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CERTIFICATE OF ANALYSIS FOR

URANIUM-BEARING
CERTIFIED REFERENCE MATERIAL
OREAS 100a

SUMMARY STATISTICS OREAS 100a

Constituent	Certified Values	
	Fusion	4 Acid
Uranium, U (ppm)	135	130
Thorium, Th (ppm)	51.6	49.2
Cerium, Ce (ppm)	463	467
Lanthanum, La (ppm)	260	259

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

Table 1. Certified Values, SD's, 95% Confidence and Tolerance Limits for OREAS 100a.

Constituent	Certified Value	SD	95% Confidence Limits		95% Tolerance Limits	
			Low	High	Low	High
Fusion						
Cerium, Ce (ppm)	463	29	444	483	453	474
Cobalt, Co (ppm)	18.1	1.4	17.1	19.1	17.5	18.7
Copper, Cu (ppm)	169	9	163	175	159	178
Dysprosium, Dy (ppm)	23.2	0.9	22.8	23.6	22.3	24.1
Erbium, Er (ppm)	14.9	0.9	14.4	15.4	14.3	15.5
Europium, Eu (ppm)	3.71	0.36	3.48	3.93	3.56	3.85
Iron, Fe (wt.%)	4.66	0.11	4.60	4.72	4.61	4.72
Gadolinium, Gd (ppm)	23.6	2.2	22.2	24.9	22.6	24.5
Holmium, Ho (ppm)	4.81	0.23	4.68	4.95	4.62	5.01
Potassium, K (wt.%)	3.94	0.20	3.80	4.07	3.87	4.01
Lanthanum, La (ppm)	260	13	252	269	254	267
Lutetium, Lu (ppm)	2.26	0.16	2.16	2.37	2.20	2.32
Magnesium, Mg (wt.%)	0.839	0.023	0.825	0.854	0.826	0.853
Manganese, Mn (ppm)	537	29	520	555	536	538
Molybdenum, Mo (ppm)	24.1	1.8	23.0	25.2	22.4	25.7
Neodymium, Nd (ppm)	152	14	144	160	147	157
Nickel, Ni (ppm)	<20	IND	IND	IND	IND	IND
Phosphorous, P (ppm)	529	76	484	574	454	604
Lead, Pb (ppm)	<20	IND	IND	IND	IND	IND
Praseodymium, Pr (ppm)	47.1	4.0	44.7	49.5	45.7	48.5
Samarium, Sm (ppm)	23.6	0.7	23.2	24.0	22.8	24.4
Terbium, Tb (ppm)	3.80	0.34	3.57	4.03	3.65	3.95
Thorium, Th (ppm)	51.6	4.3	48.9	54.3	50.5	52.7
Titanium, Ti (wt.%)	0.239	0.005	0.237	0.242	0.236	0.243
Thulium, Tm (ppm)	2.31	0.18	2.19	2.42	2.26	2.36
Uranium, U (ppm)	135	11	128	142	132	138
Vanadium, V (ppm)	36.7	4.9	33.4	40.0	35.6	37.8
Yttrium, Y (ppm)	142	6	139	145	139	145
Ytterbium, Yb (ppm)	14.9	0.5	14.6	15.3	14.5	15.4
4 Acid						
Cerium, Ce (ppm)	467	34	447	486	455	479
Cobalt, Co (ppm)	17.5	1.4	16.8	18.2	16.9	18.1
Copper, Cu (ppm)	167	8.97	162	172	163	171
Dysprosium, Dy (ppm)	18.9	2.2	17.3	20.6	18.3	19.6
Erbium, Er (ppm)	11.6	1.37	10.6	12.7	11.3	12.0
Europium, Eu (ppm)	3.7	0.26	3.5	3.9	3.5	3.8
Iron, Fe (wt.%)	4.51	0.31	4.33	4.69	4.43	4.59
Gadolinium, Gd (ppm)	20.3	2.1	18.7	21.9	19.7	20.9
Holmium, Ho (ppm)	3.66	0.37	3.38	3.94	3.55	3.77
Potassium, K (wt.%)	3.80	0.24	3.65	3.94	3.68	3.91

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
4 Acid continued						
Lanthanum, La (ppm)	259	17.57	249	268	252	265
Lutetium, Lu (ppm)	1.56	0.16	1.45	1.67	1.50	1.62
Magnesium, Mg (wt.%)	0.81	0.05	0.78	0.84	0.79	0.83
Manganese, Mn (ppm)	532	36	511	553	521	543
Molybdenum, Mo (ppm)	22.2	1.9	21.2	23.3	21.2	23.3
Neodymium, Nd (ppm)	152	11	144	160	146	158
Nickel, Ni (ppm)	10.3	0.8	9.8	10.7	9.5	11.0
Phosphorous, P (ppm)	487	13	480	493	470	503
Lead, Pb (ppm)	13.2	2.5	11.8	14.6	12.6	13.7
Praseodymium, Pr (ppm)	47.1	3.9	44.0	50.2	45.7	48.4
Samarium, Sm (ppm)	23.8	1.8	22.4	25.2	22.7	24.9
Terbium, Tb (ppm)	3.25	0.43	2.96	3.54	3.13	3.37
Thorium, Th (ppm)	49.2	4.9	46.4	51.9	48.2	50.1
Titanium, Ti (wt.%)	0.218	0.020	0.205	0.230	0.213	0.222
Thulium, Tm (ppm)	1.61	0.18	1.48	1.74	1.52	1.70
Uranium, U (ppm)	130	12	123	136	127	133
Vanadium, V (ppm)	34.7	3.6	32.6	36.8	33.4	36.0
Yttrium, Y (ppm)	95.5	5.1	92.5	98.6	93.3	97.8
Ytterbium, Yb (ppm)	11.4	1.4	10.4	12.3	10.9	11.8

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 MATERIALS

OREAS 100a is one of four CRMs 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 north-easterly over a distance of 11km. Mt. Gee is believed to be of hydrothermal origin and has been described as an IOCG variant.

COMMINUTION AND HOMOGENISATION PROCEDURES

The material constituting OREAS 100a was prepared in the following manner:

a) drying to constant mass at 105^0 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 100a

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^3) 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_3-$HClO_4$) 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_2O_3 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 100a DataPack.xlsx**).

STATISTICAL EVALUATION OF OREAS 100a

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

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

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

where

x_{ij} *is the jth 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;*
$\ddot{x}$ *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).

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

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

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 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:

$$S = 1.483 \underset{j=1.....n}{median} / x_j - \underset{i=1.....n}{median}(x_i) /$$

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

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%. 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 inter-laboratory 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 100a

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
Laser Ablation ICP-MS								
Ag	ppm	*0.100*	Ho	ppm	*4.92*	Sn	ppm	*9.60*
As	ppm	*14.9*	In	ppm	*0.063*	Sr	ppm	*35.4*
Ba	ppm	*411*	La	ppm	*272*	Ta	ppm	*3.69*
Be	ppm	*3.80*	Lu	ppm	*2.16*	Tb	ppm	*3.64*
Bi	ppm	*0.40*	Mn	wt.%	*0.051*	Te	ppm	*< 0.2*
Cd	ppm	*< 0.1*	Mo	ppm	*19.9*	Th	ppm	*51*
Ce	ppm	*453*	Nb	ppm	*41.9*	Ti	wt.%	*0.245*
Co	ppm	*17.7*	Nd	ppm	*151*	Tl	ppm	*0.40*
Cr	ppm	*39.5*	Ni	ppm	*13.0*	Tm	ppm	*2.51*
Cs	ppm	*2.83*	Pb	ppm	*12.5*	U	ppm	*134*
Cu	ppm	*171*	Pr	ppm	*48.7*	V	ppm	*35.8*
Dy	ppm	*24.4*	Rb	ppm	*256*	W	ppm	*9.33*
Er	ppm	*15.7*	Re	ppm	*0.075*	Y	ppm	*141*
Eu	ppm	*4.12*	Sb	ppm	*1.10*	Yb	ppm	*15.2*
Ga	ppm	*19.5*	Sc	ppm	*6.10*	Zn	ppm	*20.0*
Gd	ppm	*21.7*	Se	ppm	*3.75*	Zr	ppm	*507*
Hf	ppm	*16.3*	Sm	ppm	*25.1*			
Borate Fusion XRF								
Al_2O_3	wt.%	*11.38*	Fe_2O_3	wt.%	*6.66*	Pb	ppm	*12.5*
As	ppm	*20.0*	K_2O	wt.%	*4.67*	SiO_2	wt.%	*70.02*
Ba	ppm	*405*	MgO	wt.%	*1.41*	Sn	ppm	*20.0*
CaO	wt.%	*1.56*	MnO	wt.%	*0.080*	SO_3	wt.%	*0.114*
Co	ppm	*25.0*	Na_2O	wt.%	*0.170*	TiO_2	wt.%	*0.397*
Cr	ppm	*35.0*	Ni	ppm	*20.0*	U	ppm	*135*
Cu	ppm	*175*	P_2O_5	wt.%	*0.125*	Zn	ppm	*30.0*
Thermogravimetry								
LOI^{1000}	wt.%	*3.17*						

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 jth raw result reported by laboratory i*;

x'_{ij} *is the jth 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

$$\text{Lower limit is } \ddot{x} - k'_2(n, p, 1-\alpha)s''_g$$
$$\text{Upper limit is } \ddot{x} + k'_2(n, p, 1-\alpha)s''_g$$

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 132 and 138 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 (IS0 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:

$$s''_g = \frac{\sum_{i=1}^{p}\left(s_i\left(1 - \frac{s_i}{s'_g}\right)\right)}{\sum_{i=1}^{p}\left(1 - \frac{s_i}{s'_g}\right)}$$

where

$$1 - \left(\frac{s_i}{2s'_g} \right) \text{ is the weighting factor for laboratory } i \text{ ;}$$

s'_g *is the grand standard deviation computed from the transformed (i.e. means - adjusted) results*

according to the formula:

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

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 $s_l / 2s_g' > 1$ (i.e., where the weighting factor $1 - s_l / 2s_g' < 0$). 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 CRM variability.

For an effective CRM 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 and 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.

Table 3. Performance gates for OREAS 100a.

Constituent	Certified Value	Performance Gates						
		1SD	2SD		3SD		5%	
			Low	High	Low	High	Low	High
Fusion								
Ce (ppm)	463	29	405	521	376	550	440	486
Co (ppm)	18.1	1.4	15.2	20.9	13.8	22.3	17.2	19.0
Cu (ppm)	169	9	150	188	140	197	160	177
Dy (ppm)	23.2	0.9	21.4	25.0	20.6	25.8	22.0	24.4
Er (ppm)	14.9	0.9	13.2	16.6	12.3	17.5	14.2	15.6
Eu (ppm)	3.71	0.36	2.98	4.43	2.62	4.79	3.52	3.89
Fe (wt.%)	4.66	0.11	4.45	4.88	4.34	4.99	4.43	4.90
Gd (ppm)	23.6	2.2	19.1	28.0	16.8	30.3	22.4	24.7
Ho (ppm)	4.81	0.23	4.36	5.27	4.13	5.50	4.57	5.06
K (wt.%)	3.94	0.20	3.53	4.35	3.33	4.55	3.74	4.14
La (ppm)	260	13	234	287	221	300	247	273
Lu (ppm)	2.26	0.16	1.94	2.59	1.78	2.75	2.15	2.38
Mg (wt.%)	0.839	0.023	0.793	0.885	0.770	0.908	0.797	0.881
Mn (ppm)	537	29	480	594	451	623	510	564
Mo (ppm)	24.1	1.8	20.5	27.6	18.7	29.4	22.9	25.3
Nd (ppm)	152	14	125	179	111	193	145	160
Ni (ppm)	<20	IND	IND	IND	IND	IND	IND	IND
P (ppm)	529	76	378	680	302	756	503	555
Pb (ppm)	<20	IND	IND	IND	IND	IND	IND	IND
Pr (ppm)	47.1	4.0	39.2	55.0	35.3	59.0	44.8	49.5
Sm (ppm)	23.6	0.7	22.2	25.1	21.4	25.8	22.4	24.8
Tb (ppm)	3.80	0.34	3.12	4.48	2.79	4.82	3.61	3.99
Th (ppm)	51.6	4.3	43.1	60.2	38.8	64.4	49.0	54.2
Ti (wt.%)	0.239	0.005	0.230	0.249	0.225	0.253	0.227	0.251
Tm (ppm)	2.31	0.18	1.96	2.66	1.78	2.83	2.19	2.42
U (ppm)	135	11	114	156	103	167	129	142
V (ppm)	36.7	4.9	27.0	46.4	22.1	51.3	34.9	38.5
Y (ppm)	142	6	131	153	125	159	135	149
Yb (ppm)	14.9	0.5	13.9	16.0	13.4	16.5	14.2	15.7
4 Acid								
Ce (ppm)	467	34	398	536	363	570	443	490
Co (ppm)	17.5	1.4	14.7	20.3	13.3	21.7	16.6	18.4
Cu (ppm)	167	8.97	149	185	140	194	159	175
Dy (ppm)	18.9	2.2	14.6	23.3	12.4	25.5	18.0	19.9
Er (ppm)	11.6	1.4	8.9	14.4	7.5	15.8	11.1	12.2
Eu (ppm)	3.7	0.3	3.2	4.2	2.9	4.5	3.5	3.9
Fe (wt.%)	4.51	0.31	3.89	5.14	3.58	5.45	4.29	4.74
Gd (ppm)	20.3	2.1	16.1	24.6	14.0	26.7	19.3	21.3
Ho (ppm)	3.66	0.37	2.93	4.39	2.57	4.76	3.48	3.84
K (wt.%)	3.80	0.24	3.32	4.27	3.08	4.51	3.61	3.99
La (ppm)	259	17.57	223	294	206	311	246	271
Lu (ppm)	1.56	0.16	1.24	1.88	1.08	2.04	1.48	1.64
Mg (wt.%)	0.81	0.05	0.72	0.90	0.67	0.95	0.77	0.85
Mn (ppm)	532	36	461	604	425	639	506	559
Mo (ppm)	22.2	1.9	18.4	26.1	16.5	28.0	21.1	23.4
Nd (ppm)	152	11	131	173	120	184	144	160
Ni (ppm)	10.3	0.8	8.6	11.9	7.8	12.8	9.8	10.8
P (ppm)	487	13	461	512	448	525	462	511
Pb (ppm)	13.2	2.5	8.1	18.2	5.6	20.8	12.5	13.8
Pr (ppm)	47.1	3.9	39.2	54.9	35.3	58.8	44.7	49.4
Sm (ppm)	23.8	1.8	20.1	27.4	18.3	29.2	22.6	25.0
Tb (ppm)	3.25	0.43	2.39	4.11	1.96	4.54	3.09	3.41
Th (ppm)	49.2	4.9	39.3	59.0	34.4	63.9	46.7	51.6
Ti (wt.%)	0.218	0.020	0.178	0.257	0.159	0.276	0.207	0.228
Tm (ppm)	1.61	0.18	1.26	1.96	1.08	2.14	1.53	1.69
U (ppm)	130	12	105	154	93	166	123	136
V (ppm)	34.7	3.6	27.5	41.9	23.9	45.5	33.0	36.4
Y (ppm)	95.5	5.1	85.4	105.7	80.4	110.7	90.8	100.3
Yb (ppm)	11.4	1.4	8.5	14.2	7.1	15.6	10.8	11.9

