

CERTIFICATE OF ANALYSIS FOR

URANIUM-BEARING

CERTIFIED REFERENCE MATERIAL

OREAS 102a

SUMMARY STATISTICS OREAS 102a

Constituent	Certified Values	
	Fusion	4 Acid
Uranium, U (ppm)	662	638
Thorium, Th (ppm)	39.6	38.5
Cerium, Ce (ppm)	587	573
Lanthanum, La (ppm)	323	317

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

Table 1. Certified Values, SD's, 95% Confidence and Tolerance Limits for OREAS 102a.

Constituent	Certified Value	SD	95% Confidence Limits		95% Tolerance Limits	
			Low	High	Low	High
Fusion						
Cerium, Ce (ppm)	587	48	558	617	571	604
Cobalt, Co (ppm)	41	3.5	39	43	40	42
Copper, Cu (ppm)	289	20	274	305	283	296
Dysprosium, Dy (ppm)	18.1	1.0	17.6	18.6	17.4	18.8
Erbium, Er (ppm)	11.1	0.9	10.6	11.5	10.7	11.4
Europium, Eu (ppm)	3.89	0.35	3.68	4.10	3.68	4.10
Iron, Fe (wt.%)	5.78	0.18	5.68	5.89	5.71	5.86
Gadolinium, Gd (ppm)	20.9	1.6	19.9	22.0	20.0	21.9
Holmium, Ho (ppm)	3.56	0.14	3.49	3.63	3.39	3.73
Potassium, K (wt.%)	3.63	0.17	3.52	3.75	3.55	3.71
Lanthanum, La (ppm)	323	16	313	333	316	330
Lutetium, Lu (ppm)	1.70	0.14	1.60	1.80	1.65	1.74
Magnesium, Mg (wt.%)	1.36	0.042	1.34	1.39	1.33	1.39
Manganese, Mn (ppm)	465	23	450	479	458	472
Molybdenum, Mo (ppm)	14.3	1.4	13.3	15.2	13.3	15.2
Neodymium, Nd (ppm)	180	16	170	189	173	186
Nickel, Ni (ppm)	18	5	13	23	15	21
Phosphorous, P (ppm)	601	76	554	648	576	626
Praseodymium, Pr (ppm)	58	4.2	55	60	56	60
Samarium, Sm (ppm)	24.7	1.3	24.0	25.4	24.0	25.3
Terbium, Tb (ppm)	3.05	0.23	2.90	3.21	2.95	3.16
Thorium, Th (ppm)	39.6	2.0	38.2	40.9	38.3	40.8
Titanium, Ti (wt.%)	0.172	0.006	0.167	0.176	0.170	0.173
Thulium, Tm (ppm)	1.64	0.11	1.57	1.72	1.59	1.70
Uranium, U (ppm)	662	39	638	685	641	682
Vanadium, V (ppm)	35	9.4	28	41	33	36
Yttrium, Y (ppm)	105	5	103	108	102	108
Ytterbium, Yb (ppm)	10.9	0.5	10.5	11.3	10.6	11.2
4 Acid						
Cerium, Ce (ppm)	573	48	541	606	556	591
Cobalt, Co (ppm)	38.9	2.5	37.6	40.2	38.0	39.8
Copper, Cu (ppm)	290	15	282	298	285	294
Dysprosium, Dy (ppm)	12.9	1.4	11.7	14.0	12.3	13.4
Erbium, Er (ppm)	7.4	0.74	6.8	8.0	7.1	7.7
Europium, Eu (ppm)	3.84	0.20	3.67	4.02	3.72	3.97
Iron, Fe (wt.%)	5.65	0.37	5.43	5.87	5.55	5.75
Gadolinium, Gd (ppm)	18.5	1.4	17.4	19.6	17.7	19.4
Holmium, Ho (ppm)	2.45	0.26	2.25	2.65	2.34	2.56
Potassium, K (wt.%)	3.64	0.22	3.50	3.77	3.56	3.71
Lanthanum, La (ppm)	317	17.99	308	327	310	324

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						
Lutetium, Lu (ppm)	1.04	0.11	0.97	1.12	1.00	1.09
Magnesium, Mg (wt.%)	1.31	0.07	1.27	1.35	1.28	1.34
Manganese, Mn (ppm)	448	29	431	464	439	456
Molybdenum, Mo (ppm)	13.6	1.0	13.1	14.1	13.1	14.1
Neodymium, Nd (ppm)	180	12	171	189	171	189
Nickel, Ni (ppm)	14.2	0.9	13.7	14.7	13.5	14.8
Phosphorous, P (ppm)	563	42	539	586	546	579
Lead, Pb (ppm)	14	4.0	11	16	13	14
Praseodymium, Pr (ppm)	57	4.7	53	60	55	58
Samarium, Sm (ppm)	24.4	1.8	23.0	25.8	23.4	25.5
Terbium, Tb (ppm)	2.56	0.42	2.27	2.85	2.45	2.67
Thorium, Th (ppm)	38.5	3.3	36.7	40.2	37.6	39.3
Titanium, Ti (wt.%)	0.164	0.010	0.158	0.171	0.162	0.166
Thulium, Tm (ppm)	1.04	0.11	0.95	1.12	0.97	1.10
Uranium, U (ppm)	638	43	615	662	625	652
Vanadium, V (ppm)	31.6	2.8	29.9	33.3	30.5	32.8
Yttrium, Y (ppm)	64	6.3	60	68	62	65
Ytterbium, Yb (ppm)	7.2	0.66	6.8	7.7	7.0	7.5

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 102a 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 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 102a was prepared in the following manner:

- a) drying to constant mass at 105⁰ 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 102a

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 (PDM³) 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-HNO₃-HClO₄) 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 (Al₂O₃ 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 102a DataPack.xlsx**).

