5.79%	-1.85%	2.70%

Table A42. Analytical results for 4-acid La in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*OES	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*OES	Lab H 4A*MS	Lab I 4A*MS	Lab J 4A*MS	Lab K 4A*MS	Lab L 4A*MS	Lab M 4A*MS	Lab N 4A*MS	Lab O 4A*OES
1	773	851	970	<b>422</b>	900	770	850	NR	<b>618</b>	720	>500	<b>860</b>	730	775	852
2	826	831	983	<b>416</b>	884	790	860	NR	778	710	>500	760	740	756	861
3	731	844	973	787	892	770	800	NR	796	720	>500	750	730	778	868
4	727	862	936	798	864	800	880	NR	798	710	>500	750	740	770	856
5	743	853	914	776	813	790	810	NR	783	730	>500	780	730	742	875
6	782	864	941	800	805	760	890	NR	798	720	>500	780	730	801	868
Mean	764	851	953	667	860	780	848		762	718	>500	780	733	770	864
Median	758	852	956	782	874	780	855		790	720	>500	770	730	772	865
Std.Dev.	38	12	27	192	41	15	37		71	8	-	41	5	20	8
Rel.Std.Dev.	4.95%	1.43%	2.79%	28.8%	4.80%	1.99%	4.31%		9.32%	1.05%	-	5.32%	0.70%	2.61%	0.98%
PDM <sup>3</sup>	-5.34%	5.48%	18.1%	-17.4%	6.58%	-3.30%	5.18%		-5.55%	-10.9%	-	-3.30%	-9.08%	-4.49%	7.06%

Table A43. Analytical results for 4-acid Lu in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*OES	Lab H -	Lab I 4A*MS	Lab J -	Lab K 4A*MS	Lab L 4A*MS	Lab M -	Lab N -	Lab O -
1	1.84	2.18	1.86	1.60	2.31	1.90	2.30	NR	<b>1.80</b>	NR	1.63	<b>2.48</b>	NR	NR	NR
2	1.85	2.12	1.90	1.70	2.31	1.90	2.40	NR	2.00	NR	1.68	2.21	NR	NR	NR
3	1.75	2.16	1.91	1.70	2.38	1.90	2.30	NR	2.00	NR	<b>1.50</b>	2.20	NR	NR	NR
4	1.77	2.06	2.01	1.70	2.23	1.90	2.20	NR	2.10	NR	1.69	<b>2.14</b>	NR	NR	NR
5	1.83	2.02	1.85	1.70	2.12	2.00	2.20	NR	2.00	NR	1.73	2.23	NR	NR	NR
6	1.81	2.12	1.96	1.60	2.13	1.90	2.40	NR	2.10	NR	1.69	2.24	NR	NR	NR
Mean	1.81	2.11	1.92	1.67	2.25	1.92	2.30		2.00		1.65	2.25			
Median	1.82	2.12	1.91	1.70	2.27	1.90	2.30		2.00		1.69	2.22			
Std.Dev.	0.04	0.06	0.06	0.05	0.11	0.04	0.09		0.11		0.08	0.12			
Rel.Std.Dev.	2.33%	2.86%	3.18%	3.10%	4.69%	2.13%	3.89%		5.48%		4.94%	5.24%			
PDM <sup>3</sup>	-9.16%	6.00%	-3.80%	-16.3%	12.8%	-3.71%	15.5%		0.47%		-16.9%	13.0%			