IND = indeterminate; Note: intervals may appear asymmetric due to rounding

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.

For the second method a simple ±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.

PARTICIPATING LABORATORIES

Acme Analytical Laboratories, Vancouver, BC, Canada
Activation Laboratories, Ancaster, ON, Canada
Activation Laboratories, Perth, WA, Australia
ALS Chemex, Brisbane, QLD, Australia
ALS Chemex, Lima, South America
ALS Chemex, North Vancouver, BC, Canada
ALS Chemex, Perth, WA, Australia
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PREPARER AND SUPPLIER

Certified reference material OREAS 100a is prepared, certified and supplied by:

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

INTENDED USE

OREAS 100a 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 100a 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 100a 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

28th September, 2021

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

DOCUMENT HISTORY

Revision No.	Date	Changes applied
3	28th September, 2021	Amended units of measure in Table 1 from ppm to wt.% for K (both instances that were inadvertently affected during the Rev. 1 revision).
2	30th March, 2019	Fixed spelling of Erbium and Lutetium (both instances).
1	30th November, 2016	Added indicative (uncertified) values (Table 2) for major and trace elements determined by borate fusion XRF (Al_2O_3 to Zn) and laser ablation with ICP-MS (Ag to Zr).
0	22nd September, 2008	First publication.

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 100a

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[3]	percent deviation of lab mean from corrected mean of means
NR	not reported
PF	sodium peroxide fusion
BF	lithium metaborate fusion
4A	four acid ($HF–HNO_3–HClO_4–HCl$) digest
OES	inductively coupled plasma optical emission spectrometry
MS	inductively coupled plasma mass spectrometry
XRF	x-ray fluorescence

Table A2. Analytical results for fusion U in OREAS 100a (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	135	140	121	112	151	130	NR	130	140	134	145	NR	NR	151	116
2	136	141	121	116	152	130	NR	131	141	141	146	NR	NR	154	123
3	135	147	121	122	**143**	130	NR	132	**145**	137	148	NR	NR	147	122
4	136	145	121	122	149	130	NR	130	140	126	147	NR	NR	148	123
5	134	140	119	122	149	130	NR	131	142	140	145	NR	NR	149	128
6	**138**	140	122	122	**157**	130	NR	129	141	132	144	NR	NR	150	132
Mean	136	142	121	119	150	130		131	142	135	145			150	124
Median	135	141	121	122	150	130		130	141	136	145			150	123
Std.Dev.	1	3	1	4	5	0		1	2	5	1			2	5
Rel.Std.Dev.	0.93%	2.15%	0.71%	3.62%	3.15%	0.00%		0.85%	1.32%	4.08%	0.93%			1.50%	4.21%
PDM[3]	0.28%	5.08%	-10.7%	-11.8%	11.0%	-3.91%		-3.50%	4.59%	-0.27%	7.49%			10.8%	-8.25%

Table A3. Analytical results for fusion Ce in OREAS 100a (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	439	488	464	**572**	538	470	NR	448	449	435	513	NR	NR	457	428
2	431	493	459	547	578	470	NR	449	450	447	500	NR	NR	453	429
3	428	496	471	507	**496**	460	NR	443	452	451	505	NR	NR	453	424
4	436	510	467	511	560	470	NR	448	444	421	507	NR	NR	450	422
5	423	485	456	490	548	470	NR	438	448	454	506	NR	NR	453	435
6	428	501	468	497	550	**450**	NR	448	451	441	512	NR	NR	**447**	444
Mean	431	496	464	521	**545**	465		446	449	442	507			452	430
Median	430	495	466	509	549	470		448	450	444	507			453	429
Std.Dev.	6	9	6	32	27	8		4	3	12	5			3	8
Rel.Std.Dev.	1.36%	1.84%	1.23%	6.14%	5.04%	1.80%		1.00%	0.63%	2.75%	0.94%			0.77%	1.92%
PDM[3]	-6.99%	6.95%	0.19%	12.4%	17.6%	0.37%		-3.81%	-3.08%	-4.70%	9.47%			-2.38%	-7.08%

Table A4. Analytical results for fusion Co in OREAS 100a (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	18.0	<20	19.0	18.0	18.6	20.0	NR	**14.6**	16.0	17.2	18.0	NR	NR	17.5	NR
2	18.0	20.0	19.0	19.0	**20.1**	20.0	NR	**15.9**	16.0	17.3	17.5	NR	NR	**18.4**	NR
3	18.0	20.0	19.0	19.0	**17.6**	21.0	NR	15.5	16.0	17.9	17.6	NR	NR	17.8	NR
4	18.0	<20	19.0	20.0	19.2	20.0	NR	15.3	16.0	16.0	17.5	NR	NR	17.9	NR
5	17.0	20.0	18.0	19.0	18.9	20.0	NR	15.2	17.0	17.5	17.8	NR	NR	17.9	NR
6	18.0	<20	18.0	19.0	19.1	20.0	NR	15.3	16.0	16.8	17.9	NR	NR	17.8	NR
Mean	17.8	20.0	18.7	19.0	18.9	20.2		15.3	16.2	17.1	17.7			17.9	
Median	18.0	20.0	19.0	19.0	19.0	20.0		15.3	16.0	17.3	17.7			17.9	
Std.Dev.	0.4	0.0	0.5	0.6	0.8	0.4		0.4	0.4	0.7	0.2			0.3	
Rel.Std.Dev.	2.29%	0.00%	2.77%	3.33%	4.24%	2.02%		2.88%	2.53%	3.83%	1.21%			1.64%	
PDM[3]	-1.28%	10.7%	3.33%	5.18%	4.72%	11.6%		-15.4%	-10.5%	-5.25%	-1.92%			-1.00%	

Table A5. Analytical results for fusion Cu in OREAS 100a (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	191	160	279	180	169	170	NR	154	**157**	159	162	NR	NR	NR	NR
2	170	180	255	180	163	170	NR	155	**156**	164	158	NR	NR	NR	NR
3	171	160	**319**	180	167	170	NR	157	169	168	160	NR	NR	NR	NR
4	174	180	245	180	165	180	NR	147	174	**152**	157	NR	NR	NR	NR
5	185	180	**363**	170	168	180	NR	167	172	165	158	NR	NR	NR	NR
6	183	180	260	170	158	170	NR	162	170	163	160	NR	NR	NR	NR
Mean	179	173	**287**	177	165	173		157	166	162	159				
Median	179	180	270	180	166	170		156	170	164	159				
Std.Dev.	9	10	46	5	4	5		7	8	6	2				
Rel.Std.Dev.	4.78%	5.96%	15.9%	2.92%	2.53%	2.98%		4.35%	4.70%	3.48%	1.15%				
PDM[3]	6.11%	2.75%	70.0%	4.73%	-2.26%	2.75%		-7.04%	-1.40%	-4.07%	-5.65%				

Table A6. Analytical results for fusion Dy in OREAS 100a (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	**24.5**	24.5	26.4	24.8	25.9	24.0	23.0	23.5	24.0	23.0	23.7	NR	NR	22.1	19.7
2	23.3	24.5	26.5	23.8	27.3	23.0	24.0	23.2	22.3	23.0	24.0	NR	NR	22.3	23.0
3	23.8	25.0	25.3	22.6	**24.1**	23.0	23.0	25.4	24.6	23.5	23.7	NR	NR	22.5	20.5
4	23.6	26.0	25.3	22.8	27.2	23.0	22.0	25.6	22.2	**21.2**	23.6	NR	NR	**21.3**	20.3
5	23.2	25.0	25.2	21.6	26.1	23.0	**16.0**	24.6	22.7	23.2	23.3	NR	NR	22.2	21.8
6	23.2	25.5	23.9	22.3	27.1	22.0	24.0	23.9	22.6	22.0	23.0	NR	NR	22.1	22.0
Mean	23.6	**25.1**	**25.4**	23.0	**26.3**	23.0	22.0	24.4	23.1	22.7	23.6			22.1	**21.2**
Median	23.5	25.0	25.3	22.7	26.6	23.0	23.0	24.2	22.7	23.0	23.7			22.2	21.2
Std.Dev.	0.5	0.6	1.0	1.1	1.2	0.6	3.0	1.0	1.0	0.9	0.4			0.4	1.2
Rel.Std.Dev.	2.13%	2.33%	3.74%	4.97%	4.58%	2.75%	13.8%	3.99%	4.30%	3.85%	1.49%			1.97%	5.83%
PDM[3]	1.73%	8.13%	9.63%	-0.93%	13.3%	-0.85%	-5.17%	5.06%	-0.57%	-2.36%	1.52%			-4.79%	-8.50%

Table A7. Analytical results for fusion Er in OREAS 100a (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	15.2	16.5	16.1	12.5	17.0	16.0	15.0	14.0	15.0	15.1	15.5	NR	NR	14.7	12.7
2	15.3	16.0	16.5	12.6	17.7	15.0	15.0	14.5	14.0	15.5	15.7	NR	NR	14.9	14.5
3	14.7	16.0	15.4	12.8	**15.5**	15.0	15.0	13.5	15.1	15.5	15.6	NR	NR	14.5	13.0
4	15.2	16.5	15.7	13.1	17.8	15.0	14.0	14.3	13.8	14.3	15.8	NR	NR	14.4	13.4
5	14.8	16.0	15.5	13.0	17.0	15.0	**10.0**	13.3	14.2	16.0	15.6	NR	NR	14.8	13.7
6	15.1	**17.5**	14.6	12.9	17.2	15.0	15.0	13.3	13.9	14.9	15.4	NR	NR	14.4	13.9
Mean	15.1	16.4	15.6	**12.8**	**17.0**	15.2	14.0	13.8	14.3	15.2	15.6			14.6	13.5
Median	15.2	16.3	15.6	12.9	17.1	15.0	15.0	13.8	14.1	15.3	15.6			14.6	13.5
Std.Dev.	0.2	0.6	0.7	0.2	0.8	0.4	2.0	0.5	0.6	0.6	0.1			0.2	0.6
Rel.Std.Dev.	1.61%	3.56%	4.16%	1.81%	4.72%	2.69%	14.3%	3.72%	3.99%	3.80%	0.83%			1.34%	4.71%
PDM[3]	1.00%	10.2%	4.92%	-14.0%	14.4%	1.79%	-6.04%	-7.29%	-3.80%	2.01%	4.58%			-1.96%	-9.30%

Table A8. Analytical results for fusion Eu in OREAS 100a (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	3.70	3.80	4.20	3.80	4.25	< 8	3.40	3.60	3.95	3.89	3.65	NR	NR	3.69	2.64
2	3.70	4.00	4.30	3.70	4.38	< 8	3.30	3.62	3.85	3.95	3.70	NR	NR	3.70	3.13
3	3.60	4.00	4.00	3.40	**3.80**	< 8	3.30	3.53	3.64	4.08	3.67	NR	NR	3.70	2.83
4	3.60	4.00	3.90	3.40	4.47	< 8	3.20	3.57	3.74	3.64	3.70	NR	NR	**3.60**	2.91
5	3.80	4.00	4.00	3.30	4.26	< 8	**2.40**	3.49	3.83	4.17	3.59	NR	NR	3.69	3.13
6	3.60	4.20	3.90	3.30	4.24	< 8	3.50	3.62	3.83	3.86	3.54	NR	NR	3.67	3.15
Mean	3.67	4.00	4.05	3.48	4.23	< 8	3.18	3.57	3.81	3.93	3.64			3.68	2.97
Median	3.65	4.00	4.00	3.40	4.26	< 8	3.30	3.59	3.83	3.92	3.66			3.69	3.02
Std.Dev.	0.08	0.13	0.16	0.21	0.23	-	0.40	0.05	0.11	0.18	0.06			0.04	0.21
Rel.Std.Dev.	2.23%	3.16%	4.06%	6.13%	5.41%	-	12.5%	1.46%	2.77%	4.70%	1.77%			1.04%	7.01%
PDM[3]	-1.05%	7.94%	9.29%	-6.00%	14.3%	-	-14.1%	-3.62%	2.73%	6.10%	-1.73%			-0.83%	-20.0%