STATISTICAL EVALUATION OF OREAS 102a

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 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 102a.

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
Laser Ablation ICP-MS								
Ag	ppm	0.125	Ho	ppm	3.71	Sn	ppm	7.50
As	ppm	10.6	In	ppm	0.063	Sr	ppm	40.0
Ba	ppm	334	La	ppm	337	Ta	ppm	2.90
Be	ppm	3.10	Lu	ppm	1.53	Tb	ppm	3.03
Bi	ppm	0.13	Mn	wt.%	0.044	Te	ppm	0.25
Cd	ppm	< 0.1	Mo	ppm	12.9	Th	ppm	39.7
Ce	ppm	568	Nb	ppm	34.6	Ti	wt.%	0.172
Co	ppm	38.8	Nd	ppm	178	Tl	ppm	0.40
Cr	ppm	30.5	Ni	ppm	16.0	Tm	ppm	1.75
Cs	ppm	2.73	Pb	ppm	13.0	U	ppm	641
Cu	ppm	284	Pr	ppm	59	V	ppm	32.5
Dy	ppm	18.7	Rb	ppm	269	W	ppm	8.20
Er	ppm	11.5	Re	ppm	0.045	Y	ppm	107
Eu	ppm	4.19	Sb	ppm	0.70	Yb	ppm	11.2
Ga	ppm	18.6	Sc	ppm	6.50	Zn	ppm	< 5
Gd	ppm	18.4	Se	ppm	3.75	Zr	ppm	347
Hf	ppm	11.0	Sm	ppm	25.6			
Borate Fusion XRF								
Al ₂ O ₃	wt.%	12.40	Fe ₂ O ₃	wt.%	8.16	Pb	ppm	25.0
As	ppm	20.0	K ₂ O	wt.%	4.38	SiO ₂	wt.%	65.75
Ba	ppm	305	MgO	wt.%	2.25	Sn	ppm	12.5
CaO	wt.%	1.98	MnO	wt.%	0.065	SO ₃	wt.%	0.210
Co	ppm	40.0	Na ₂ O	wt.%	0.175	TiO ₂	wt.%	0.285
Cr	ppm	30.0	Ni	ppm	20.0	U	ppm	655
Cu	ppm	290	P ₂ O ₅	wt.%	0.144	Zn	ppm	20.0
Thermogravimetry								
LOI ¹⁰⁰⁰	wt.%	3.61						

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, α 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 641 and 682 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.

Table 3. Performance gates for OREAS 102a (intervals values may appear asymmetric due to rounding).

Constituent	Certified Value	Performance Gates						
		1SD	2SD		3SD		5%	
			Low	High	Low	High	Low	High
Fusion								
Ce (ppm)	587	48	491	683	443	732	558	616
Co (ppm)	41	3	34	48	31	51	39	43
Cu (ppm)	289	20	248	330	228	351	275	304
Dy (ppm)	18.1	1.0	16.1	20.1	15.1	21.1	17.2	19.0
Er (ppm)	11.1	0.9	9.4	12.8	8.5	13.6	10.5	11.6
Eu (ppm)	3.89	0.35	3.20	4.58	2.85	4.92	3.69	4.08
Fe (wt.%)	5.78	0.18	5.43	6.14	5.26	6.31	5.50	6.07
Gd (ppm)	20.9	1.6	17.7	24.2	16.1	25.8	19.9	22.0
Ho (ppm)	3.56	0.14	3.28	3.84	3.15	3.97	3.38	3.74
K (wt.%)	3.63	0.17	3.30	3.97	3.14	4.13	3.45	3.82
La (ppm)	323	16	290	356	274	372	307	339
Lu (ppm)	1.70	0.14	1.41	1.99	1.26	2.13	1.61	1.78
Mg (wt.%)	1.36	0.04	1.28	1.44	1.24	1.49	1.29	1.43
Mn (ppm)	465	23	418	511	395	535	441	488
Mo (ppm)	14.3	1.4	11.4	17.2	10.0	18.6	13.6	15.0
Nd (ppm)	180	16	148	212	132	228	171	189
P (ppm)	601	76	449	753	373	829	571	631
Pr (ppm)	58	4	49	66	45	71	55	61
Sm (ppm)	24.7	1.3	22.1	27.2	20.8	28.5	23.4	25.9
Tb (ppm)	3.05	0.23	2.60	3.51	2.37	3.74	2.90	3.21
Th (ppm)	39.6	2.0	35.5	43.6	33.4	45.7	37.6	41.5
Ti (wt.%)	0.172	0.006	0.159	0.184	0.153	0.191	0.163	0.180
Tm (ppm)	1.64	0.11	1.42	1.87	1.31	1.98	1.56	1.73
U (ppm)	662	39	584	739	546	777	628	695
V (ppm)	35	9	16	54	7	63	33	37
Y (ppm)	105	5	96	115	91	120	100	111
Yb (ppm)	10.9	0.5	9.8	11.9	9.3	12.5	10.3	11.4
4 Acid								
Ce (ppm)	573	48	477	670	429	718	545	602
Co (ppm)	38.9	2.5	33.9	43.9	31.4	46.4	37.0	40.8
Cu (ppm)	290	15	261	319	246	334	275	304
Dy (ppm)	12.9	1.4	10.2	15.6	8.8	16.9	12.2	13.5
Er (ppm)	7.4	0.7	5.9	8.9	5.2	9.6	7.0	7.8
Eu (ppm)	3.84	0.20	3.45	4.24	3.25	4.44	3.65	4.04
Fe (wt.%)	5.65	0.37	4.91	6.39	4.54	6.76	5.37	5.93
Gd (ppm)	18.5	1.4	15.8	21.2	14.4	22.6	17.6	19.4
Ho (ppm)	2.45	0.26	1.92	2.98	1.66	3.24	2.33	2.57
K (wt.%)	3.64	0.22	3.19	4.09	2.96	4.31	3.45	3.82
La (ppm)	317	18	281	353	263	371	301	333
Lu (ppm)	1.04	0.11	0.83	1.26	0.72	1.36	0.99	1.10
Mg (wt.%)	1.31	0.07	1.17	1.46	1.10	1.53	1.25	1.38
Mn (ppm)	448	29	390	505	361	534	425	470
Mo (ppm)	13.6	1.0	11.7	15.5	10.8	16.5	12.9	14.3
Nd (ppm)	180	12	155	204	143	217	171	189
Ni (ppm)	14.2	0.9	12.3	16.1	11.3	17.0	13.5	14.9
P (ppm)	563	42	479	646	437	688	535	591
Pb (ppm)	14	4	6	22	2	26	13	14
Pr (ppm)	57	5	47	66	43	71	54	60
Sm (ppm)	24.4	1.8	20.8	28.0	19.0	29.8	23.2	25.6
Tb (ppm)	2.56	0.42	1.72	3.40	1.30	3.82	2.43	2.69
Th (ppm)	38.5	3.3	31.8	45.1	28.5	48.4	36.5	40.4
Ti (wt.%)	0.164	0.010	0.144	0.184	0.134	0.194	0.156	0.172
Tm (ppm)	1.04	0.11	0.81	1.26	0.70	1.37	0.98	1.09
U (ppm)	638	43	553	724	510	767	607	670
V (ppm)	31.6	2.8	26.1	37.2	23.3	39.9	30.0	33.2
Y (ppm)	64	6	51	76	45	83	61	67
Yb (ppm)	7.2	0.7	5.9	8.6	5.2	9.2	6.9	7.6