Table A44. Analytical results for 4-acid Mg in OREAS 101a (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A 4A*OES	Lab B 4A*OES	Lab C 4A*OES	Lab D 4A*OES	Lab E 4A*OES	Lab F 4A*OES	Lab G -	Lab H 4A*MS	Lab I 4A*OES	Lab J 4A*MS	Lab K 4A*MS	Lab L 4A*MS	Lab M 4A*MS	Lab N 4A*MS	Lab O 4A*OES
1	1.31	1.23	1.24	1.24	1.09	1.20	NR	1.30	<b>1.06</b>	1.07	1.21	<b>1.25</b>	1.11	1.22	1.22
2	1.30	1.21	1.22	1.24	1.09	1.20	NR	1.25	1.17	1.05	1.19	1.11	1.13	1.19	1.23
3	1.30	1.22	1.24	1.21	1.08	1.20	NR	1.27	1.16	1.06	1.17	1.09	1.11	1.20	1.23
4	<b>1.23</b>	1.21	1.24	1.23	1.08	1.20	NR	<b>1.18</b>	1.13	1.05	1.23	1.08	1.12	1.20	1.23
5	1.29	1.21	1.19	1.20	1.08	1.20	NR	1.27	1.15	1.08	1.24	1.12	1.11	1.18	1.22
6	1.28	1.22	1.22	1.24	1.11	1.20	NR	1.32	<b>1.23</b>	1.06	1.22	1.13	1.11	1.23	1.23
Mean	1.29	1.22	1.23	1.23	1.09	1.20		1.27	1.15	<b>1.06</b>	1.21	1.13	1.12	1.20	1.23
Median	1.30	1.22	1.23	1.24	1.09	1.20		1.27	1.16	1.06	1.22	1.12	1.11	1.20	1.23
Std.Dev.	0.03	0.01	0.02	0.02	0.01	0.00		0.05	0.06	0.01	0.03	0.06	0.01	0.02	0.00
Rel.Std.Dev.	2.21%	0.67%	1.58%	1.43%	0.85%	0.00%		3.83%	4.83%	1.10%	2.16%	5.46%	0.75%	1.55%	0.37%
PDM <sup>3</sup>	7.48%	1.69%	2.50%	2.53%	-8.98%	0.30%		5.73%	-3.88%	-11.3%	1.14%	-5.55%	-6.80%	0.58%	2.75%

Table A45. Analytical results for 4-acid Mn in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*OES	Lab B 4A*OES	Lab C 4A*OES	Lab D 4A*MS	Lab E 4A*OES	Lab F 4A*OES	Lab G -	Lab H 4A*MS	Lab I 4A*OES	Lab J 4A*MS	Lab K 4A*MS	Lab L 4A*MS	Lab M 4A*MS	Lab N 4A*MS	Lab O 4A*OES
1	993	980	902	990	819	920	NR	1040	1000	898	975	<b>1010</b>	881	988	1056
2	980	986	923	1000	829	960	NR	1004	996	882	951	903	894	994	1067
3	993	984	922	986	823	970	NR	1030	997	886	945	887	876	992	1053
4	<b>927</b>	986	902	989	818	940	NR	957	975	878	980	882	888	970	1068
5	994	994	878	977	817	1000	NR	1002	983	901	995	916	879	966	1037
6	978	992	911	998	<b>839</b>	970	NR	1004	<b>1080</b>	892	971	924	876	1018	1054
Mean	978	987	906	990	<b>824</b>	960		1006	1005	<b>890</b>	970	920	<b>882</b>	988	1056
Median	987	986	907	990	821	965		1004	997	889	973	910	880	990	1055
Std.Dev.	26	5	17	8	9	28		29	38	9	19	47	7	19	11
Rel.Std.Dev.	2.63%	0.52%	1.84%	0.85%	1.05%	2.87%		2.87%	3.77%	1.02%	1.92%	5.09%	0.82%	1.90%	1.07%
PDM <sup>3</sup>	0.09%	1.06%	-7.20%	1.37%	-15.6%	-1.70%		3.02%	2.92%	-8.92%	-0.73%	-5.77%	-9.66%	1.16%	8.12%

Table A46. Analytical results for 4-acid Mo in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*OES	Lab G 4A*OES	Lab H 4A*MS	Lab I 4A*MS	Lab J 4A*MS	Lab K 4A*MS	Lab L 4A*MS	Lab M 4A*MS	Lab N 4A*MS	Lab O 4A*OES
1	21.6	20.5	21.6	17.8	23.8	<b>27.0</b>	20.0	19.4	18.1	19.6	17.5	<b>24.4</b>	21.6	19.3	20.9
2	21.8	21.0	21.1	18.8	22.5	<b>26.0</b>	20.0	19.9	18.4	19.5	18.4	21.3	21.7	18.9	20.8
3	21.8	20.5	21.5	18.2	23.0	21.0	20.0	19.7	19.3	18.2	17.3	20.9	<b>22.8</b>	18.7	20.5
4	21.8	21.0	20.8	17.2	22.0	24.0	19.0	<b>18.5</b>	19.1	18.7	18.5	20.7	21.8	19.2	21.4
5	<b>21.1</b>	21.0	20.4	17.4	21.2	24.0	20.0	19.6	<b>16.7</b>	19.9	18.5	22.1	22.0	18.8	21.3
6	21.4	21.0	20.9	17.7	20.3	23.0	21.0	20.2	19.3	19.1	18.6	21.7	21.8	18.9	21.3
Mean	21.6	20.8	21.1	17.9	22.1	24.2	20.0	19.6	18.5	19.1	18.1	21.9	22.0	19.0	21.0
Median	21.7	21.0	21.0	17.8	22.2	24.0	20.0	19.7	18.8	19.3	18.4	21.5	21.8	18.9	21.1
Std.Dev.	0.3	0.3	0.5	0.6	1.3	2.1	0.6	0.6	1.0	0.6	0.6	1.4	0.4	0.2	0.3
Rel.Std.Dev.	1.32%	1.24%	2.14%	3.24%	5.75%	8.84%	3.16%	2.98%	5.44%	3.26%	3.12%	6.18%	1.99%	1.23%	1.62%
PDM <sup>3</sup>	5.99%	2.30%	3.37%	-12.3%	8.69%	18.7%	-1.79%	-4.00%	-9.24%	-6.04%	-11.2%	7.30%	7.79%	-6.86%	3.15%