Table A9. Analytical results for fusion Fe in OREAS 100a (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 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	4.81	4.87	4.63	**4.62**	4.55	4.60	4.87	4.57	**4.87**	NR	4.56	NR	NR	**5.11**	4.61
2	4.80	4.85	4.61	4.76	4.61	4.60	4.71	4.60	4.62	NR	4.53	NR	NR	4.88	4.61
3	4.73	4.73	4.75	4.76	4.63	4.60	4.67	4.59	4.60	NR	**4.59**	NR	NR	5.04	4.62
4	4.80	4.77	4.60	4.75	4.56	**4.80**	4.69	4.64	**4.73**	NR	4.53	NR	NR	4.90	4.63
5	4.80	4.80	4.61	4.77	4.62	4.70	4.43	4.60	4.62	NR	4.54	NR	NR	4.80	**4.55**
6	4.77	4.82	4.74	4.72	4.57	**4.40**	4.96	4.57	4.62	NR	4.54	NR	NR	4.90	**4.68**
Mean	4.79	4.81	4.66	4.73	4.59	4.62	4.72	4.59	4.68		4.55			**4.94**	4.62
Median	4.80	4.81	4.62	4.76	4.59	4.60	4.70	4.60	4.62		4.54			4.90	4.62
Std.Dev.	0.03	0.05	0.07	0.06	0.03	0.13	0.18	0.03	0.11		0.02			0.11	0.04
Rel.Std.Dev.	0.63%	1.07%	1.49%	1.20%	0.76%	2.88%	3.88%	0.57%	2.25%		0.51%			2.32%	0.91%
PDM[3]	2.60%	3.06%	-0.17%	1.42%	-1.57%	-1.01%	1.24%	-1.50%	0.25%		-2.48%			5.88%	-1.03%

Table A10. Analytical results for fusion Gd in OREAS 100a (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	20.3	22.0	27.5	25.3	27.3	26.0	22.0	22.5	21.7	24.3	25.3	NR	NR	21.4	19.9
2	20.0	26.0	27.7	24.3	28.3	25.0	22.0	23.0	22.4	26.7	25.2	NR	NR	21.4	23.0
3	20.6	22.0	26.4	23.1	**24.6**	25.0	22.0	22.7	**19.5**	25.1	25.2	NR	NR	21.5	21.9
4	20.3	22.0	25.8	23.1	28.0	25.0	**20.0**	22.9	21.7	24.5	24.6	NR	NR	21.3	21.1
5	20.3	22.0	26.7	22.0	27.6	25.0	**16.0**	21.9	22.1	26.7	24.6	NR	NR	21.1	22.2
6	20.7	24.0	24.7	22.6	27.5	24.0	23.0	21.9	22.2	25.8	23.9	NR	NR	21.3	22.9
Mean	20.4	23.0	26.5	23.4	27.2	25.0	20.8	22.5	21.6	25.5	24.8			21.3	21.8
Median	20.3	22.0	26.6	23.1	27.6	25.0	22.0	22.6	21.9	25.5	24.9			21.3	22.0
Std.Dev.	0.3	1.7	1.1	1.2	1.4	0.6	2.6	0.5	1.1	1.1	0.5			0.2	1.2
Rel.Std.Dev.	1.23%	7.28%	4.21%	5.13%	5.00%	2.53%	12.3%	2.10%	4.93%	4.14%	2.18%			0.76%	5.28%
PDM[3]	-13.5%	-2.35%	12.4%	-0.66%	15.5%	6.14%	-11.6%	-4.60%	-8.30%	8.33%	5.29%			-9.45%	-7.28%

Table A11. Analytical results for fusion Ho in OREAS 100a (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	5.00	5.40	5.20	5.10	5.51	5.00	4.60	4.84	4.90	4.72	5.06	NR	NR	NR	4.19
2	5.00	5.60	5.20	4.90	5.74	< 5	4.70	4.84	4.70	4.88	5.11	NR	NR	NR	4.88
3	4.90	5.60	4.90	4.70	**5.14**	< 5	4.60	4.68	**5.10**	4.90	5.13	NR	NR	NR	4.28
4	4.90	5.60	5.00	4.60	5.67	< 5	4.50	4.80	4.60	4.60	5.09	NR	NR	NR	4.33
5	4.90	5.40	5.00	4.50	5.57	< 5	**3.30**	4.68	4.60	4.98	5.00	NR	NR	NR	4.60
6	5.00	5.60	4.70	4.70	5.61	< 5	4.90	4.72	4.70	4.77	4.98	NR	NR	NR	4.49
Mean	4.95	**5.53**	5.00	4.75	**5.54**	< 5	4.43	4.76	4.77	4.81	5.06				4.46
Median	4.95	5.60	5.00	4.70	5.59	< 5	4.60	4.76	4.70	4.83	5.08				4.41
Std.Dev.	0.05	0.10	0.19	0.22	0.21	-	0.57	0.08	0.20	0.14	0.06				0.25
Rel.Std.Dev.	1.11%	1.87%	3.79%	4.56%	3.83%	-	12.9%	1.59%	4.13%	2.88%	1.19%				5.68%
PDM[3]	2.80%	14.9%	3.84%	-1.35%	15.0%	-	-7.93%	-1.17%	-1.00%	-0.14%	5.12%				-7.35%

Table A12. Analytical results for fusion K in OREAS 100a (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	3.98	3.90	3.84	4.11	**3.50**	4.40	4.10	4.39	3.93	NR	3.99	NR	NR	3.89	3.79
2	4.02	3.80	3.86	4.09	3.58	4.20	4.21	4.41	3.77	NR	**3.89**	NR	NR	3.87	3.80
3	4.02	3.90	3.92	**3.79**	3.59	4.50	4.08	4.59	3.96	NR	3.98	NR	NR	3.85	3.81
4	4.03	3.80	3.83	4.05	3.55	4.40	4.08	4.37	3.97	NR	3.99	NR	NR	3.89	3.82
5	4.03	3.70	3.82	4.05	3.62	4.50	3.97	4.66	3.76	NR	4.03	NR	NR	3.93	3.80
6	4.06	3.70	3.92	3.91	3.59	4.20	**4.41**	**3.77**	3.79	NR	4.02	NR	NR	3.90	**3.89**
Mean	4.02	3.80	3.87	4.00	3.57	4.37	4.14	**4.36**	3.86		3.98			3.89	3.82
Median	4.03	3.80	3.85	4.05	3.59	4.40	4.09	4.40	3.86		3.99			3.89	3.80
Std.Dev.	0.03	0.09	0.04	0.12	0.04	0.14	0.15	0.31	0.10		0.05			0.03	0.04
Rel.Std.Dev.	0.64%	2.35%	1.10%	3.11%	1.19%	3.13%	3.67%	7.20%	2.55%		1.25%			0.74%	1.01%
PDM[3]	2.14%	-3.53%	-1.88%	1.55%	-9.33%	10.9%	5.15%	10.8%	-1.93%		1.13%			-1.26%	-3.07%

Table A13. Analytical results for fusion La in OREAS 100a (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	**259**	278	259	240	309	260	NR	249	**245**	256	287	NR	NR	264	251
2	254	294	259	240	328	260	NR	251	257	272	278	NR	NR	261	254
3	250	269	266	240	**283**	260	NR	246	260	265	282	NR	NR	263	251
4	252	278	267	240	320	250	NR	251	254	255	284	NR	NR	258	245
5	250	278	260	250	313	260	NR	245	258	277	282	NR	NR	262	262
6	251	291	269	240	314	250	NR	250	256	267	285	NR	NR	261	259
Mean	253	281	263	242	**311**	257		249	255	265	283			261	254
Median	252	278	263	240	313	260		250	257	266	283			261	252
Std.Dev.	3	9	5	4	15	5		3	5	9	3			2	6
Rel.Std.Dev.	1.37%	3.33%	1.71%	1.69%	4.90%	2.01%		1.02%	2.08%	3.27%	1.09%			0.76%	2.50%
PDM[3]	-2.90%	8.08%	1.16%	-7.16%	19.6%	-1.40%		-4.40%	-2.04%	1.93%	8.72%			0.34%	-2.59%

Table A14. Analytical results for fusion Lu in OREAS 100a (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	**2.26**	2.40	2.40	2.20	2.48	< 8	NR	NR	2.15	2.08	2.29	NR	NR	2.32	1.97
2	2.29	2.40	**2.50**	2.20	2.66	< 8	NR	NR	2.15	2.26	2.32	NR	NR	2.34	2.08
3	2.33	2.40	2.30	2.00	2.30	< 8	NR	NR	**2.31**	2.20	2.30	NR	NR	2.33	1.97
4	2.33	2.40	2.30	2.10	2.53	< 8	NR	NR	2.20	2.11	2.29	NR	NR	2.29	1.92
5	2.32	2.40	2.30	2.00	2.58	< 8	NR	NR	2.20	2.30	2.26	NR	NR	2.32	2.04
6	2.32	2.60	2.20	2.10	2.46	< 8	NR	NR	2.19	2.20	**2.20**	NR	NR	2.29	2.01
Mean	2.31	2.43	2.33	2.10	2.50	< 8			2.20	2.19	2.28			2.32	2.00
Median	2.32	2.40	2.30	2.10	2.51	< 8			2.20	2.20	2.29			2.32	1.99
Std.Dev.	0.03	0.08	0.10	0.09	0.12	-			0.06	0.08	0.04			0.02	0.06
Rel.Std.Dev.	1.21%	3.36%	4.43%	4.26%	4.95%	-			2.67%	3.85%	1.86%			0.90%	2.84%
PDM[3]	2.01%	7.53%	3.11%	-7.20%	10.6%	-			-2.78%	-3.15%	0.61%			2.30%	-11.7%

Table A15. Analytical results for fusion Mg in OREAS 100a (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	0.830	0.840	0.828	0.800	0.797	0.760	0.850	0.850	0.850	NR	0.860	NR	NR	0.832	0.877
2	0.820	0.850	0.832	0.830	0.798	0.750	0.840	0.868	0.850	NR	0.850	NR	NR	0.838	0.890
3	0.820	0.820	0.850	0.800	0.811	0.750	0.820	0.868	**0.808**	NR	0.860	NR	NR	0.826	0.861
4	0.810	0.840	0.845	0.820	0.804	0.770	0.830	0.881	**0.820**	NR	0.850	NR	NR	0.832	0.859
5	0.840	0.820	0.838	0.830	0.800	0.760	0.800	0.874	0.856	NR	0.860	NR	NR	0.838	0.868
6	0.830	0.860	0.838	0.820	**0.782**	0.740	0.850	0.850	0.850	NR	0.860	NR	NR	0.832	0.889
Mean	0.825	0.838	0.839	0.817	0.799	**0.755**	0.832	0.865	0.839		0.857			0.833	0.874
Median	0.825	0.840	0.838	0.820	0.799	0.755	0.835	0.868	0.850		0.860			0.832	0.873
Std.Dev.	0.010	0.016	0.008	0.014	0.010	0.010	0.019	0.013	0.020		0.005			0.005	0.014
Rel.Std.Dev.	1.27%	1.91%	0.97%	1.67%	1.19%	1.39%	2.33%	1.45%	2.38%		0.60%			0.54%	1.56%
PDM[3]	-1.72%	-0.13%	-0.11%	-2.71%	-4.87%	-10.1%	-0.92%	3.10%	-0.01%		2.06%			-0.72%	4.14%

Table A16. Analytical results for fusion Mn in OREAS 100a (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	543	540	510	**558**	501	520	600	542	558	NR	500	NR	NR	NR	553
2	546	540	510	590	509	510	600	542	542	NR	500	NR	NR	NR	555
3	537	540	530	586	513	510	600	542	534	NR	500	NR	NR	NR	542
4	537	540	520	594	507	**540**	500	542	542	NR	500	NR	NR	NR	544
5	543	540	520	586	509	520	500	542	542	NR	500	NR	NR	NR	545
6	541	540	520	578	**493**	510	600	542	542	NR	500	NR	NR	NR	555
Mean	541	540	518	582	505	518	567	542	543		500				549
Median	542	540	520	586	508	515	600	542	542		500				549
Std.Dev.	4	0	8	13	7	12	52	0	8		0				6
Rel.Std.Dev.	0.67%	0.00%	1.45%	2.22%	1.45%	2.26%	9.11%	0.00%	1.40%		0.00%				1.09%
PDM[3]	0.74%	0.53%	-3.51%	8.35%	-5.97%	-3.51%	5.49%	0.92%	1.16%		-6.92%				2.16%