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 $\pm 5\%$ 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.

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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Genalysis Laboratory Services, Perth, WA, Australia
OMAC Laboratories, Loughrea, County Galway, Ireland
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PREPARER AND SUPPLIER

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

INTENDED USE

OREAS 102a 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 102a 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 102a 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

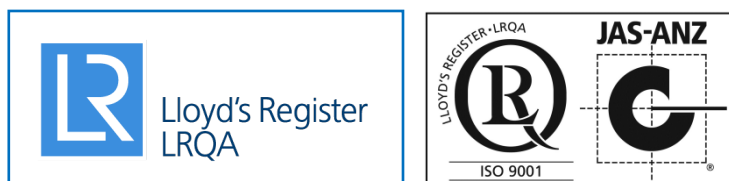
The analytical samples were selected in a manner to represent the entire batch of prepared CRM. This 'representivity' was maintained in each submitted laboratory sample batch and ensures the user that the data is traceable from sample selection through to the analytical results that underlie the consensus 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 9001:2015 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	28 th 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	30 th March, 2019	Fixed spelling of Erbium and Lutetium (both instances).
1	30 th November, 2016	Added indicative (uncertified) values (Table 2) for major and trace elements determined by borate fusion XRF (Al ₂ O ₃ to Zn) and laser ablation with ICP-MS (Ag to Zr).
0	22 nd 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 102a

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 102a (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	660	689	644	644	706	630	NR	732	621	637	677	NR	NR	703	623
2	669	648	652	659	712	630	NR	680	604	624	684	NR	NR	729	649
3	671	640	624	670	717	630	NR	711	607	638	678	NR	NR	717	661
4	649	670	632	666	712	620	NR	688	577	673	698	NR	NR	743	669
5	654	663	647	643	723	620	NR	695	600	626	690	NR	NR	737	674
6	671	654	628	647	696	630	NR	689	562	631	670	NR	NR	745	647
Mean	662	661	638	655	711	627		699	595	638	683			729	654
Median	665	659	638	653	712	630		692	602	634	681			733	655
Std.Dev.	10	17	11	12	9	5		19	22	18	10			16	18
Rel.Std.Dev.	1.45%	2.65%	1.72%	1.80%	1.33%	0.82%		2.75%	3.63%	2.82%	1.47%			2.24%	2.82%
PDM ³	0.13%	-0.13%	-3.60%	-1.01%	7.48%	-5.27%		5.73%	-10.0%	-3.53%	3.22%			10.2%	-1.15%

Table A3. Analytical results for fusion Ce in OREAS 102a (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	521	634	586	635	719	600	NR	638	563	544	611	NR	NR	549	518
2	526	606	597	638	697	600	NR	564	581	539	624	NR	NR	562	534
3	527	605	578	646	714	610	NR	626	550	552	623	NR	NR	568	531
4	514	607	579	602	633	610	NR	568	556	583	629	NR	NR	572	535
5	522	628	588	600	696	600	NR	604	501	536	620	NR	NR	583	533
6	529	645	576	605	631	600	NR	612	515	545	609	NR	NR	581	508
Mean	523	621	584	621	682	603		602	544	550	619			569	526
Median	524	618	583	620	697	600		608	553	545	622			570	532
Std.Dev.	6	17	8	21	40	5		30	30	17	8			13	11
Rel.Std.Dev.	1.05%	2.76%	1.36%	3.35%	5.85%	0.86%		5.02%	5.57%	3.12%	1.26%			2.22%	2.12%
PDM ³	-10.9%	5.75%	-0.53%	5.77%	16.1%	2.76%		2.54%	-7.28%	-6.35%	5.49%			-3.04%	-10.3%