Table A47. Analytical results for 4-acid Nd in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E -	Lab F 4A*MS	Lab G -	Lab H 4A*MS	Lab I 4A*MS	Lab J -	Lab K 4A*MS	Lab L 4A*MS	Lab M -	Lab N -	Lab O -
1	358	413	389	410	NR	360	NR	390	<b>354</b>	NR	349	<b>493</b>	NR	NR	NR
2	385	430	394	415	NR	350	NR	400	411	NR	366	438	NR	NR	NR
3	340	437	404	409	NR	<b>330</b>	NR	406	425	NR	332	436	NR	NR	NR
4	347	421	420	406	NR	370	NR	<b>367</b>	420	NR	366	426	NR	NR	NR
5	358	415	385	405	NR	370	NR	386	414	NR	385	445	NR	NR	NR
6	373	443	410	409	NR	360	NR	395	425	NR	375	449	NR	NR	NR
Mean	360	427	400	409		357		391	408		362	448			
Median	358	426	399	409		360		393	417		366	442			
Std.Dev.	17	12	13	4		15		14	27		19	24			
Rel.Std.Dev.	4.62%	2.85%	3.33%	0.86%		4.22%		3.46%	6.65%		5.24%	5.25%			
PDM <sup>3</sup>	-9.24%	7.42%	0.82%	3.01%		-10.2%		-1.62%	2.80%		-8.78%	12.8%			

Table A48. Analytical results for 4-acid Ni in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*OES	Lab B 4A*OES	Lab C 4A*OES	Lab D 4A*MS	Lab E 4A*OES	Lab F 4A*OES	Lab G 4A*OES	Lab H 4A*MS	Lab I 4A*OES	Lab J 4A*MS	Lab K 4A*MS	Lab L 4A*MS	Lab M 4A*MS	Lab N 4A*MS	Lab O 4A*OES
1	7.00	22.0	8.40	9.00	5.75	< 20	11.0	5.50	8.00	7.90	8.40	<b>9.20</b>	8.60	9.00	8.78
2	7.00	18.0	8.30	9.00	5.60	< 20	10.0	6.10	10.0	8.00	7.40	7.40	8.50	9.50	8.95
3	<b>12.00</b>	22.0	8.30	9.00	6.26	< 20	<10	5.50	10.0	7.50	7.90	6.50	9.00	<b>7.40</b>	9.48
4	6.00	20.0	8.00	<b>13.00</b>	5.34	< 20	12.0	6.10	10.0	7.50	7.90	6.90	8.30	9.30	9.20
5	7.00	22.0	8.10	9.00	5.20	< 20	<10	6.20	10.0	7.90	7.50	7.50	8.70	8.70	8.73
6	<b>9.00</b>	22.0	8.30	9.00	5.50	< 20	11.00	6.00	11.0	8.00	7.90	7.40	8.30	9.10	9.01
Mean	8.00	<b>21.0</b>	8.23	9.67	5.61		11.0	5.90	9.83	7.80	7.83	7.48	8.57	8.83	9.02
Median	7.00	22.0	8.30	9.00	5.55		11.0	6.05	10.0	7.90	7.90	7.40	8.55	9.05	8.98
Std.Dev.	2.19	1.7	0.15	1.63	0.37		0.82	0.32	0.98	0.24	0.36	0.92	0.27	0.75	0.28
Rel.Std.Dev.	27.4%	7.97%	1.83%	16.9%	6.67%		7.42%	5.36%	10.0%	3.03%	4.54%	12.3%	3.10%	8.52%	3.09%
PDM <sup>3</sup>	-1.71%	158%	1.15%	18.8%	-31.1%		35.1%	-27.5%	20.8%	-4.17%	-3.76%	-8.1%	5.25%	8.53%	10.9%