Table A17. Analytical results for fusion Mo in OREAS 100a (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	26.0	25.0	26.0	26.2	24.2	22.0	NR	20.7	21.0	22.0	27.0	NR	NR	NR	NR
2	25.0	25.0	24.6	26.7	26.4	22.0	NR	22.7	22.0	23.0	25.0	NR	NR	NR	NR
3	24.0	25.0	25.6	25.6	22.7	**17.0**	NR	22.7	23.0	22.0	25.0	NR	NR	NR	NR
4	24.0	25.0	25.9	**30.5**	25.6	**17.0**	NR	21.6	**47.0**	22.0	25.0	NR	NR	NR	NR
5	24.0	25.0	25.1	25.4	26.6	20.0	NR	21.7	**32.0**	23.0	26.0	NR	NR	NR	NR
6	24.0	25.0	25.5	25.3	24.4	27.0	NR	22.5	23.0	22.0	25.0	NR	NR	NR	NR
Mean	24.5	25.0	25.5	26.6	25.0	20.8		22.0	28.0	22.3	25.5				
Median	24.0	25.0	25.6	25.9	25.0	21.0		22.1	23.0	22.0	25.0				
Std.Dev.	0.8	0.0	0.5	2.0	1.5	3.8		0.8	10.1	0.5	0.8				
Rel.Std.Dev.	3.41%	0.00%	2.06%	7.42%	6.02%	18.1%		3.63%	36.1%	2.31%	3.28%				
PDM[3]	1.84%	3.91%	5.79%	10.6%	3.78%	-13.4%		-8.59%	16.4%	-7.17%	5.99%				

Table A18. Analytical results for fusion Nd in OREAS 100a (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	152	160	177	**185**	170	150	150	151	135	130	150	NR	NR	164	**119**
2	150	160	179	175	182	150	150	151	128	142	148	NR	NR	164	134
3	147	155	166	165	**157**	150	140	148	140	134	150	NR	NR	165	133
4	149	162	168	164	177	150	140	149	128	136	150	NR	NR	159	134
5	147	159	171	158	173	160	**100**	146	124	144	147	NR	NR	163	135
6	149	164	160	162	174	140	150	149	131	140	146	NR	NR	**158**	**145**
Mean	149	160	170	168	172	150	138	149	131	137	148			162	133
Median	149	160	169	165	173	150	145	149	130	138	149			163	134
Std.Dev.	2	3	7	10	8	6	19	2	6	5	2			3	8
Rel.Std.Dev.	1.23%	1.90%	4.01%	5.94%	4.88%	4.22%	14.0%	1.34%	4.37%	3.86%	1.20%			1.87%	6.37%
PDM[3]	-2.03%	5.17%	11.8%	10.5%	13.2%	-1.40%	-9.07%	-2.13%	-13.9%	-9.67%	-2.50%			6.52%	-12.4%

Table A19. Analytical results for fusion Ni in OREAS 100a (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 -	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	**22.0**	<50	27.0	20.0	2.1	< 25	NR	<15	10.0	**16.0**	16.0	NR	NR	<20	NR
2	<20	<50	24.0	20.0	10.5	< 25	NR	<15	11.0	8.0	12.0	NR	NR	**25.0**	NR
3	<20	<50	24.0	20.0	8.6	< 25	NR	<15	10.0	**16.0**	15.0	NR	NR	<20	NR
4	<20	<50	29.0	20.0	4.9	< 25	NR	<15	10.0	7.0	11.0	NR	NR	<20	NR
5	<20	<50	25.0	10.0	6.7	< 25	NR	<15	11.0	8.0	14.0	NR	NR	<20	NR
6	<20	<50	29.0	20.0	4.4	< 25	NR	<15	11.0	8.0	14.0	NR	NR	<20	NR
Mean	<20	<50	26.3	18.3	6.2	< 25		<15	10.5	10.5	13.7			<20	
Median	<20	<50	26.0	20.0	5.8	< 25		<15	10.5	8.0	14.0			<20	
Std.Dev.	-	-	2.3	4.1	3.1	-		-	0.5	4.3	1.9			-	
Rel.Std.Dev.	-	-	8.88%	22.3%	49.3%	-		-	5.22%	40.7%	13.6%			-	
PDM[3]	-	-	90.9%	32.9%	-55.1%	-		-	-23.9%	-23.9%	-0.94%			-	

Table A20. Analytical results for fusion P in OREAS 100a (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	700	600	410	500	470	NR	NR	393	611	NR	600	NR	NR	546	**668**
2	600	600	450	500	441	NR	NR	524	611	NR	500	NR	NR	572	510
3	500	700	490	400	524	NR	NR	567	567	NR	600	NR	NR	519	460
4	600	600	430	500	395	NR	NR	524	567	NR	500	NR	NR	533	495
5	600	600	460	500	488	NR	NR	436	567	NR	500	NR	NR	498	483
6	600	700	450	500	417	NR	NR	655	611	NR	500	NR	NR	563	508
Mean	600	633	448	483	456			516	589		533			538	521
Median	600	600	450	500	456			524	589		500			539	501
Std.Dev.	63	52	27	41	47			93	24		52			28	75
Rel.Std.Dev.	10.5%	8.15%	6.05%	8.45%	10.4%			18.1%	4.06%		9.68%			5.15%	14.3%
PDM[3]	13.4%	19.7%	-15.2%	-8.62%	-13.8%			-2.37%	11.4%		0.83%			1.77%	-1.55%

Table A21. Analytical results for fusion Pb in OREAS 100a (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	23.0	10.0	<15	15.0	13.9	< 20	NR	9.5	10.0	9.0	13.4	NR	NR	NR	NR
2	<20	10.0	<15	18.0	12.3	**31.0**	NR	**16.8**	22.0	8.0	13.4	NR	NR	NR	NR
3	21.0	<10	<15	14.0	13.3	< 20	NR	10.3	10.0	9.0	14.0	NR	NR	NR	NR
4	**34.0**	10.0	<15	20.0	13.5	**25.0**	NR	11.0	**56.0**	8.0	13.7	NR	NR	NR	NR
5	21.0	<10	<15	15.0	12.0	< 20	NR	10.5	**38.0**	9.0	13.6	NR	NR	NR	NR
6	23.0	10.0	<15	22.0	13.9	< 20	NR	10.0	14.0	9.0	**12.9**	NR	NR	NR	NR
Mean	24.4	10.0	<15	17.3	13.2	< 20		11.4	25.0	8.7	13.5				
Median	23.0	10.0	<15	16.5	13.4	< 20		10.4	18.0	9.0	13.5				
Std.Dev.	5.5	0.0	-	3.2	0.8	-		2.7	18.5	0.5	0.4				
Rel.Std.Dev.	22.4%	0.00%	-	18.5%	6.20%	-		24.0%	74.0%	5.96%	2.73%				
PDM[3]	79.0%	-26.6%	-	27.2%	-3.46%	-		-16.6%	83.4%	-36.4%	-0.97%				

Table A22. Analytical results for fusion Pr in OREAS 100a (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	**45.7**	49.2	56.7	**54.3**	52.8	46.0	45.0	46.7	**48.0**	43.8	47.0	NR	NR	49.8	**38.4**
2	43.6	50.8	57.0	51.1	56.5	45.0	44.0	47.6	42.4	47.3	46.4	NR	NR	49.8	42.1
3	43.7	50.2	53.7	47.2	**48.8**	46.0	43.0	46.0	**52.9**	45.0	47.0	NR	NR	49.0	41.6
4	44.7	50.4	53.9	47.9	54.5	46.0	41.0	46.9	42.2	44.5	47.1	NR	NR	48.9	42.3
5	43.4	49.8	53.6	46.0	53.4	46.0	**31.0**	45.8	41.8	48.2	45.9	NR	NR	49.3	42.9
6	43.8	**52.4**	51.0	46.9	54.5	44.0	45.0	46.9	42.7	47.2	46.2	NR	NR	49.1	**46.4**
Mean	44.1	50.5	54.3	48.9	53.4	45.5	41.5	46.7	45.0	46.0	46.6			49.3	42.3
Median	43.7	50.3	53.8	47.6	53.9	46.0	43.5	46.8	42.6	46.1	46.7			49.2	42.2
Std.Dev.	0.9	1.1	2.2	3.2	2.6	0.8	5.4	0.6	4.5	1.8	0.5			0.4	2.6
Rel.Std.Dev.	2.03%	2.17%	4.11%	6.49%	4.85%	1.84%	12.9%	1.37%	10.0%	3.90%	1.08%			0.78%	6.12%
PDM[3]	-6.36%	7.10%	15.3%	3.78%	13.3%	-3.44%	-11.9%	-0.96%	-4.50%	-2.38%	-1.10%			4.68%	-10.2%

Table A23. Analytical results for fusion Sm in OREAS 100a (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	24.1	26.0	28.9	**26.4**	26.5	24.0	23.0	24.4	24.4	23.1	24.0	NR	NR	23.6	**19.6**
2	23.7	26.0	28.6	25.3	28.4	24.0	22.0	24.3	23.9	24.0	23.6	NR	NR	24.1	22.8
3	24.0	26.5	27.2	23.8	**24.7**	25.0	22.0	23.8	**23.1**	23.8	23.7	NR	NR	23.2	22.3
4	23.7	26.0	27.2	23.9	28.1	25.0	**21.0**	24.0	23.6	23.1	23.8	NR	NR	22.9	22.5
5	23.5	**24.5**	27.3	22.9	27.0	25.0	**16.0**	23.6	23.9	24.9	23.4	NR	NR	22.7	23.0
6	24.2	26.5	26.4	23.4	27.6	24.0	23.0	23.8	24.0	24.1	23.1	NR	NR	22.9	**24.5**
Mean	23.9	**25.9**	**27.6**	24.3	**27.1**	24.5	21.2	24.0	23.8	23.8	23.6			23.2	22.5
Median	23.9	26.0	27.3	23.9	27.3	24.5	22.0	23.9	23.9	23.9	23.7			23.1	22.7
Std.Dev.	0.3	0.7	1.0	1.3	1.4	0.5	2.6	0.3	0.4	0.7	0.3			0.5	1.6
Rel.Std.Dev.	1.14%	2.84%	3.45%	5.40%	5.07%	2.24%	12.5%	1.31%	1.83%	2.85%	1.34%			2.24%	7.09%
PDM[3]	1.12%	9.80%	16.9%	2.88%	14.7%	3.80%	-10.3%	1.69%	0.91%	0.98%	-0.01%			-1.56%	-4.82%

Table A24. Analytical results for fusion Tb in OREAS 100a (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	3.57	3.60	4.10	3.70	4.37	< 8	NR	3.60	3.90	3.74	4.22	NR	NR	3.80	3.08
2	3.55	4.20	4.10	3.60	4.56	< 8	NR	3.61	3.90	3.78	4.24	NR	NR	3.84	3.58
3	3.53	4.20	3.90	3.40	**4.07**	< 8	NR	3.58	3.80	3.89	4.23	NR	NR	3.77	3.19
4	3.46	4.00	3.90	3.40	4.58	< 8	NR	3.57	3.80	3.54	4.26	NR	NR	3.73	3.20
5	3.47	4.00	3.90	3.30	4.51	< 8	NR	3.50	3.90	3.88	4.12	NR	NR	3.75	3.42
6	3.42	3.80	3.70	3.40	4.41	< 8	NR	3.56	3.80	3.70	4.14	NR	NR	3.72	3.50
Mean	3.50	3.97	3.93	3.47	4.42	< 8		3.57	3.85	3.76	4.20			3.77	3.33
Median	3.50	4.00	3.90	3.40	4.46	< 8		3.58	3.85	3.76	4.23			3.76	3.31
Std.Dev.	0.06	0.23	0.15	0.15	0.19	-		0.04	0.05	0.13	0.06			0.05	0.20
Rel.Std.Dev.	1.68%	5.89%	3.83%	4.34%	4.25%	-		1.13%	1.42%	3.45%	1.37%			1.20%	5.95%
PDM[3]	-7.96%	4.32%	3.44%	-8.83%	16.2%	-		-6.10%	1.25%	-1.25%	10.5%			-0.90%	-12.4%

Table A25. Analytical results for fusion Th in OREAS 100a (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	48.2	48.5	57.1	44.7	58.3	**51.0**	NR	47.8	**51.6**	53.6	53.6	NR	NR	55.8	47.6
2	48.2	48.0	57.5	44.9	58.9	50.0	NR	48.9	53.0	53.6	54.6	NR	NR	58.0	47.4
3	**47.2**	50.0	58.1	47.3	55.1	49.0	NR	46.2	**56.7**	55.1	55.6	NR	NR	56.5	**44.3**
4	48.1	48.5	57.8	46.7	56.5	49.0	NR	46.8	53.2	**49.0**	54.8	NR	NR	55.1	46.7
5	48.3	48.5	56.6	47.8	56.4	49.0	NR	47.3	53.1	54.3	54.5	NR	NR	56.8	46.9
6	48.5	50.5	58.1	46.8	56.8	48.0	NR	48.0	53.8	51.1	53.6	NR	NR	58.1	45.6
Mean	48.1	49.0	57.5	46.4	57.0	49.3		47.5	53.6	52.8	54.5			56.7	46.4
Median	48.2	48.5	57.7	46.8	56.7	49.0		47.5	53.2	53.6	54.6			56.7	46.8
Std.Dev.	0.5	1.0	0.6	1.3	1.4	1.0		0.9	1.7	2.3	0.8			1.2	1.2
Rel.Std.Dev.	0.94%	2.04%	1.04%	2.75%	2.43%	2.09%		1.98%	3.17%	4.33%	1.40%			2.10%	2.67%
PDM[3]	-6.85%	-5.08%	11.5%	-10.2%	10.4%	-4.43%		-8.0%	3.77%	2.25%	5.48%			9.87%	-10.1%