Table A4. Analytical results for fusion Co in OREAS 102a (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	41.0	40.0	41.0	45.0	46.3	44.0	NR	35.9	39.0	39.1	39.8	NR	NR	40.8	NR
2	41.0	60.0	41.0	46.0	45.1	46.0	NR	33.7	37.0	38.5	40.1	NR	NR	42.2	NR
3	40.0	40.0	41.0	46.0	45.0	46.0	NR	35.3	39.0	39.5	40.4	NR	NR	41.5	NR
4	42.0	40.0	40.0	47.0	40.8	45.0	NR	35.2	35.0	42.6	40.5	NR	NR	44.4	NR
5	42.0	20.0	41.0	44.0	46.4	47.0	NR	35.8	32.0	38.6	40.8	NR	NR	42.8	NR
6	43.0	60.0	40.0	44.0	40.8	46.0	NR	35.2	35.0	39.2	40.4	NR	NR	43.2	NR
Mean	41.5	43.3	40.7	45.3	44.0	45.7		35.2	36.2	39.6	40.3			42.5	
Median	41.5	40.0	41.0	45.5	45.0	46.0		35.3	36.0	39.2	40.4			42.5	
Std.Dev.	1.0	15.1	0.5	1.2	2.6	1.0		0.8	2.7	1.5	0.3			1.3	
Rel.Std.Dev.	2.53%	34.7%	1.27%	2.67%	5.90%	2.26%		2.21%	7.50%	3.85%	0.85%			3.01%	
PDM ³	1.22%	5.69%	-0.81%	10.6%	7.40%	11.4%		-14.1%	-11.8%	-3.45%	-1.62%			3.62%	

Table A5. Analytical results for fusion Cu in OREAS 102a (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	311	260	335	310	269	300	NR	312	280	281	274	NR	NR	NR	NR
2	332	240	357	310	275	300	NR	307	203	273	276	NR	NR	NR	NR
3	320	220	367	320	276	300	NR	301	280	282	273	NR	NR	NR	NR
4	321	260	382	320	247	310	NR	290	281	305	278	NR	NR	NR	NR
5	305	280	352	300	276	300	NR	302	266	275	275	NR	NR	NR	NR
6	323	260	337	300	274	300	NR	308	280	278	269	NR	NR	NR	NR
Mean	319	253	355	310	269	302		303	265	282	274				
Median	321	260	355	310	275	300		305	280	280	275				
Std.Dev.	9	21	18	9	11	4		8	31	12	3				
Rel.Std.Dev.	2.97%	8.15%	5.05%	2.89%	4.21%	1.35%		2.59%	11.7%	4.12%	1.12%				
PDM ³	10.1%	-12.4%	22.7%	7.15%	-6.87%	4.27%		4.84%	-8.41%	-2.41%	-5.24%				

Table A6. Analytical results for fusion Dy in OREAS 102a (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	17.5	20.0	18.1	18.3	21.8	18.0	20.0	19.3	17.8	17.6	17.7	NR	NR	18.3	16.1
2	18.0	20.0	18.2	18.2	21.6	19.0	17.0	18.0	18.1	17.1	17.9	NR	NR	18.2	16.7
3	17.9	19.5	18.5	18.4	22.2	19.0	19.0	18.4	17.7	17.7	17.8	NR	NR	18.4	17.3
4	17.7	20.5	17.5	17.3	19.6	19.0	19.0	19.6	16.6	18.4	17.7	NR	NR	18.6	17.4
5	17.3	19.5	18.6	17.5	21.6	18.0	17.0	17.4	15.3	17.4	17.7	NR	NR	18.9	17.4
6	17.6	20.0	18.7	17.5	18.8	18.0	19.0	19.3	15.8	17.4	17.4	NR	NR	19.1	17.2
Mean	17.7	19.9	18.3	17.9	20.9	18.5	18.5	18.7	16.9	17.6	17.7			18.6	17.0
Median	17.7	20.0	18.4	17.9	21.6	18.5	19.0	18.8	17.2	17.5	17.7			18.5	17.2
Std.Dev.	0.3	0.4	0.4	0.5	1.4	0.5	1.2	0.9	1.2	0.4	0.2			0.4	0.5
Rel.Std.Dev.	1.46%	1.89%	2.42%	2.71%	6.66%	2.96%	6.62%	4.58%	6.88%	2.41%	0.99%			1.95%	2.98%
PDM ³	-2.39%	10.0%	0.92%	-1.29%	15.7%	2.21%	2.21%	3.15%	-6.72%	-2.90%	-2.39%			2.65%	-5.97%