Table A49. Analytical results for 4-acid P in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*OES	Lab B 4A*OES	Lab C 4A*OES	Lab D 4A*OES	Lab E 4A*OES	Lab F 4A*OES	Lab G 4A*OES	Lab H 4A*MS	Lab I 4A*OES	Lab J 4A*MS	Lab K 4A*MS	Lab L 4A*MS	Lab M 4A*MS	Lab N 4A*MS	Lab O 4A*OES
1	1326	1250	1156	1170	1174	1100	1060	NR	1050	1160	1250	<b>1300</b>	1150	1100	1211
2	1276	1250	1152	1190	1158	1100	1010	NR	1060	1150	1230	1160	<b>1180</b>	1100	1211
3	1368	1250	1149	1070	1137	1100	1020	NR	1050	1160	1210	1140	1160	<b>1200</b>	1216
4	<b>1151</b>	1250	1148	1110	1147	1200	1050	NR	1040	<b>1120</b>	1270	1130	1160	1100	1215
5	1312	1250	<b>1086</b>	1080	1138	1100	1030	NR	<b>990</b>	<b>1200</b>	1280	1170	1160	1100	1214
6	1282	1250	1138	1120	1169	1100	1030	NR	<b>1200</b>	1170	1250	1180	1160	1100	1221
Mean	1286	1250	1138	1123	1154	1117	1033		1065	1160	1248	1180	1162	1117	1215
Median	1297	1250	1149	1115	1153	1100	1030		1050	1160	1250	1165	1160	1100	1214
Std.Dev.	74	0	26	48	16	41	19		71	26	26	62	10	41	4
Rel.Std.Dev.	5.75%	0.00%	2.31%	4.28%	1.38%	3.66%	1.80%		6.63%	2.25%	2.05%	5.22%	0.85%	3.7%	0.33%
PDM <sup>3</sup>	10.9%	7.86%	-1.79%	-3.07%	-0.44%	-3.65%	-10.8%		-8.11%	0.09%	7.71%	1.82%	0.23%	-3.65%	4.80%

Table A50. Analytical results for 4-acid Pb in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*OES	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*OES	Lab G 4A*OES	Lab H 4A*MS	Lab I 4A*OES	Lab J 4A*MS	Lab K 4A*MS	Lab L 4A*MS	Lab M 4A*MS	Lab N 4A*MS	Lab O 4A*OES
1	27.0	22.0	7.7	13.0	17.6	31.0	28.0	19.8	22.0	24.2	20.5	25.3	22.2	9.0	23.2
2	27.0	21.0	7.6	17.0	18.3	32.0	31.0	21.1	22.0	24.4	21.1	23.8	22.6	8.7	24.4
3	<b>29.0</b>	22.0	7.5	11.0	17.8	29.0	26.0	18.5	20.0	23.2	19.2	23.1	22.5	9.9	24.1
4	27.0	20.0	7.4	10.0	18.4	32.0	31.0	19.9	21.0	23.4	21.4	23.1	22.3	9.7	23.4
5	<b>29.0</b>	21.0	7.1	15.0	17.8	29.0	26.0	21.4	<b>25.0</b>	24.9	22.0	23.7	21.9	8.1	25.3
6	26.0	21.0	7.2	10.0	18.0	33.0	30.0	21.0	21.0	25.0	21.8	24.0	<b>21.0</b>	<b>13.3</b>	26.0
Mean	27.5	21.2	<b>7.4</b>	12.7	18.0	31.0	28.7	20.3	21.8	24.2	21.0	23.8	22.1	<b>9.8</b>	24.4
Median	27.0	21.0	7.5	12.0	17.9	31.5	29.0	20.5	21.5	24.3	21.3	23.8	22.3	9.4	24.3
Std.Dev.	1.2	0.8	0.2	2.9	0.3	1.7	2.3	1.1	1.7	0.7	1.0	0.8	0.6	1.8	1.1
Rel.Std.Dev.	4.45%	3.56%	3.12%	22.7%	1.65%	5.40%	8.16%	5.40%	7.89%	3.10%	4.90%	3.39%	2.65%	18.9%	4.38%
PDM <sup>3</sup>	21.0%	-6.86%	-67.4%	-44.3%	-20.8%	36.4%	26.1%	-10.8%	-3.93%	6.41%	-7.60%	4.87%	-2.83%	-57.0%	7.34%