Table A26. Analytical results for fusion Ti in OREAS 100a (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	0.240	0.240	0.236	**0.258**	0.220	0.260	0.240	0.236	**0.249**	NR	0.240	NR	NR	0.234	0.237
2	0.240	0.240	0.235	0.272	0.224	0.260	0.240	0.236	0.236	NR	0.250	NR	NR	0.234	0.238
3	0.240	0.230	**0.241**	0.270	0.225	0.250	0.240	0.236	0.240	NR	0.250	NR	NR	0.234	0.240
4	0.240	0.240	0.236	0.276	0.221	0.250	0.240	0.238	0.246	NR	0.250	NR	NR	0.240	0.240
5	0.240	0.230	**0.234**	0.274	0.224	0.250	**0.220**	0.239	0.239	NR	0.240	NR	NR	0.240	0.238
6	0.240	0.240	0.236	0.267	0.222	0.240	0.250	0.233	0.238	NR	0.250	NR	NR	0.240	0.242
Mean	0.240	0.237	0.236	**0.270**	**0.223**	**0.252**	0.238	0.236	0.241		0.247			0.237	0.239
Median	0.240	0.240	0.236	0.271	0.223	0.250	0.240	0.236	0.239		0.250			0.237	0.239
Std.Dev.	0.000	0.005	0.002	0.006	0.002	0.008	0.010	0.002	0.005		0.005			0.003	0.002
Rel.Std.Dev.	0.00%	2.18%	1.02%	2.39%	0.87%	2.99%	4.13%	0.89%	2.17%		2.09%			1.39%	0.80%
PDM[3]	0.31%	-1.08%	-1.22%	12.6%	-6.92%	5.19%	-0.38%	-1.27%	0.90%		3.10%			-1.02%	0.04%

Table A27. Analytical results for fusion Tm in OREAS 100a (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	2.20	2.60	2.50	NR	2.55	< 10	2.10	2.19	2.23	2.25	2.27	NR	NR	2.42	2.03
2	2.20	2.40	2.50	NR	2.67	< 10	2.10	2.21	2.12	2.36	2.30	NR	NR	2.49	2.28
3	2.20	2.60	2.40	NR	**2.40**	< 10	2.10	2.18	2.29	2.31	2.28	NR	NR	2.42	2.01
4	2.20	2.60	2.40	NR	2.63	< 10	2.00	2.16	2.11	2.19	2.30	NR	NR	2.47	2.16
5	2.20	2.40	2.40	NR	2.62	< 10	**1.50**	2.11	2.19	2.40	2.30	NR	NR	2.47	2.15
6	2.20	2.60	2.30	NR	2.61	< 10	2.20	2.12	2.12	2.26	2.28	NR	NR	2.43	2.11
Mean	2.20	2.53	2.42		2.58	< 10	2.00	2.16	2.18	2.30	2.29			2.45	2.12
Median	2.20	2.60	2.40		2.61	< 10	2.10	2.17	2.16	2.29	2.29			2.45	2.13
Std.Dev.	0.00	0.10	0.08		0.10	-	0.25	0.04	0.07	0.08	0.01			0.03	0.10
Rel.Std.Dev.	0.00%	4.08%	3.11%		3.75%	-	12.6%	1.78%	3.36%	3.36%	0.58%			1.24%	4.70%
PDM[3]	-4.58%	9.88%	4.82%		12.0%	-	-13.3%	-6.31%	-5.59%	-0.46%	-0.75%			6.26%	-7.88%

Table A28. Analytical results for fusion V in OREAS 100a (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	<50	<50	32.0	40.0	35.1	39.0	NR	32.2	32.0	37.0	**64.0**	NR	NR	42.0	30.6
2	<50	50.0	32.0	40.0	35.0	39.0	NR	34.4	38.0	42.0	39.0	NR	NR	41.0	30.9
3	<50	<50	33.0	40.0	**37.3**	41.0	NR	34.5	37.0	38.0	48.0	NR	NR	38.0	30.6
4	<50	<50	33.0	40.0	35.9	41.0	NR	29.7	33.0	36.0	51.0	NR	NR	38.0	30.9
5	<50	50.0	32.0	40.0	35.4	42.0	NR	27.7	36.0	42.0	44.0	NR	NR	32.0	31.5
6	<50	50.0	32.0	40.0	33.9	40.0	NR	27.8	38.0	40.0	**53.0**	NR	NR	31.0	**32.9**
Mean	<50	**50.0**	32.3	40.0	35.4	40.3		31.0	35.7	39.2	49.8			37.0	31.2
Median	<50	50.0	32.0	40.0	35.3	40.5		31.0	36.5	39.0	49.5			38.0	30.9
Std.Dev.	-	0.0	0.5	0.0	1.1	1.2		3.1	2.6	2.6	8.6			4.6	0.9
Rel.Std.Dev.	-	0.00%	1.60%	0.00%	3.15%	3.00%		10.0%	7.24%	6.54%	17.2%			12.3%	2.78%
PDM[3]	-	36.2%	-11.9%	8.99%	-3.44%	9.89%		-15.4%	-2.82%	6.71%	35.8%			0.81%	-14.9%

Table A29. Analytical results for fusion Y in OREAS 100a (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	135	149	143	153	141	130	NR	138	**153**	135	148	NR	NR	141	143
2	135	144	141	151	152	130	NR	139	140	145	148	NR	NR	141	144
3	137	146	141	149	134	140	NR	136	150	142	148	NR	NR	138	141
4	137	152	146	149	153	140	NR	136	145	134	**145**	NR	NR	140	141
5	135	149	142	147	148	140	NR	135	139	144	148	NR	NR	138	141
6	136	146	144	143	146	130	NR	135	140	140	148	NR	NR	136	145
Mean	136	148	143	149	146	135		137	145	140	147			139	142
Median	136	148	143	149	147	135		136	143	141	148			139	142
Std.Dev.	1	3	2	3	7	5		2	6	5	1			2	2
Rel.Std.Dev.	0.80%	1.95%	1.36%	2.32%	4.77%	4.06%		1.20%	4.08%	3.39%	0.77%			1.46%	1.10%
PDM[3]	-4.33%	4.00%	0.60%	4.70%	2.59%	-4.92%		-3.71%	1.77%	-1.52%	3.71%			-2.28%	0.27%

Table A30. Analytical results for fusion Yb in OREAS 100a (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 -	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	14.6	12.2	17.5	15.3	16.8	15.0	NR	15.0	15.2	15.0	15.8	NR	NR	15.3	13.3
2	14.5	12.4	**18.4**	15.1	17.7	15.0	NR	15.2	14.5	14.5	15.8	NR	NR	15.5	14.2
3	14.6	12.6	17.3	14.2	15.8	15.0	NR	14.9	15.2	15.6	15.9	NR	NR	15.3	12.7
4	14.7	12.6	17.2	14.4	17.9	15.0	NR	15.0	14.6	13.7	16.0	NR	NR	14.9	13.1
5	14.4	**11.8**	17.2	13.9	17.1	15.0	NR	14.5	14.7	15.0	15.8	NR	NR	15.2	13.8
6	**15.1**	12.6	**16.2**	14.1	17.6	15.0	NR	14.6	14.4	14.4	**15.5**	NR	NR	15.1	13.5
Mean	14.7	**12.4**	**17.3**	14.5	**17.1**	15.0		14.9	14.8	14.7	15.8			15.2	**13.5**
Median	14.6	12.5	17.3	14.3	17.4	15.0		14.9	14.7	14.7	15.8			15.3	13.4
Std.Dev.	0.2	0.3	0.7	0.6	0.8	0.0		0.2	0.4	0.6	0.2			0.2	0.5
Rel.Std.Dev.	1.66%	2.59%	4.07%	3.93%	4.57%	0.00%		1.65%	2.37%	4.41%	1.18%			1.30%	3.98%
PDM[3]	-1.88%	-17.2%	15.9%	-2.89%	14.8%	0.46%		-0.36%	-1.10%	-1.72%	5.71%			1.94%	-9.88%

Table A31. Analytical results for 4-acid U in OREAS 100a (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	137	135	123	127	147	100	132	116	**140**	121	127	120	116	139	145
2	130	134	125	131	159	110	136	114	148	124	130	120	110	136	147
3	136	135	128	121	143	120	130	112	147	122	136	119	115	131	146
4	143	135	126	124	150	110	129	110	149	121	135	123	117	**146**	144
5	131	136	125	121	150	120	133	116	147	123	132	118	117	137	146
6	132	135	124	133	155	120	131	115	146	124	127	122	111	135	147
Mean	135	135	125	126	151	113	132	114	146	122	131	120	114	137	146
Median	134	135	125	126	150	115	132	114	147	122	131	120	115	137	146
Std.Dev.	5	1	2	5	6	8	2	3	3	1	4	2	3	5	1
Rel.Std.Dev.	3.73%	0.47%	1.38%	4.02%	3.83%	7.20%	1.88%	2.21%	2.18%	1.09%	2.98%	1.50%	2.75%	3.68%	0.72%
PDM[3]	3.92%	4.01%	-3.56%	-2.79%	16.1%	-12.7%	1.57%	-12.3%	12.6%	-5.87%	0.80%	-7.42%	-12.0%	5.75%	12.3%

Table A32. Analytical results for 4-acid Ce in OREAS 100a (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	416	488	446	250	490	420	510	**455**	**434**	433	484	471	496	417	465
2	419	493	457	240	502	430	540	484	454	455	493	472	470	408	463
3	**448**	496	452	240	474	430	560	477	460	446	460	474	483	399	461
4	415	510	462	240	503	420	530	489	**513**	466	486	491	461	420	461
5	**401**	485	448	240	502	420	530	484	457	465	496	490	492	410	464
6	419	501	461	240	539	410	500	486	465	452	472	484	495	411	465
Mean	420	496	454	**242**	502	422	528	479	464	453	482	480	483	411	463
Median	417	495	455	240	502	420	530	484	459	454	485	479	488	411	464
Std.Dev.	16	9	7	4	21	8	21	12	26	12	14	9	14	7	2
Rel.Std.Dev.	3.72%	1.84%	1.48%	1.69%	4.28%	1.79%	4.04%	2.57%	5.68%	2.73%	2.82%	1.90%	3.00%	1.79%	0.43%
PDM[3]	-10.1%	6.17%	-2.65%	-48.2%	7.50%	-9.65%	13.2%	2.68%	-0.61%	-2.97%	3.24%	2.92%	3.46%	-12.0%	-0.72%

Table A33. Analytical results for 4-acid Co in OREAS 100a (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	16.8	15.0	16.5	17.9	18.8	18.0	19.0	16.1	18.0	14.8	17.7	18.1	16.3	18.0	16.8
2	**15.9**	20.0	16.5	17.8	19.2	20.0	19.0	16.4	17.0	15.3	17.9	17.5	**15.3**	17.0	17.0
3	16.5	20.0	16.3	17.5	17.8	20.0	19.0	15.5	19.0	15.5	18.3	17.5	16.2	17.0	16.9
4	17.1	15.0	16.7	18.0	18.5	19.0	18.0	15.8	19.0	16.1	18.4	18.0	16.8	18.0	16.5
5	16.9	20.0	16.2	17.6	18.8	21.0	19.0	15.4	18.0	15.9	17.6	17.5	16.4	17.0	16.8
6	16.8	20.0	16.7	18.0	19.1	21.0	18.0	15.7	18.0	15.7	17.2	18.0	16.1	18.0	**17.2**
Mean	16.7	18.3	16.5	17.8	18.7	19.8	18.7	15.8	18.2	15.6	17.9	17.8	16.2	17.5	16.9
Median	16.8	20.0	16.5	17.9	18.8	20.0	19.0	15.8	18.0	15.6	17.8	17.8	16.3	17.5	16.8
Std.Dev.	0.4	2.6	0.2	0.2	0.5	1.2	0.5	0.4	0.8	0.5	0.5	0.3	0.5	0.5	0.2
Rel.Std.Dev.	2.54%	14.1%	1.24%	1.18%	2.59%	5.89%	2.77%	2.38%	4.14%	2.98%	2.52%	1.66%	3.06%	3.13%	1.30%
PDM[3]	-4.74%	4.79%	-5.79%	1.74%	6.88%	13.4%	6.69%	-9.60%	3.83%	-11.1%	2.02%	1.55%	-7.50%	0.02%	-3.65%

Table A34. Analytical results for 4-acid Cu in OREAS 100a (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	172	166	181	179	152	190	176	172	157	**153**	169	155	161	181	166
2	171	164	182	172	154	200	182	176	156	157	169	153	159	170	166
3	173	164	180	172	148	190	176	**181**	169	157	174	153	162	172	165
4	172	164	180	175	151	200	175	172	174	**164**	172	157	163	181	162
5	173	166	**170**	169	149	200	176	170	172	160	169	158	162	179	165
6	**168**	164	176	177	151	200	176	169	170	158	164	153	161	173	166
Mean	172	165	178	174	151	**197**	177	173	166	158	169	155	161	176	165
Median	172	164	180	174	151	200	176	172	170	157	169	154	161	176	165
Std.Dev.	2	1	4	4	2	5	3	5	8	4	4	2	1	5	1
Rel.Std.Dev.	1.09%	0.63%	2.52%	2.12%	1.34%	2.63%	1.45%	2.66%	4.70%	2.38%	2.07%	1.50%	0.91%	2.79%	0.83%
PDM[3]	2.61%	-1.47%	6.60%	4.11%	-9.77%	17.7%	5.80%	3.64%	-0.48%	-5.51%	1.27%	-7.46%	-3.62%	5.27%	-1.36%