Table A7. Analytical results for fusion Er in OREAS 102a (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	11.1	12.5	10.7	10.3	13.3	12.0	12.0	10.4	10.4	11.4	11.3	NR	NR	10.6	9.6
2	10.9	11.5	11.0	10.5	13.2	11.0	10.0	9.6	11.1	11.3	11.5	NR	NR	11.2	10.1
3	10.9	12.0	10.8	10.8	13.2	12.0	11.0	9.9	10.7	11.7	11.2	NR	NR	11.2	10.3
4	10.6	12.0	10.4	10.4	12.0	12.0	11.0	9.8	10.2	12.0	11.4	NR	NR	11.0	10.3
5	10.8	12.0	11.0	10.2	13.1	11.0	9.8	10.1	9.9	11.3	11.2	NR	NR	11.4	10.7
6	10.9	11.5	11.0	10.4	11.7	12.0	11.0	9.8	10.0	11.4	10.9	NR	NR	11.2	10.2
Mean	10.9	11.9	10.8	10.4	12.7	11.7	10.8	9.9	10.4	11.5	11.2			11.1	10.2
Median	10.9	12.0	10.9	10.4	13.1	12.0	11.0	9.8	10.3	11.4	11.2			11.2	10.3
Std.Dev.	0.2	0.4	0.2	0.2	0.7	0.5	0.8	0.3	0.5	0.3	0.2			0.3	0.4
Rel.Std.Dev.	1.50%	3.16%	2.22%	1.98%	5.37%	4.43%	7.41%	2.84%	4.37%	2.30%	1.75%			2.40%	3.53%
PDM ³	-1.70%	7.80%	-2.15%	-5.62%	15.3%	5.54%	-2.30%	-10.3%	-6.07%	3.88%	1.54%			0.43%	-7.73%

Table A8. Analytical results for fusion Eu in OREAS 102a (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	3.80	4.00	4.00	3.70	4.74	< 8	3.80	3.95	4.03	4.17	3.62	NR	NR	3.81	3.15
2	3.70	4.00	4.00	3.80	4.58	< 8	3.30	3.64	4.47	4.04	3.72	NR	NR	4.00	3.22
3	3.90	4.20	4.00	3.80	4.75	< 8	3.70	3.84	4.04	4.15	3.76	NR	NR	4.05	3.36
4	3.70	4.00	3.80	3.60	4.17	< 8	3.70	3.72	4.17	4.33	3.75	NR	NR	3.89	3.29
5	3.60	4.20	4.00	3.50	4.71	< 8	3.20	3.68	3.84	4.12	3.85	NR	NR	4.21	3.34
6	3.70	4.40	4.10	3.60	4.07	< 8	3.60	3.74	3.88	4.09	3.65	NR	NR	4.24	3.28
Mean	3.73	4.13	3.98	3.67	4.50	< 8	3.55	3.76	4.07	4.15	3.73			4.03	3.27
Median	3.70	4.10	4.00	3.65	4.64	< 8	3.65	3.73	4.04	4.14	3.74			4.03	3.28
Std.Dev.	0.10	0.16	0.10	0.12	0.31	-	0.24	0.12	0.23	0.10	0.08			0.17	0.08
Rel.Std.Dev.	2.77%	3.95%	2.47%	3.30%	6.77%	-	6.84%	3.08%	5.62%	2.40%	2.22%			4.23%	2.33%
PDM ³	-3.98%	6.31%	2.45%	-5.69%	15.9%	-	-8.69%	-3.23%	4.73%	6.74%	-4.19%			3.74%	-15.8%

Table A9. Analytical results for fusion Fe in OREAS 102a (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	5.97	5.98	5.70	5.87	5.52	5.90	6.02	5.82	5.65	NR	5.65	NR	NR	5.81	5.66
2	6.04	5.72	5.79	5.91	5.59	5.90	5.66	5.71	5.71	NR	5.58	NR	NR	6.00	5.73
3	5.97	5.94	5.75	6.18	5.63	5.80	5.60	5.71	5.69	NR	5.60	NR	NR	5.94	5.62
4	6.08	5.92	5.77	6.22	5.14	6.00	5.53	5.69	5.67	NR	5.60	NR	NR	5.99	5.62
5	6.01	5.96	5.71	5.98	5.67	6.00	5.60	5.71	5.63	NR	5.58	NR	NR	5.99	5.65
6	6.06	5.83	5.73	5.95	5.67	5.80	5.61	5.74	5.63	NR	5.59	NR	NR	5.99	5.66
Mean	6.02	5.89	5.74	6.02	5.54	5.90	5.67	5.73	5.66		5.60			5.95	5.66
Median	6.03	5.93	5.74	5.97	5.61	5.90	5.61	5.71	5.66		5.60			5.99	5.65
Std.Dev.	0.05	0.10	0.03	0.15	0.20	0.09	0.18	0.05	0.03		0.03			0.07	0.04
Rel.Std.Dev.	0.77%	1.68%	0.60%	2.43%	3.65%	1.52%	3.11%	0.80%	0.55%		0.47%			1.21%	0.76%
PDM ³	4.09%	1.84%	-0.76%	4.03%	-4.28%	1.99%	-1.99%	-0.92%	-2.10%		-3.20%			2.87%	-2.24%

Table A10. Analytical results for fusion Gd in OREAS 102a (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	18.0	22.0	22.9	21.9	26.5	25.0	22.0	21.8	21.6	26.5	23.7	NR	NR	18.5	20.1
2	18.0	20.0	22.7	21.9	26.7	26.0	19.0	20.7	21.7	25.8	23.7	NR	NR	20.0	20.4
3	18.5	20.0	22.4	22.1	26.8	25.0	21.0	21.4	20.5	26.4	23.8	NR	NR	19.8	21.5
4	17.7	20.0	22.1	20.7	23.8	26.0	22.0	20.8	20.1	27.2	23.7	NR	NR	20.0	21.3
5	17.4	20.0	22.9	20.8	26.3	25.0	19.0	20.7	19.0	25.3	23.5	NR	NR	20.9	22.3
6	18.5	20.0	23.1	21.0	24.2	25.0	21.0	20.9	19.1	25.5	23.4	NR	NR	21.3	21.3
Mean	18.0	20.3	22.7	21.4	25.7	25.3	20.7	21.1	20.3	26.1	23.6			20.1	21.2
Median	18.0	20.0	22.8	21.5	26.4	25.0	21.0	20.8	20.3	26.1	23.7			20.0	21.3
Std.Dev.	0.4	0.8	0.4	0.6	1.4	0.5	1.4	0.5	1.2	0.7	0.2			1.0	0.8
Rel.Std.Dev.	2.42%	4.02%	1.64%	2.96%	5.31%	2.04%	6.61%	2.22%	5.76%	2.73%	0.64%			4.84%	3.71%
PDM ³	-13.9%	-2.87%	8.35%	2.22%	22.8%	21.0%	-1.28%	0.57%	-2.87%	24.8%	12.9%			-4.11%	1.03%