Table A51. Analytical results for 4-acid Pr in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E -	Lab F 4A*OES	Lab G -	Lab H 4A*MS	Lab I 4A*MS	Lab J -	Lab K 4A*MS	Lab L 4A*MS	Lab M -	Lab N -	Lab O -
1	120	140	130	127	NR	130	NR	120	<b>120</b>	NR	111	<b>169</b>	NR	NR	NR
2	126	144	131	128	NR	120	NR	129	139	NR	115	150	NR	NR	NR
3	113	147	136	126	NR	130	NR	123	144	NR	106	149	NR	NR	NR
4	114	147	141	126	NR	120	NR	117	144	NR	117	146	NR	NR	NR
5	117	139	129	125	NR	140	NR	125	139	NR	122	152	NR	NR	NR
6	122	148	137	127	NR	130	NR	118	145	NR	119	154	NR	NR	NR
Mean	119	144	134	127		128		122	139		115	153			
Median	119	146	134	127		130		122	142		116	151			
Std.Dev.	5	4	4	1		8		4	9		6	8			
Rel.Std.Dev.	4.19%	2.68%	3.33%	0.83%		5.87%		3.64%	6.82%		5.15%	5.22%			
PDM <sup>3</sup>	-9.61%	9.90%	2.13%	-3.57%		-2.17%		-7.09%	5.58%		-12.4%	16.8%			

Table A52. Analytical results for 4-acid Sm in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E -	Lab F 4A*MS	Lab G -	Lab H 4A*MS	Lab I 4A*MS	Lab J -	Lab K 4A*MS	Lab L 4A*MS	Lab M -	Lab N -	Lab O -
1	48.9	55.1	50.0	49.6	NR	53.0	NR	47.0	42.8	NR	41.8	62.4	NR	NR	NR
2	52.1	54.6	51.0	50.2	NR	52.0	NR	45.9	48.6	NR	43.1	56.2	NR	NR	NR
3	46.5	58.2	51.7	49.5	NR	53.0	NR	45.7	49.6	NR	39.5	55.4	NR	NR	NR
4	47.5	55.7	53.5	48.9	NR	52.0	NR	<b>43.5</b>	50.1	NR	43.9	54.2	NR	NR	NR
5	48.6	53.9	49.5	48.5	NR	49.0	NR	46.0	48.7	NR	45.2	55.3	NR	NR	NR
6	49.9	58.1	52.4	49.8	NR	49.0	NR	45.3	49.9	NR	44.0	57.3	NR	NR	NR
Mean	48.9	55.9	51.3	49.4		51.3		45.6	48.3		42.9	<b>56.8</b>			
Median	48.7	55.4	51.3	49.6		52.0		45.8	49.2		43.5	55.8			
Std.Dev.	2.0	1.8	1.5	0.6		1.9		1.2	2.8		2.0	2.9			
Rel.Std.Dev.	4.00%	3.25%	2.94%	1.25%		3.63%		2.54%	5.71%		4.70%	5.16%			
PDM <sup>3</sup>	-0.71%	13.5%	4.18%	0.31%		4.20%		-7.50%	-1.99%		-12.9%	15.3%			

Table A53. Analytical results for 4-acid Tb in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*OES	Lab H 4A*MS	Lab I 4A*MS	Lab J -	Lab K 4A*MS	Lab L 4A*MS	Lab M -	Lab N -	Lab O -
1	4.65	5.40	4.56	4.24	7.52	5.80	7.00	5.00	<b>4.60</b>	NR	4.73	7.16	NR	NR	NR
2	<b>4.95</b>	5.40	4.78	4.24	7.43	5.80	7.30	4.70	5.10	NR	4.76	6.54	NR	NR	NR
3	4.55	5.70	4.86	4.28	7.52	5.90	6.80	4.80	5.20	NR	4.39	6.37	NR	NR	NR
4	4.54	5.55	4.92	4.19	7.27	5.80	6.80	<b>4.20</b>	5.20	NR	4.91	6.31	NR	NR	NR
5	4.62	5.25	4.55	4.14	6.92	6.20	6.80	4.70	5.10	NR	5.00	6.57	NR	NR	NR
6	4.80	5.25	4.85	4.17	6.73	5.80	7.40	4.90	5.30	NR	4.99	6.74	NR	NR	NR
Mean	4.69	5.43	4.75	4.21	<b>7.23</b>	5.88	7.02	4.72	5.08		4.80	6.62			
Median	4.63	5.40	4.82	4.22	7.35	5.80	6.90	4.75	5.15		4.84	6.56			
Std.Dev.	0.16	0.18	0.16	0.05	0.33	0.16	0.27	0.28	0.25		0.23	0.31			
Rel.Std.Dev.	3.42%	3.23%	3.37%	1.24%	4.60%	2.72%	3.87%	5.91%	4.89%		4.78%	4.65%			
PDM <sup>3</sup>	-12.1%	1.72%	-10.9%	-21.1%	35.6%	10.3%	31.6%	-11.6%	-4.68%		-10.1%	24.0%			