Table A35. Analytical results for 4-acid Dy in OREAS 100a (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	17.3	22.2	18.9	18.3	NR	23.0	NR	19.0	**16.9**	NR	15.7	19.6	NR	NR	NR
2	17.2	21.8	19.3	18.4	NR	22.0	NR	19.2	17.7	NR	15.5	20.0	NR	NR	NR
3	**18.4**	21.7	18.4	18.0	NR	23.0	NR	17.9	17.8	NR	16.3	19.6	NR	NR	NR
4	17.2	22.5	19.1	18.0	NR	23.0	NR	17.7	**19.5**	NR	15.8	20.2	NR	NR	NR
5	17.0	20.1	18.9	17.6	NR	22.0	NR	19.8	17.4	NR	16.3	19.7	NR	NR	NR
6	17.1	21.0	18.0	18.0	NR	24.0	NR	19.2	17.6	NR	15.2	19.9	NR	NR	NR
Mean	17.4	21.6	18.8	18.1		22.8		18.8	17.8		15.8	19.8			
Median	17.2	21.8	18.9	18.0		23.0		19.1	17.7		15.8	19.8			
Std.Dev.	0.5	0.9	0.5	0.3		0.8		0.8	0.9		0.4	0.2			
Rel.Std.Dev.	3.07%	4.05%	2.52%	1.56%		3.30%		4.37%	4.96%		2.77%	1.22%			
PDM[3]	-8.26%	13.8%	-0.86%	-4.68%		20.6%		-0.72%	-5.91%		-16.6%	4.74%			

Table A36. Analytical results for 4-acid Er in OREAS 100a (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	10.4	11.9	11.8	10.8	NR	14.0	NR	10.8	**11.9**	NR	9.8	12.5	NR	NR	NR
2	10.1	12.0	11.9	10.8	NR	14.0	NR	11.6	12.5	NR	9.6	12.5	NR	NR	NR
3	10.6	11.9	11.4	10.9	NR	15.0	NR	11.0	12.4	NR	**10.2**	12.4	NR	NR	NR
4	9.9	**12.4**	11.6	11.3	NR	14.0	NR	11.0	**14.0**	NR	9.7	12.7	NR	NR	NR
5	9.9	11.8	11.6	10.8	NR	14.0	NR	11.6	12.3	NR	9.6	12.4	NR	NR	NR
6	10.1	12.2	11.2	11.2	NR	15.0	NR	11.5	12.4	NR	9.3	12.7	NR	NR	NR
Mean	10.1	12.0	11.6	11.0		14.3		11.3	12.6		9.7	12.5			
Median	10.1	12.0	11.6	10.9		14.0		11.3	12.4		9.7	12.5			
Std.Dev.	0.3	0.2	0.3	0.2		0.5		0.4	0.7		0.3	0.1			
Rel.Std.Dev.	2.69%	1.87%	2.26%	2.05%		3.60%		3.17%	5.76%		2.94%	0.93%			
PDM[3]	-12.8%	3.41%	-0.47%	-5.75%		23.2%		-3.32%	8.14%		-16.8%	7.49%			

Table A37. Analytical results for 4-acid Eu in OREAS 100a (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	3.33	3.90	3.87	3.40	NR	**3.20**	NR	3.40	3.64	NR	3.73	4.04	NR	NR	NR
2	3.34	3.95	3.95	3.40	NR	3.70	NR	3.70	3.71	NR	3.66	4.07	NR	NR	NR
3	**3.77**	3.80	3.78	3.31	NR	3.60	NR	3.70	3.78	NR	3.84	4.03	NR	NR	NR
4	3.24	4.10	3.88	3.29	NR	3.70	NR	3.60	**4.16**	NR	3.70	**4.18**	NR	NR	NR
5	3.26	3.85	3.81	3.19	NR	3.60	NR	3.70	3.82	NR	3.64	4.03	NR	NR	NR
6	3.28	3.95	**3.54**	3.24	NR	3.60	NR	3.70	3.83	NR	3.48	4.14	NR	NR	NR
Mean	3.37	3.93	3.81	3.31		3.57		3.63	3.82		3.68	4.08			
Median	3.31	3.93	3.84	3.30		3.60		3.70	3.80		3.68	4.06			
Std.Dev.	0.20	0.10	0.14	0.08		0.19		0.12	0.18		0.12	0.06			
Rel.Std.Dev.	5.93%	2.64%	3.75%	2.56%		5.22%		3.33%	4.70%		3.23%	1.56%			
PDM[3]	-8.49%	6.58%	3.32%	-10.3%		-3.15%		-1.34%	3.82%		-0.21%	10.8%			

Table A38. Analytical results for 4-acid Fe in OREAS 100a (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	4.99	4.92	4.55	3.93	4.12	4.40	NR	4.65	4.74	**4.24**	4.76	4.36	4.46	4.60	4.57
2	4.86	4.87	4.58	3.79	4.12	4.70	NR	4.55	4.82	4.30	4.81	4.32	4.41	4.51	4.57
3	5.03	4.80	4.55	3.89	4.01	4.60	NR	4.60	4.95	4.33	**5.02**	4.31	4.44	4.35	4.55
4	4.97	4.78	**4.49**	3.90	3.96	4.60	NR	4.58	**5.34**	**4.47**	4.86	4.41	4.53	4.54	4.51
5	4.90	4.84	4.54	3.70	4.02	4.70	NR	4.61	4.96	4.34	4.89	4.33	4.50	4.46	4.54
6	4.80	4.78	4.56	3.83	3.98	4.40	NR	4.53	4.90	4.30	4.80	4.36	4.49	4.32	4.55
Mean	4.93	4.83	4.55	3.84	4.03	4.57		4.59	4.95	4.33	4.86	4.35	4.47	4.46	4.55
Median	4.94	4.82	4.55	3.86	4.01	4.60		4.59	4.93	4.32	4.84	4.35	4.48	4.49	4.55
Std.Dev.	0.09	0.06	0.03	0.09	0.07	0.14		0.04	0.21	0.08	0.09	0.04	0.04	0.11	0.02
Rel.Std.Dev.	1.76%	1.16%	0.70%	2.22%	1.70%	2.99%		0.94%	4.19%	1.78%	1.90%	0.84%	0.97%	2.46%	0.51%
PDM[3]	9.11%	7.04%	0.73%	-14.9%	-10.6%	1.17%		1.62%	9.70%	-4.07%	7.60%	-3.66%	-0.93%	-1.12%	0.82%

Table A39. Analytical results for 4-acid Gd in OREAS 100a (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	19.4	23.0	19.3	**20.7**	NR	22.0	NR	16.1	21.8	NR	20.8	17.6	NR	NR	NR
2	19.4	22.8	19.8	20.4	NR	24.0	NR	17.8	22.5	NR	20.5	18.0	NR	NR	NR
3	**20.7**	21.8	19.1	20.3	NR	24.0	NR	17.6	22.3	NR	21.5	17.5	NR	NR	NR
4	18.9	23.2	19.7	20.4	NR	24.0	NR	16.9	**24.9**	NR	21.0	17.7	NR	NR	NR
5	19.1	21.0	19.5	**20.0**	NR	24.0	NR	18.6	22.5	NR	20.4	17.5	NR	NR	NR
6	18.8	22.4	**18.1**	20.4	NR	23.0	NR	18.3	22.1	NR	19.8	**18.2**	NR	NR	NR
Mean	19.4	22.4	19.2	20.4		23.5		17.6	22.7		20.7	17.7			
Median	19.3	22.6	19.4	20.4		24.0		17.7	22.4		20.7	17.6			
Std.Dev.	0.7	0.8	0.6	0.2		0.8		0.9	1.1		0.6	0.3			
Rel.Std.Dev.	3.44%	3.73%	3.23%	1.11%		3.56%		5.26%	4.93%		2.87%	1.62%			
PDM[3]	-4.58%	10.0%	-5.38%	0.20%		15.6%		-13.7%	11.6%		1.64%	-12.8%			

Table A40. Analytical results for 4-acid Ho in OREAS 100a (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	3.58	**4.08**	3.53	3.37	NR	**3.20**	NR	3.80	4.10	NR	3.13	4.01	NR	NR	NR
2	3.53	3.84	3.61	3.37	NR	3.50	NR	3.90	4.20	NR	3.04	4.04	NR	NR	NR
3	**3.74**	3.82	3.41	3.33	NR	3.50	NR	3.70	4.30	NR	3.24	4.05	NR	NR	NR
4	3.47	3.92	3.50	3.34	NR	3.60	NR	3.70	4.50	NR	3.16	4.10	NR	NR	NR
5	3.52	3.76	3.50	**3.24**	NR	3.50	NR	4.20	4.10	NR	3.07	4.01	NR	NR	NR
6	3.48	3.84	3.38	3.33	NR	3.40	NR	4.00	4.20	NR	2.95	4.06	NR	NR	NR
Mean	3.55	3.88	3.49	3.33		3.45		3.88	4.23		3.10	4.05			
Median	3.53	3.84	3.50	3.34		3.50		3.85	4.20		3.10	4.05			
Std.Dev.	0.10	0.11	0.08	0.05		0.14		0.19	0.15		0.10	0.03			
Rel.Std.Dev.	2.80%	2.89%	2.39%	1.43%		4.00%		5.00%	3.56%		3.26%	0.84%			
PDM[3]	-2.94%	5.89%	-4.71%	-9.04%		-5.76%		6.08%	15.6%		-15.4%	10.5%			

Table A41. Analytical results for 4-acid K in OREAS 100a (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	4.23	3.76	4.02	3.89	3.66	NR	NR	4.08	3.20	3.39	3.83	3.84	3.54	3.84	**3.89**
2	4.14	3.82	4.06	3.97	3.74	NR	NR	4.21	2.89	3.42	3.82	3.77	**3.48**	3.76	3.77
3	4.29	3.78	4.08	3.93	3.61	NR	NR	4.01	3.57	3.41	3.94	3.73	3.52	3.66	3.75
4	4.21	3.88	3.97	4.12	3.52	NR	NR	4.19	3.59	**3.60**	3.88	3.86	3.53	3.81	3.76
5	4.17	3.90	4.01	3.90	3.60	NR	NR	4.13	4.04	3.41	3.86	3.63	3.53	3.67	3.79
6	4.04	3.81	4.02	4.08	3.57	NR	NR	4.16	3.80	3.43	3.76	3.81	3.56	3.64	3.80
Mean	4.18	3.83	4.03	3.98	3.62			4.13	3.52	3.44	3.85	3.77	3.53	3.73	3.79
Median	4.19	3.82	4.02	3.95	3.61			4.15	3.58	3.42	3.85	3.79	3.53	3.72	3.78
Std.Dev.	0.09	0.06	0.04	0.10	0.08			0.07	0.41	0.08	0.06	0.08	0.03	0.08	0.05
Rel.Std.Dev.	2.08%	1.44%	0.96%	2.43%	2.09%			1.81%	11.8%	2.26%	1.58%	2.24%	0.75%	2.27%	1.38%
PDM[3]	10.09%	0.77%	6.10%	4.90%	-4.72%			8.80%	-7.40%	-9.29%	1.38%	-0.59%	-7.09%	-1.73%	-0.11%

Table A42. Analytical results for 4-acid La in OREAS 100a (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	247	278	288	138	258	240	250	**225**	**254**	**226**	263	260	251	245	273
2	252	273	296	136	265	240	270	240	262	236	271	259	**245**	242	275
3	**267**	274	294	144	**251**	240	290	240	266	236	275	262	250	231	272
4	247	276	300	134	265	240	280	235	**286**	243	275	266	253	250	269
5	240	276	289	134	265	240	260	240	263	240	269	265	249	241	271
6	242	274	295	142	**283**	230	240	244	266	238	260	264	250	239	275
Mean	249	275	294	**138**	265	238	265	237	266	237	269	263	250	241	273
Median	247	275	295	137	265	240	265	240	265	237	270	263	250	242	272
Std.Dev.	10	2	5	4	11	4	19	7	11	6	6	3	3	6	3
Rel.Std.Dev.	3.88%	0.67%	1.53%	3.04%	4.01%	1.71%	7.06%	2.88%	4.01%	2.45%	2.31%	1.07%	1.06%	2.57%	0.93%
PDM[3]	-3.60%	6.42%	13.6%	-46.6%	2.30%	-7.82%	2.49%	-8.20%	2.94%	-8.53%	3.97%	1.59%	-3.44%	-6.68%	5.40%