Table A11. Analytical results for fusion Ho in OREAS 102a (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	3.50	4.20	3.40	3.70	4.50	< 5	3.70	3.72	3.60	3.62	3.69	NR	NR	NR	3.27
2	3.70	4.00	3.50	3.60	4.42	< 5	3.30	3.47	3.60	3.62	3.74	NR	NR	NR	3.30
3	3.70	4.20	3.50	3.80	4.49	< 5	3.60	3.60	3.40	3.68	3.67	NR	NR	NR	3.55
4	3.60	4.20	3.30	3.50	4.03	< 5	3.60	3.47	3.30	3.83	3.75	NR	NR	NR	3.54
5	3.60	4.20	3.50	3.50	4.28	< 5	3.10	3.53	3.10	3.57	3.66	NR	NR	NR	3.63
6	3.80	4.00	3.60	3.60	3.92	< 5	3.50	3.59	3.20	3.64	3.62	NR	NR	NR	3.35
Mean	3.65	4.13	3.47	3.62	4.27		3.47	3.56	3.37	3.66	3.69				3.44
Median	3.65	4.20	3.50	3.60	4.35		3.55	3.56	3.35	3.63	3.68				3.45
Std.Dev.	0.10	0.10	0.10	0.12	0.25		0.23	0.10	0.21	0.09	0.05				0.15
Rel.Std.Dev.	2.87%	2.50%	2.98%	3.23%	5.77%		6.5%	2.69%	6.14%	2.47%	1.34%				4.38%
PDM ³	2.51%	16.1%	-2.63%	1.58%	20.0%		-2.63%	0.08%	-5.44%	2.80%	3.59%				-3.39%

Table A12. Analytical results for fusion K in OREAS 102a (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	3.88	3.40	3.58	4.26	3.27	3.50	4.32	2.99	3.64	NR	3.74	NR	NR	3.71	3.60
2	3.87	3.40	3.70	4.15	3.31	3.30	3.89	2.67	3.59	NR	3.75	NR	NR	3.59	3.68
3	3.84	3.50	3.69	4.34	3.43	3.60	3.78	3.04	3.48	NR	3.72	NR	NR	3.59	3.61
4	3.89	3.50	3.68	4.50	3.05	3.60	3.95	3.17	3.62	NR	3.71	NR	NR	3.60	3.59
5	3.92	3.40	3.70	4.37	3.39	3.60	3.74	3.40	3.63	NR	3.75	NR	NR	3.62	3.64
6	3.91	3.50	3.68	4.24	3.37	3.70	3.86	2.68	3.34	NR	3.74	NR	NR	3.59	3.67
Mean	3.89	3.45	3.67	4.31	3.30	3.55	3.92	2.99	3.55		3.74			3.62	3.63
Median	3.89	3.45	3.68	4.30	3.34	3.60	3.88	3.01	3.61		3.74			3.60	3.62
Std.Dev.	0.03	0.05	0.05	0.12	0.14	0.14	0.21	0.28	0.12		0.02			0.05	0.04
Rel.Std.Dev.	0.74%	1.59%	1.25%	2.81%	4.13%	3.88%	5.31%	9.40%	3.35%		0.44%			1.32%	1.06%
PDM ³	6.92%	-5.05%	1.04%	18.6%	-9.05%	-2.30%	7.97%	-17.7%	-2.33%		2.79%			-0.50%	-0.06%

Table A13. Analytical results for fusion La in OREAS 102a (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	300	356	320	330	408	330	NR	319	326	322	338	NR	NR	312	299
2	302	338	323	320	399	330	NR	294	332	318	346	NR	NR	326	322
3	304	349	315	330	403	330	NR	311	320	328	349	NR	NR	329	313
4	300	352	317	340	358	330	NR	296	318	344	348	NR	NR	332	316
5	304	353	317	330	399	330	NR	298	293	324	349	NR	NR	340	310
6	306	343	311	320	355	330	NR	304	295	326	338	NR	NR	338	309
Mean	303	349	317	328	387	330		304	314	327	345			330	311
Median	303	351	317	330	399	330		301	319	325	347			331	311
Std.Dev.	2	7	4	8	24	0		10	16	9	5			10	8
Rel.Std.Dev.	0.80%	1.94%	1.30%	2.29%	6.22%	0.00%		3.18%	5.18%	2.76%	1.53%			3.00%	2.52%
PDM ³	-6.31%	7.88%	-1.82%	1.63%	19.8%	2.15%		-5.99%	-2.80%	1.22%	6.69%			2.01%	-3.59%