Table A54. Analytical results for 4-acid Th in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*OES	Lab H 4A*MS	Lab I 4A*MS	Lab J 4A*MS	Lab K 4A*MS	Lab L 4A*MS	Lab M 4A*MS	Lab N 4A*MS	Lab O 4A*OES
1	36.4	32.6	39.6	33.8	40.9	37.0	39.0	32.9	<b>38.4</b>	33.1	36.2	37.6	29.0	35.5	14.8
2	36.2	31.4	39.1	33.9	40.8	37.0	41.0	34.0	31.4	33.4	38.9	34.6	29.5	35.5	15.5
3	<b>35.0</b>	33.2	39.1	33.3	41.3	37.0	39.0	33.4	31.1	31.9	33.7	33.7	29.1	35.4	15.0
4	36.9	31.8	38.8	33.8	39.2	37.0	39.0	30.5	32.4	32.5	40.0	33.7	27.7	35.6	13.9
5	36.5	32.3	<b>36.9</b>	<b>32.7</b>	37.5	36.0	39.0	32.7	33.1	34.0	38.2	35.3	27.8	<b>34.7</b>	14.1
6	36.3	32.0	39.0	34.2	37.2	36.0	41.0	31.6	<b>41.3</b>	33.3	41.0	36.1	27.2	<b>36.7</b>	14.7
Mean	36.2	32.2	38.8	33.6	39.5	36.7	39.7	32.5	34.6	33.0	38.0	35.2	28.4	35.6	<b>14.7</b>
Median	36.3	32.2	39.1	33.8	40.0	37.0	39.0	32.8	32.8	33.2	38.6	35.0	28.4	35.5	14.8
Std.Dev.	0.6	0.6	0.9	0.5	1.8	0.5	1.0	1.3	4.2	0.7	2.7	1.5	0.9	0.6	0.6
Rel.Std.Dev.	1.71%	1.97%	2.44%	1.59%	4.60%	1.41%	2.60%	3.91%	12.2%	2.23%	7.02%	4.30%	3.29%	1.81%	3.98%
PDM <sup>3</sup>	3.05%	-8.33%	10.3%	-4.34%	12.3%	4.34%	12.9%	-7.47%	-1.50%	-6.00%	8.13%	0.07%	-19.2%	1.21%	-58.2%



Table A55. Analytical results for 4-acid Ti in OREAS 101a (abbreviations as in Table A1; values in wt.%).

Replicate No.	Lab A 4A*OES	Lab B 4A*OES	Lab C 4A*OES	Lab D 4A*MS	Lab E 4A*OES	Lab F 4A*OES	Lab G -	Lab H 4A*MS	Lab I 4A*OES	Lab J 4A*MS	Lab K 4A*MS	Lab L 4A*MS	Lab M 4A*MS	Lab N 4A*MS	Lab O 4A*OES
1	0.382	0.385	0.368	0.344	0.221	0.410	NR	NR	0.380	0.310	0.356	<b>0.378</b>	0.323	0.297	0.354
2	0.381	0.385	<b>0.374</b>	0.340	0.226	0.400	NR	NR	0.390	0.302	0.344	0.346	0.325	0.299	0.352
3	0.379	0.400	0.370	0.350	0.234	0.410	NR	NR	0.380	0.304	0.341	0.344	0.327	<b>0.317</b>	0.352
4	0.355	0.385	0.368	0.343	0.209	0.400	NR	NR	0.370	0.307	0.353	0.344	0.331	0.305	0.349
5	0.382	0.380	<b>0.362</b>	0.331	0.224	0.400	NR	NR	<b>0.340</b>	0.308	0.360	0.347	0.328	0.299	0.354
6	0.369	0.390	0.368	0.338	0.233	0.390	NR	NR	0.390	0.312	0.357	0.356	0.327	0.300	0.357
Mean	0.375	0.388	0.368	0.341	<b>0.224</b>	0.402			0.375	0.307	0.352	0.353	0.327	0.303	0.353
Median	0.380	0.385	0.368	0.342	0.225	0.400			0.380	0.308	0.355	0.347	0.327	0.300	0.353
Std.Dev.	0.011	0.007	0.004	0.006	0.009	0.008			0.019	0.004	0.008	0.013	0.003	0.007	0.002
Rel.Std.Dev.	2.88%	1.78%	1.07%	1.87%	4.13%	1.87%			4.99%	1.21%	2.17%	3.76%	0.83%	2.46%	0.70%
PDM <sup>3</sup>	5.98%	9.63%	4.21%	-3.53%	-36.5%	13.6%			6.09%	-13.1%	-0.46%	-0.27%	-7.53%	-14.3%	-0.13%