Table A43. Analytical results for 4-acid Lu in OREAS 100a (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	1.48	1.72	1.62	1.40	1.67	1.20	1.70	NR	1.60	NR	1.33	1.69	NR	NR	NR
2	1.40	1.76	1.64	1.40	1.75	1.40	1.70	NR	1.70	NR	1.34	1.72	NR	NR	NR
3	1.52	1.74	1.56	1.40	1.60	1.40	1.80	NR	1.70	NR	**1.38**	1.70	NR	NR	NR
4	1.43	1.74	1.63	1.40	1.67	1.40	1.70	NR	**1.90**	NR	1.35	1.73	NR	NR	NR
5	1.45	1.68	1.59	1.30	1.73	1.40	1.60	NR	1.60	NR	1.33	1.68	NR	NR	NR
6	1.43	1.76	1.53	1.40	1.78	1.40	1.60	NR	1.60	NR	1.31	1.74	NR	NR	NR
Mean	1.45	1.73	1.60	1.38	1.70	1.37	1.68		1.68		1.34	1.71			
Median	1.44	1.74	1.61	1.40	1.70	1.40	1.70		1.65		1.34	1.71			
Std.Dev.	0.04	0.03	0.04	0.04	0.06	0.08	0.08		0.12		0.02	0.02			
Rel.Std.Dev.	3.01%	1.74%	2.71%	2.95%	3.82%	5.97%	4.47%		6.94%		1.77%	1.38%			
PDM[3]	-6.85%	11.1%	2.27%	-11.3%	8.98%	-12.4%	7.93%		7.93%		-14.1%	9.64%			

Table A44. Analytical results for 4-acid Mg in OREAS 100a (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	0.884	0.820	0.814	0.846	0.764	0.810	NR	0.860	0.790	0.710	0.810	0.770	0.770	0.800	0.844
2	0.876	0.820	0.817	0.865	0.769	0.830	NR	0.890	0.790	0.720	0.820	0.760	0.760	0.790	0.851
3	0.886	0.820	0.832	0.859	0.748	0.830	NR	0.840	0.820	0.740	0.860	0.760	0.760	0.760	0.851
4	0.889	0.820	0.800	**0.899**	0.754	0.820	NR	0.880	**0.880**	0.740	0.830	0.780	0.780	0.800	0.838
5	0.886	0.830	0.799	0.858	0.746	0.810	NR	0.860	0.820	0.730	0.830	0.770	0.770	0.820	0.839
6	**0.858**	0.820	0.806	0.884	0.751	0.830	NR	0.900	0.810	0.720	0.810	0.760	0.770	0.750	0.842
Mean	0.880	0.822	0.811	0.869	0.755	0.822		0.872	0.818	0.727	0.827	0.767	0.768	0.787	0.844
Median	0.885	0.820	0.810	0.862	0.752	0.825		0.870	0.815	0.725	0.825	0.765	0.770	0.795	0.843
Std.Dev.	0.011	0.004	0.012	0.019	0.009	0.010		0.022	0.033	0.012	0.019	0.008	0.008	0.027	0.006
Rel.Std.Dev.	1.30%	0.50%	1.52%	2.24%	1.21%	1.20%		2.56%	4.05%	1.67%	2.25%	1.06%	0.98%	3.38%	0.68%
PDM[3]	8.49%	1.32%	0.05%	7.10%	-6.88%	1.32%		7.49%	0.91%	-10.4%	1.94%	-5.46%	-5.25%	-2.99%	4.11%

Table A45. Analytical results for 4-acid Mn in OREAS 100a (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	548	550	490	589	475	520	NR	527	558	491	533	529	503	564	**639**
2	540	548	493	577	477	550	NR	520	563	497	535	522	495	551	601
3	554	548	496	573	466	520	NR	496	574	503	**559**	520	495	523	599
4	556	548	484	581	463	550	NR	503	**615**	**516**	542	535	505	575	591
5	553	**558**	487	**555**	467	540	NR	509	578	503	544	520	503	554	591
6	537	546	489	577	466	500	NR	502	572	498	535	525	500	544	593
Mean	548	550	490	575	469	530		510	577	501	541	525	500	552	602
Median	551	548	490	577	467	530		506	573	501	539	524	502	553	596
Std.Dev.	8	4	4	11	6	20		12	20	8	10	6	4	18	19
Rel.Std.Dev.	1.44%	0.78%	0.87%	1.97%	1.21%	3.77%		2.32%	3.50%	1.69%	1.79%	1.13%	0.86%	3.22%	3.10%
PDM[3]	2.96%	3.28%	-7.97%	8.10%	-11.8%	-0.42%		-4.27%	8.35%	-5.80%	1.71%	-1.33%	-6.02%	3.68%	13.2%

Table A46. Analytical results for 4-acid Mo in OREAS 100a (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	24.4	22.5	23.2	18.9	24.5	22.0	21.0	21.7	19.2	20.4	20.3	25.0	25.2	22.2	22.6
2	23.5	23.0	23.4	18.6	25.6	23.0	22.0	22.8	20.3	21.1	20.6	23.8	24.0	19.7	22.2
3	23.9	22.5	24.0	18.7	23.0	23.0	21.0	21.6	18.7	21.0	21.1	23.5	24.8	19.5	22.4
4	24.2	22.5	24.5	19.1	24.6	**25.0**	22.0	22.6	**23.4**	**22.1**	21.2	24.7	25.2	21.0	22.1
5	24.2	23.5	22.9	19.1	24.6	23.0	23.0	21.8	**14.9**	21.5	20.3	24.2	24.9	19.5	23.1
6	23.9	23.0	24.0	19.6	25.7	24.0	22.0	22.2	17.9	21.1	19.4	24.3	24.7	20.6	22.4
Mean	24.0	22.8	23.7	19.0	24.7	23.3	21.8	22.1	19.1	21.2	20.5	24.3	24.8	20.4	22.5
Median	24.1	22.8	23.7	19.0	24.6	23.0	22.0	22.0	19.0	21.1	20.5	24.3	24.9	20.2	22.4
Std.Dev.	0.3	0.4	0.6	0.4	1.0	1.0	0.8	0.5	2.8	0.6	0.7	0.6	0.4	1.1	0.4
Rel.Std.Dev.	1.33%	1.79%	2.53%	1.88%	3.90%	4.43%	3.45%	2.26%	14.7%	2.67%	3.28%	2.28%	1.79%	5.25%	1.62%
PDM[3]	7.98%	2.66%	6.41%	-14.6%	10.9%	4.91%	-1.83%	-0.56%	-14.3%	-4.68%	-7.94%	9.03%	11.5%	-8.20%	1.14%

Table A47. Analytical results for 4-acid Nd in OREAS 100a (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	140	166	159	159	NR	140	NR	143	152	NR	141	155	NR	NR	NR
2	141	170	164	160	NR	130	NR	147	155	NR	139	158	NR	NR	NR
3	**153**	169	154	155	NR	140	NR	153	160	NR	146	159	NR	NR	NR
4	141	172	162	158	NR	140	NR	144	**176**	NR	142	161	NR	NR	NR
5	138	**159**	159	154	NR	140	NR	154	158	NR	139	158	NR	NR	NR
6	140	167	153	158	NR	140	NR	158	163	NR	134	162	NR	NR	NR
Mean	**142**	**167**	158	157		138		150	161		**140**	159			
Median	140	168	159	158		140		150	159		140	158			
Std.Dev.	6	5	4	2		4		6	8		4	3			
Rel.Std.Dev.	3.98%	2.71%	2.72%	1.49%		2.95%		3.94%	5.25%		2.76%	1.66%			
PDM[3]	-6.55%	9.91%	4.09%	3.45%		-9.05%		-1.44%	5.64%		-7.95%	4.32%			

Table A48. Analytical results for 4-acid Ni in OREAS 100a (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	12.0	18.0	9.8	11.0	**8.5**	< 20	12.0	7.7	10.0	9.0	9.5	**15.0**	10.9	10.4	11.1
2	10.0	18.0	10.0	10.0	7.7	< 20	11.0	8.1	11.0	9.1	10.0	9.0	10.6	9.9	10.6
3	9.0	22.0	9.8	11.0	7.5	< 20	12.0	7.2	10.0	9.3	**12.6**	10.0	11.0	9.5	10.4
4	11.0	20.0	10.2	11.0	7.2	< 20	11.0	7.7	10.0	9.4	10.0	9.4	11.3	**11.1**	10.3
5	11.0	18.0	9.6	10.0	7.3	< 20	12.0	7.2	11.0	9.3	9.2	**13.4**	10.7	9.6	10.7
6	12.0	22.0	10.0	**17.0**	7.8	< 20	10.0	8.1	11.0	9.1	9.0	10.5	10.8	9.8	10.9
Mean	10.8	**19.7**	9.9	11.7	**7.7**		11.3	**7.7**	10.5	9.2	10.1	11.2	10.9	10.1	10.7
Median	11.0	19.0	9.9	11.0	7.6		11.5	7.7	10.5	9.2	9.8	10.3	10.9	9.9	10.7
Std.Dev.	1.2	2.0	0.2	2.7	0.4		0.8	0.4	0.5	0.2	1.3	2.4	0.2	0.6	0.3
Rel.Std.Dev.	10.8%	10.0%	2.12%	22.8%	5.79%		7.20%	5.26%	5.22%	1.68%	13.1%	21.6%	2.28%	5.99%	2.80%
PDM[3]	5.43%	91.4%	-3.66%	13.5%	-25.3%		10.29%	-25.4%	2.18%	-10.5%	-2.20%	9.16%	5.91%	-2.20%	3.93%

Table A49. Analytical results for 4-acid P in OREAS 100a (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 -	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	580	500	467	**460**	492	450	430	NR	350	460	530	480	480	**400**	500
2	536	500	474	480	489	470	**450**	NR	360	500	520	480	480	500	496
3	577	500	484	470	488	490	440	NR	370	460	540	480	490	**400**	501
4	563	500	473	490	472	480	430	NR	**420**	490	530	490	500	500	493
5	544	**550**	468	490	477	490	430	NR	**330**	460	530	480	500	500	493
6	532	500	479	490	497	480	420	NR	350	500	520	480	490	500	490
Mean	**555**	508	474	480	486	477	**433**		**363**	478	**528**	482	490	467	496
Median	554	500	474	485	489	480	430		355	475	530	480	490	500	495
Std.Dev.	21	20	6	13	10	15	10		31	20	8	4	9	52	4
Rel.Std.Dev.	3.76%	4.02%	1.37%	2.64%	2.00%	3.16%	2.38%		8.47%	4.27%	1.42%	0.85%	1.83%	11.1%	0.89%
PDM[3]	14.1%	4.46%	-2.56%	-1.36%	-0.16%	-2.05%	-11.0%		-25.3%	-1.71%	8.57%	-1.02%	0.69%	-4.10%	1.86%

Table A50. Analytical results for 4-acid Pb in OREAS 100a (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	17.0	15.0	8.6	**37.0**	10.1	**24.0**	13.0	13.5	10.0	14.9	13.4	15.5	14.3	10.8	15.2
2	16.0	14.0	8.5	14.0	9.7	< 20	15.0	12.6	11.0	15.1	13.4	15.6	**15.6**	10.9	16.4
3	17.0	14.0	8.7	11.0	9.7	< 20	14.0	13.3	12.0	15.0	14.0	15.2	14.3	9.6	15.7
4	17.0	14.0	8.5	15.0	9.8	< 20	15.0	12.1	12.0	**15.7**	13.7	15.7	14.7	10.7	**19.3**
5	17.0	14.0	8.3	10.0	9.5	< 20	15.0	11.4	13.0	15.2	13.6	15.4	14.5	9.9	16.2
6	16.0	14.0	8.4	12.0	9.6	< 20	14.0	13.0	11.0	15.2	**12.9**	15.5	13.8	9.2	16.5
Mean	16.7	14.2	8.5	16.5	9.7	< 20	14.3	12.7	11.5	15.2	13.5	15.5	14.5	10.2	16.6
Median	17.0	14.0	8.5	13.0	9.7	< 20	14.5	12.8	11.5	15.2	13.5	15.5	14.4	10.3	16.3
Std.Dev.	0.5	0.4	0.1	10.2	0.2	-	0.8	0.8	1.0	0.3	0.4	0.2	0.6	0.7	1.4
Rel.Std.Dev.	3.10%	2.88%	1.66%	61.9%	2.25%	-	5.70%	6.26%	9.12%	1.84%	2.73%	1.11%	4.14%	7.01%	8.68%
PDM[3]	26.4%	7.42%	-35.5%	25.1%	-26.2%	-	8.68%	-4.08%	-12.8%	15.1%	2.36%	17.4%	10.2%	-22.8%	25.5%

Table A51. Analytical results for 4-acid Pr in OREAS 100a (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 -	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	43.3	51.6	49.9	45.7	NR	43.0	NR	42.2	49.3	NR	42.4	49.3	NR	NR	NR
2	43.7	53.7	51.6	45.6	NR	45.0	NR	44.3	50.1	NR	41.6	51.3	NR	NR	NR
3	**48.3**	52.8	48.8	45.0	NR	45.0	NR	42.6	51.3	NR	44.0	50.8	NR	NR	NR
4	44.0	53.5	50.6	45.5	NR	45.0	NR	41.8	**57.2**	NR	42.9	52.0	NR	NR	NR
5	42.1	**49.7**	49.5	**44.3**	NR	45.0	NR	43.9	51.1	NR	42.4	51.2	NR	NR	NR
6	44.5	53.5	46.9	45.5	NR	45.0	NR	44.0	51.6	NR	41.2	52.2	NR	NR	NR
Mean	44.3	52.5	49.5	45.3		44.7		43.1	51.8		42.4	51.1			
Median	43.9	53.2	49.7	45.5		45.0		43.3	51.2		42.4	51.3			
Std.Dev.	2.1	1.6	1.6	0.5		0.8		1.1	2.8		1.0	1.0			
Rel.Std.Dev.	4.75%	2.97%	3.24%	1.17%		1.83%		2.46%	5.40%		2.33%	2.03%			
PDM[3]	-5.81%	11.5%	5.24%	-3.82%		-5.09%		-8.35%	9.99%		-9.87%	8.65%			