Table A14. Analytical results for fusion Lu in OREAS 102a (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	1.71	1.80	1.80	1.60	2.00	< 8	NR	NR	1.61	1.64	1.64	NR	NR	1.68	1.48
2	1.70	1.80	1.80	1.70	1.94	< 8	NR	NR	1.57	1.63	1.66	NR	NR	1.77	1.54
3	1.75	1.80	1.80	1.70	1.99	< 8	NR	NR	1.55	1.68	1.67	NR	NR	1.75	1.56
4	1.69	1.80	1.70	1.50	1.73	< 8	NR	NR	1.54	1.71	1.66	NR	NR	1.77	1.50
5	1.68	2.00	1.80	1.50	1.99	< 8	NR	NR	1.41	1.63	1.65	NR	NR	1.79	1.59
6	1.69	1.80	1.80	1.60	1.80	< 8	NR	NR	1.46	1.64	1.61	NR	NR	1.83	1.46
Mean	1.70	1.83	1.78	1.60	1.91	< 8			1.52	1.66	1.65			1.77	1.52
Median	1.70	1.80	1.80	1.60	1.97	< 8			1.55	1.64	1.66			1.77	1.52
Std.Dev.	0.03	0.08	0.04	0.09	0.12	-			0.07	0.03	0.02			0.05	0.05
Rel.Std.Dev.	1.47%	4.45%	2.29%	5.59%	6.04%	-			4.87%	1.98%	1.30%			2.82%	3.32%
PDM ³	0.36%	8.02%	5.07%	-5.73%	12.5%	-			-10.2%	-2.49%	-2.88%			3.99%	-10.4%

Table A15. Analytical results for fusion Mg in OREAS 102a (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	1.38	1.33	1.34	1.30	1.27	1.40	1.41	1.44	1.37	NR	1.39	NR	NR	1.36	1.41
2	1.42	1.29	1.35	1.32	1.28	1.40	1.35	1.40	1.33	NR	1.40	NR	NR	1.36	1.45
3	1.39	1.33	1.37	1.38	1.28	1.40	1.30	1.41	1.33	NR	1.40	NR	NR	1.35	1.37
4	1.40	1.37	1.36	1.38	1.17	1.40	1.33	1.40	1.32	NR	1.39	NR	NR	1.34	1.38
5	1.39	1.31	1.35	1.33	1.29	1.40	1.29	1.41	1.38	NR	1.40	NR	NR	1.34	1.38
6	1.42	1.35	1.34	1.32	1.29	1.40	1.32	1.43	1.37	NR	1.40	NR	NR	1.33	1.40
Mean	1.40	1.33	1.35	1.34	1.26	1.40	1.33	1.41	1.35		1.40			1.35	1.40
Median	1.40	1.33	1.35	1.33	1.28	1.40	1.33	1.41	1.35		1.40			1.35	1.39
Std.Dev.	0.02	0.03	0.01	0.03	0.05	0.00	0.04	0.02	0.02		0.01			0.01	0.03
Rel.Std.Dev.	1.20%	2.13%	0.77%	2.52%	3.65%	0.00%	3.24%	1.10%	1.83%		0.37%			0.87%	1.92%
PDM ³	2.86%	-2.28%	-0.78%	-1.67%	-7.09%	2.86%	-2.04%	3.83%	-0.89%		2.61%			-0.81%	2.76%

Table A16. Analytical results for fusion Mn in OREAS 102a (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	463	480	450	526	422	480	500	465	457	NR	500	NR	NR	NR	465
2	471	440	450	528	434	470	500	465	449	NR	500	NR	NR	NR	479
3	470	460	450	540	426	480	500	465	457	NR	500	NR	NR	NR	454
4	472	460	450	545	386	480	500	465	449	NR	400	NR	NR	NR	455
5	469	460	440	503	430	480	500	465	457	NR	500	NR	NR	NR	456
6	470	480	440	514	423	470	500	465	465	NR	500	NR	NR	NR	459
Mean	469	463	447	526	420	477	500	465	456		483				461
Median	470	460	450	527	424	480	500	465	457		500				458
Std.Dev.	3	15	5	16	18	5	0	0	6		41				10
Rel.Std.Dev.	0.68%	3.25%	1.16%	2.99%	4.18%	1.08%	0.00%	0.00%	1.28%		8.45%				2.07%
PDM ³	0.99%	-0.26%	-3.85%	13.2%	-9.56%	2.61%	7.63%	0.03%	-1.92%		4.04%				-0.70%

Table A17. Analytical results for fusion Mo in OREAS 102a (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	14.0	15.0	14.2	15.6	16.1	13.0	NR	14.2	14.0	13.0	16.0	NR	NR	NR	NR
2	17.0	15.0	14.2	18.0	16.2	10.0	NR	13.2	13.0	13.0	15.0	NR	NR	NR	NR
3	15.0	15.0	13.8	16.5	16.6	11.0	NR	13.6	15.0	13.0	15.0	NR	NR	NR	NR
4	16.0	15.0	14.1	16.0	14.4	< 10	NR	12.7	13.0	14.0	15.0	NR	NR	NR	NR
5	15.0	15.0	14.1	16.2	15.4	< 10	NR	13.6	12.0	13.0	15.0	NR	NR	NR	NR
6	17.0	15.0	13.9	15.0	13.7	13.0	NR	13.3	12.0	13.0	15.0	NR	NR	NR	NR
Mean	15.7	15.0	14.1	16.2	15.4	11.8		13.4	13.2	13.2	15.2				
Median	15.5	15.0	14.1	16.1	15.8	12.0		13.5	13.0	13.0	15.0				
Std.Dev.	1.2	0.0	0.2	1.0	1.1	1.5		0.5	1.2	0.4	0.4				
Rel.Std.Dev.	7.73%	0.00%	1.17%	6.27%	7.31%	12.8%		3.73%	8.88%	3.10%	2.69%				
PDM ³	9.69%	5.02%	-1.63%	13.5%	7.91%	-17.7%		-5.92%	-7.81%	-7.81%	6.19%				