Table A56. Analytical results for 4-acid Tm in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G -	Lab H 4A*MS	Lab I 4A*MS	Lab J -	Lab K 4A*MS	Lab L 4A*MS	Lab M -	Lab N -	Lab O -
1	2.05	2.30	2.01	1.90	NR	2.10	NR	2.20	<b>2.10</b>	NR	1.78	<b>2.74</b>	NR	NR	NR
2	2.12	2.16	2.05	<b>1.94</b>	NR	2.10	NR	2.10	2.30	NR	1.80	2.44	NR	NR	NR
3	1.98	2.30	2.08	1.92	NR	2.20	NR	2.00	2.40	NR	<b>1.64</b>	2.43	NR	NR	NR
4	2.02	<b>2.50</b>	2.16	1.89	NR	2.20	NR	2.00	2.40	NR	1.81	<b>2.35</b>	NR	NR	NR
5	2.07	2.16	1.95	1.89	NR	2.20	NR	2.10	2.30	NR	1.87	2.44	NR	NR	NR
6	2.02	2.16	2.08	1.90	NR	2.10	NR	2.00	2.40	NR	1.85	2.46	NR	NR	NR
Mean	2.04	2.26	2.06	1.91		2.15		2.07	2.32		1.79	2.48			
Median	2.04	2.23	2.07	1.90		2.15		2.05	2.35		1.81	2.44			
Std.Dev.	0.05	0.13	0.07	0.02		0.05		0.08	0.12		0.08	0.13			
Rel.Std.Dev.	2.37%	5.95%	3.46%	1.03%		2.55%		3.95%	5.05%		4.54%	5.43%			
PDM <sup>3</sup>	-3.49%	6.90%	-2.94%	-9.95%		1.55%		-2.39%	9.42%		-15.4%	17.0%			

Table A57. Analytical results for 4-acid V in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*OES	Lab B 4A*OES	Lab C 4A*OES	Lab D 4A*OES	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*OES	Lab H 4A*MS	Lab I 4A*OES	Lab J 4A*MS	Lab K 4A*MS	Lab L 4A*MS	Lab M 4A*MS	Lab N 4A*MS	Lab O 4A*OES
1	82.0	80.0	75.7	<b>36.0</b>	70.1	100	84.0	83.0	86.0	72.0	77.0	<b>78.0</b>	71.0	79.0	80.3
2	81.0	80.0	75.2	<b>36.0</b>	71.7	100	79.0	86.0	88.0	70.0	74.0	70.0	72.0	82.0	80.9
3	83.0	85.0	75.4	68.0	68.6	102	79.0	<b>90.0</b>	88.0	71.0	73.0	69.0	70.0	78.0	80.3
4	<b>72.0</b>	75.0	75.8	68.0	67.5	<b>96</b>	81.0	84.0	85.0	72.0	77.0	68.0	71.0	78.0	81.5
5	83.0	75.0	<b>72.6</b>	67.0	69.2	<b>107</b>	77.0	83.0	85.0	72.0	78.0	70.0	70.0	81.0	79.5
6	80.0	85.0	75.0	69.0	71.2	100	82.0	82.0	92.0	72.0	77.0	72.0	71.0	81.0	80.7
Mean	80.2	80.0	75.0	57.3	69.7	<b>101</b>	80.3	84.7	87.3	71.5	76.0	71.2	70.8	79.8	80.5
Median	81.5	80.0	75.3	67.5	69.7	100	80.0	83.5	87.0	72.0	77.0	70.0	71.0	80.0	80.5
Std.Dev.	4.2	4.5	1.2	16.5	1.6	4	2.5	2.9	2.7	0.8	2.0	3.6	0.8	1.7	0.7
Rel.Std.Dev.	5.20%	5.59%	1.59%	28.8%	2.26%	3.57%	3.12%	3.48%	3.04%	1.17%	2.63%	5.06%	1.06%	2.16%	0.83%
PDM <sup>3</sup>	4.43%	4.21%	-2.36%	-25.3%	-9.18%	31.4%	4.65%	10.3%	13.8%	-6.86%	-1.00%	-7.29%	-7.73%	4.00%	4.91%