Table A52. Analytical results for 4-acid Sm in OREAS 100a (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	23.0	26.0	26.1	24.4	NR	23.0	NR	21.2	21.9	NR	21.7	25.0	NR	NR	NR
2	23.8	27.0	26.7	24.5	NR	23.0	NR	22.5	23.1	NR	21.2	25.5	NR	NR	NR
3	**26.0**	26.5	25.3	23.6	NR	22.0	NR	21.4	23.4	NR	22.0	25.2	NR	NR	NR
4	23.1	27.8	26.4	24.3	NR	23.0	NR	21.8	**26.3**	NR	21.6	25.8	NR	NR	NR
5	22.8	25.9	25.9	23.5	NR	22.0	NR	22.3	22.8	NR	21.2	25.3	NR	NR	NR
6	23.3	27.0	24.1	23.9	NR	23.0	NR	21.4	23.8	NR	**20.3**	25.6	NR	NR	NR
Mean	23.7	26.7	25.7	24.0		22.7		21.8	23.6		21.3	25.4			
Median	23.2	26.8	26.0	24.1		23.0		21.6	23.3		21.4	25.4			
Std.Dev.	1.2	0.7	0.9	0.4		0.5		0.5	1.5		0.6	0.3			
Rel.Std.Dev.	4.96%	2.68%	3.68%	1.78%		2.28%		2.44%	6.34%		2.78%	1.14%			
PDM[3]	-0.45%	12.3%	8.21%	1.04%		-4.70%		-8.49%	-0.99%		-10.3%	6.79%			

Table A53. Analytical results for 4-acid Tb in OREAS 100a (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	2.83	3.40	2.97	2.76	3.81	**2.90**	3.70	**2.80**	3.20	NR	2.91	3.65	NR	NR	NR
2	2.81	3.35	3.01	2.68	4.05	3.30	3.90	3.10	3.20	NR	2.87	3.83	NR	NR	NR
3	2.96	3.35	2.87	2.64	3.72	3.20	4.00	**2.90**	3.30	NR	**3.02**	3.71	NR	NR	NR
4	2.79	3.45	2.96	2.70	3.90	3.30	3.80	3.00	**3.60**	NR	2.89	3.80	NR	NR	NR
5	2.74	3.35	2.98	2.58	3.91	3.20	3.80	3.10	3.20	NR	2.87	3.72	NR	NR	NR
6	2.74	3.45	**2.76**	2.62	4.09	3.20	3.70	3.10	3.30	NR	**2.77**	3.77	NR	NR	NR
Mean	2.81	3.39	2.93	2.66	3.91	3.18	3.82	3.00	3.30		2.89	3.75			
Median	2.80	3.38	2.97	2.66	3.90	3.20	3.80	3.05	3.25		2.88	3.75			
Std.Dev.	0.08	0.05	0.09	0.06	0.14	0.15	0.12	0.13	0.15		0.08	0.07			
Rel.Std.Dev.	2.93%	1.45%	3.20%	2.39%	3.56%	4.62%	3.06%	4.22%	4.69%		2.79%	1.76%			
PDM[3]	-13.5%	4.39%	-10.0%	-18.0%	20.4%	-2.02%	17.5%	-7.66%	1.57%		-11.1%	15.3%			

Table A54. Analytical results for 4-acid Th in OREAS 100a (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	51.3	**45.4**	53.5	45.5	54.4	53.0	52.0	48.3	**25.5**	46.1	53.5	49.6	40.7	52.8	45.1
2	49.2	46.4	53.9	46.7	59.0	53.0	53.0	48.1	35.3	46.4	54.1	50.1	40.5	51.1	45.3
3	51.6	46.2	**55.0**	47.2	53.6	52.0	56.0	46.9	39.3	47.1	57.9	50.0	40.6	50.7	45.1
4	52.6	**43.9**	53.7	49.1	56.8	52.0	53.0	46.7	**51.2**	48.9	57.3	**51.3**	44.1	52.9	44.4
5	49.6	46.3	54.0	47.3	57.6	53.0	54.0	47.7	39.5	47.5	56.0	49.7	43.4	51.4	44.5
6	49.5	46.4	53.5	49.7	58.0	**50.0**	52.0	46.6	40.0	47.5	53.1	50.0	40.8	50.8	45.3
Mean	50.6	45.8	53.9	47.6	56.6	52.2	53.3	47.4	38.5	47.3	55.3	50.1	41.7	51.6	44.9
Median	50.4	46.3	53.8	47.3	57.2	52.5	53.0	47.3	39.4	47.3	55.1	50.0	40.8	51.3	45.1
Std.Dev.	1.4	1.0	0.6	1.6	2.1	1.2	1.5	0.7	8.3	1.0	2.0	0.6	1.6	1.0	0.4
Rel.Std.Dev.	2.77%	2.16%	1.04%	3.27%	3.73%	2.24%	2.82%	1.57%	21.6%	2.10%	3.68%	1.22%	3.88%	1.91%	0.85%
PDM[3]	2.96%	-6.89%	9.72%	-3.20%	15.1%	6.12%	8.50%	-3.61%	-21.7%	-3.88%	12.5%	1.95%	-15.2%	5.01%	-8.56%

Table A55. Analytical results for 4-acid Ti in OREAS 100a (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 -	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	0.233	0.230	0.222	0.211	0.142	0.240	NR	NR	0.240	0.189	0.215	0.213	0.198	0.188	0.214
2	0.234	0.240	0.224	0.215	0.142	0.250	NR	NR	0.250	0.192	0.213	0.213	0.199	0.187	**0.219**
3	0.232	0.235	0.224	0.215	0.141	0.240	NR	NR	0.240	0.193	0.220	0.211	0.198	0.180	0.214
4	0.231	0.250	0.219	0.222	**0.139**	0.240	NR	NR	0.270	**0.203**	0.216	**0.221**	0.202	0.186	**0.207**
5	0.231	0.235	0.220	0.205	0.142	0.230	NR	NR	**0.200**	0.194	0.217	0.211	0.200	0.182	0.212
6	**0.224**	0.245	0.222	0.217	0.138	0.240	NR	NR	0.230	0.192	0.210	0.216	0.199	0.183	0.213
Mean	0.231	0.239	0.222	0.214	**0.141**	0.240			0.238	0.194	0.215	0.214	0.199	0.184	0.213
Median	0.232	0.238	0.222	0.215	0.141	0.240			0.240	0.193	0.216	0.213	0.199	0.185	0.213
Std.Dev.	0.003	0.007	0.002	0.006	0.002	0.006			0.023	0.005	0.003	0.004	0.002	0.003	0.004
Rel.Std.Dev.	1.51%	3.08%	0.83%	2.68%	1.17%	2.64%			9.72%	2.47%	1.59%	1.78%	0.76%	1.70%	1.74%
PDM[3]	6.15%	10.0%	1.93%	-1.53%	-35.4%	10.3%			9.58%	-10.9%	-1.07%	-1.53%	-8.35%	-15.3%	-2.01%

Table A56. Analytical results for 4-acid Tm in OREAS 100a (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	1.55	1.78	1.66	1.51	NR	1.30	NR	1.60	1.80	NR	1.36	1.79	NR	NR	NR
2	1.50	1.94	1.65	1.51	NR	1.50	NR	1.70	1.90	NR	1.34	1.80	NR	NR	NR
3	1.58	1.88	1.58	1.45	NR	1.50	NR	1.60	1.80	NR	1.40	1.79	NR	NR	NR
4	1.48	1.72	1.66	1.47	NR	1.50	NR	1.50	2.10	NR	1.40	1.81	NR	NR	NR
5	1.48	1.64	1.61	1.43	NR	1.50	NR	1.70	1.80	NR	1.34	1.77	NR	NR	NR
6	1.52	1.70	1.54	1.49	NR	1.50	NR	1.60	1.80	NR	1.32	1.82	NR	NR	NR
Mean	1.52	1.78	1.62	1.48		1.47		1.62	1.87		1.36	1.80			
Median	1.51	1.75	1.63	1.48		1.50		1.60	1.80		1.35	1.80			
Std.Dev.	0.04	0.11	0.05	0.03		0.08		0.08	0.12		0.03	0.02			
Rel.Std.Dev.	2.65%	6.42%	3.05%	2.21%		5.57%		4.66%	6.49%		2.46%	0.97%			
PDM[3]	-5.73%	10.3%	0.38%	-8.31%		-8.93%		0.38%	15.9%		-15.6%	11.6%			

Table A57. Analytical results for 4-acid V in OREAS 100a (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	35.0	30.0	32.9	15.0	31.5	39.0	37.0	39.0	40.0	32.0	34.0	31.0	31.0	35.0	35.7
2	35.0	30.0	33.1	15.0	32.3	43.0	39.0	42.0	39.0	32.0	33.0	31.0	31.0	36.0	36.0
3	35.0	30.0	33.5	15.0	30.7	42.0	38.0	38.0	39.0	31.0	35.0	31.0	32.0	31.0	36.0
4	36.0	30.0	33.2	15.0	30.5	43.0	37.0	42.0	**44.0**	34.0	34.0	32.0	32.0	39.0	35.5
5	35.0	30.0	32.8	15.0	30.4	41.0	38.0	41.0	**35.0**	32.0	34.0	31.0	31.0	33.0	35.4
6	34.0	30.0	33.5	15.0	31.2	40.0	37.0	37.0	38.0	32.0	33.0	31.0	32.0	33.0	35.6
Mean	35.0	30.0	33.2	**15.0**	31.1	41.3	37.7	39.8	39.2	32.2	33.8	31.2	31.5	34.5	35.7
Median	35.0	30.0	33.2	15.0	30.9	41.5	37.5	40.0	39.0	32.0	34.0	31.0	31.5	34.0	35.7
Std.Dev.	0.6	0.0	0.3	0.0	0.7	1.6	0.8	2.1	2.9	1.0	0.8	0.4	0.5	2.8	0.3
Rel.Std.Dev.	1.81%	0.00%	0.89%	0.00%	2.31%	3.95%	2.17%	5.36%	7.47%	3.06%	2.22%	1.31%	1.74%	8.15%	0.73%
PDM[3]	0.83%	-13.6%	-4.45%	-56.8%	-10.4%	19.1%	8.52%	14.8%	12.8%	-7.33%	-2.53%	-10.2%	-9.25%	-0.61%	2.84%

Table A58. Analytical results for 4-acid Y in OREAS 100a (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	89	103	95	98	98	130	94	88	107	84	97	99	94	78	97
2	85	104	94	98	101	130	100	96	109	88	97	97	**92**	74	97
3	89	107	96	99	93	130	96	88	112	87	101	99	93	75	97
4	91	**110**	96	100	97	140	98	89	**124**	90	102	102	94	80	**95**
5	90	103	94	97	98	120	95	93	112	90	97	101	94	77	97
6	85	104	95	101	101	130	92	88	114	87	96	99	92	73	97
Mean	88	105	95	99	98	**130**	96	90	**113**	88	98	99	93	**76**	97
Median	89	104	95	99	98	130	96	89	112	88	97	99	94	76	97
Std.Dev.	2	3	1	1	3	6	3	3	6	2	2	2	1	3	1
Rel.Std.Dev.	2.78%	2.65%	1.07%	1.35%	3.12%	4.87%	2.98%	3.58%	5.25%	2.69%	2.34%	1.87%	1.16%	3.48%	0.71%
PDM[3]	-7.44%	10.1%	-0.64%	3.56%	2.58%	36.1%	0.30%	-5.61%	18.3%	-7.93%	2.91%	4.07%	-2.56%	-20.4%	1.11%

Table A59. Analytical results for 4-acid Yb in OREAS 100a (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	10.5	12.2	10.6	10.5	10.7	15.0	11.0	11.3	11.1	NR	9.3	11.4	NR	NR	NR
2	10.1	12.4	10.7	**10.9**	11.6	14.0	12.0	11.4	11.8	NR	9.2	11.6	NR	NR	NR
3	**10.9**	12.6	10.2	10.4	10.6	15.0	12.0	11.5	11.6	NR	9.7	11.5	NR	NR	NR
4	10.3	12.6	10.6	10.4	11.1	15.0	12.0	11.3	**12.8**	NR	9.5	11.6	NR	NR	NR
5	10.5	**11.8**	10.4	**10.2**	11.3	14.0	11.0	**12.7**	11.6	NR	9.2	11.2	NR	NR	NR
6	10.3	12.6	**9.9**	10.5	11.6	15.0	11.0	11.9	11.5	NR	8.9	11.7	NR	NR	NR
Mean	10.4	12.4	10.4	10.5	11.2	14.7	11.5	11.7	11.7		9.3	11.5			
Median	10.4	12.5	10.5	10.5	11.2	15.0	11.5	11.5	11.6		9.3	11.5			
Std.Dev.	0.3	0.3	0.3	0.2	0.4	0.5	0.5	0.5	0.6		0.3	0.2			
Rel.Std.Dev.	2.67%	2.59%	2.92%	2.21%	4.00%	3.52%	4.76%	4.67%	4.87%		2.92%	1.48%			
PDM[3]	-8.09%	8.95%	-8.38%	-7.65%	-1.70%	29.2%	1.31%	2.93%	3.37%		-18.0%	1.02%			