Table A58. Analytical results for 4-acid Y in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*OES	Lab G 4A*OES	Lab H 4A*MS	Lab I 4A*MS	Lab J 4A*MS	Lab K 4A*MS	Lab L 4A*MS	Lab M 4A*MS	Lab N 4A*MS	Lab O 4A*OES
1	<b>124</b>	152	137	137	153	170	140	<b>126</b>	<b>126</b>	125	132	<b>157</b>	125	111	133
2	126	145	<b>139</b>	137	148	170	130	121	148	125	133	139	125	106	134
3	128	147	134	138	151	170	130	122	154	120	128	136	<b>130</b>	111	135
4	127	145	133	137	146	170	140	124	154	122	134	135	124	108	134
5	127	135	133	<b>134</b>	139	170	130	120	152	128	138	141	125	105	136
6	126	154	132	138	136	160	130	121	152	127	136	143	124	112	136
Mean	126	146	135	137	146	168	133	122	148	124	133	142	125	109	135
Median	127	146	134	137	147	170	130	122	152	125	133	140	125	109	135
Std.Dev.	1	7	3	1	7	4	5	2	11	3	3	8	2	3	1
Rel.Std.Dev.	1.02%	4.57%	2.07%	1.08%	4.72%	2.43%	3.87%	1.71%	7.34%	2.40%	2.61%	5.71%	1.80%	2.46%	0.74%
PDM <sup>3</sup>	-6.55%	8.18%	-0.46%	1.16%	7.63%	24.4%	-1.43%	-9.45%	9.16%	-8.15%	-1.62%	4.73%	-7.53%	-19.6%	-0.40%

Table A59. Analytical results for 4-acid Yb in OREAS 101a (abbreviations as in Table A1; values in ppm).

Replicate No.	Lab A 4A*MS	Lab B 4A*MS	Lab C 4A*MS	Lab D 4A*MS	Lab E 4A*MS	Lab F 4A*MS	Lab G 4A*OES	Lab H 4A*MS	Lab I 4A*MS	Lab J -	Lab K 4A*MS	Lab L 4A*MS	Lab M -	Lab N -	Lab O -
1	13.5	16.0	12.5	13.1	15.8	20.0	16.0	14.1	<b>13.0</b>	NR	11.6	<b>16.7</b>	NR	NR	NR
2	14.0	15.3	12.9	13.3	15.7	19.0	17.0	14.2	14.6	NR	11.8	15.1	NR	NR	NR
3	13.2	16.3	13.1	13.3	15.8	20.0	16.0	14.1	14.9	NR	<b>10.8</b>	14.9	NR	NR	NR
4	13.4	15.0	13.5	13.0	15.0	18.0	16.0	13.5	15.0	NR	12.1	14.7	NR	NR	NR
5	14.0	15.1	12.4	12.9	14.3	19.0	15.0	13.6	14.6	NR	12.4	15.1	NR	NR	NR
6	13.2	16.1	13.3	13.0	14.3	18.0	17.0	14.3	14.7	NR	12.0	15.4	NR	NR	NR
Mean	13.5	15.6	13.0	13.1	15.1	19.0	16.2	14.0	14.5		11.7	15.3			
Median	13.5	15.7	13.0	13.1	15.3	19.0	16.0	14.1	14.7		11.9	15.1			
Std.Dev.	0.4	0.6	0.4	0.2	0.7	0.9	0.8	0.3	0.7		0.5	0.7			
Rel.Std.Dev.	2.63%	3.61%	3.37%	1.28%	4.86%	4.71%	4.66%	2.38%	5.09%		4.68%	4.74%			
PDM <sup>3</sup>	-7.66%	6.68%	-11.6%	-10.6%	3.23%	29.7%	10.3%	-4.69%	-1.28%		-19.9%	4.41%			