Table A18. Analytical results for fusion Nd in OREAS 102a (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	175	197	186	197	218	170	180	185	147	167	170	NR	NR	185	160
2	173	195	185	198	214	180	160	171	164	168	172	NR	NR	194	164
3	178	193	189	201	217	170	180	179	147	170	171	NR	NR	194	170
4	173	197	181	187	192	170	190	171	158	177	171	NR	NR	196	170
5	172	195	191	186	215	170	160	173	141	163	172	NR	NR	203	170
6	177	190	195	191	191	170	180	177	148	167	169	NR	NR	202	166
Mean	175	195	188	193	208	172	175	176	151	169	171			196	167
Median	174	195	187	194	214	170	180	175	148	168	171			195	168
Std.Dev.	3	3	5	6	13	4	12	5	8	5	1			7	4
Rel.Std.Dev.	1.44%	1.37%	2.58%	3.22%	6.04%	2.38%	7.0%	3.05%	5.62%	2.78%	0.67%			3.41%	2.59%
PDM ³	-2.88%	8.17%	4.44%	7.52%	15.7%	-4.53%	-2.67%	-2.12%	-16.1%	-6.29%	-5.17%			8.75%	-7.37%

Table A19. Analytical results for fusion Ni in OREAS 102a (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	34.0	<50	27.0	20.0	10.5	< 25	NR	<15	14.0	11.0	18.0	NR	NR	<20	NR
2	<20	<50	28.0	20.0	14.8	< 25	NR	<15	15.0	13.0	19.0	NR	NR	22.0	NR
3	24.0	<50	23.0	20.0	7.5	< 25	NR	<15	14.0	12.0	17.0	NR	NR	<20	NR
4	<20	<50	26.0	20.0	10.7	< 25	NR	<15	15.0	13.0	20.0	NR	NR	<20	NR
5	<20	<50	22.0	20.0	14.2	< 25	NR	<15	15.0	12.0	22.0	NR	NR	<20	NR
6	<20	<50	22.0	10.0	11.5	< 25	NR	<15	14.0	12.0	23.0	NR	NR	<20	NR
Mean	29.0	<50	24.7	18.3	11.5	< 25		<15	14.5	12.2	19.8			<20	
Median	29.0	<50	24.5	20.0	11.1	< 25		<15	14.5	12.0	19.5			<20	
Std.Dev.	7.1	-	2.7	4.1	2.7	-		-	0.5	0.8	2.3			-	
Rel.Std.Dev.	24.4%	-	10.8%	22.3%	23.2%	-		-	3.78%	6.19%	11.7%			-	
PDM ³	62.4%	-	38.1%	2.65%	-35.5%	-		-	-18.8%	-31.9%	11.0%			-	

Table A20. Analytical results for fusion P in OREAS 102a (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	490	500	541	NR	NR	480	655	NR	700	NR	NR	598	476
2	700	700	480	600	552	NR	NR	611	655	NR	600	NR	NR	563	622
3	700	800	500	600	522	NR	NR	655	655	NR	600	NR	NR	563	585
4	700	600	480	600	517	NR	NR	567	655	NR	600	NR	NR	581	709
5	700	600	480	600	555	NR	NR	655	655	NR	600	NR	NR	576	546
6	700	800	460	600	557	NR	NR	611	655	NR	600	NR	NR	581	510
Mean	700	683	482	583	541			596	655		617			577	575
Median	700	650	480	600	546			611	655		600			578	565
Std.Dev.	0	98	13	41	17			66	0		41			13	84
Rel.Std.Dev.	0.0%	14.4%	2.76%	7.00%	3.19%			11.0%	0.00%		6.62%			2.27%	14.6%
PDM ³	16.5%	13.7%	-19.8%	-2.92%	-10.0%			-0.74%	8.94%		2.62%			-4.00%	-4.37%

Table A21. Analytical results for fusion Pb in OREAS 102a (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	32.0	20.0	<15	16.0	11.6	< 20	NR	11.2	7.0	8.0	13.8	NR	NR	NR	NR
2	25.0	20.0	<15	19.0	9.9	< 20	NR	10.1	7.0	7.0	13.7	NR	NR	NR	NR
3	35.0	20.0	<15	22.0	9.0	< 20	NR	10.4	7.0	7.0	14.1	NR	NR	NR	NR
4	25.0	10.0	<15	29.0	12.4	< 20	NR	10.0	10.0	8.0	14.1	NR	NR	NR	NR
5	20.0	20.0	<15	16.0	12.0	< 20	NR	13.8	7.0	7.0	14.1	NR	NR	NR	NR
6	25.0	20.0	<15	22.0	11.0	< 20	NR	19.6	8.0	7.0	14.8	NR	NR	NR	NR
Mean	27.0	18.3	<15	20.7	11.0	< 20		12.5	7.7	7.3	14.1				
Median	25.0	20.0	<15	20.5	11.3	< 20		10.8	7.0	7.0	14.1				
Std.Dev.	5.5	4.1	-	4.9	1.3	-		3.7	1.2	0.5	0.4				
Rel.Std.Dev.	20.3%	22.3%	-	23.6%	12.0%	-		29.9%	15.8%	7.04%	2.73%				
PDM ³	85.6%	26.0%	-	42.1%	-24.4%	-		-14.0%	-47.3%	-49.6%	-3.08%				

Table A22. Analytical results for fusion Pr in OREAS 102a (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	52.9	63.0	59.6	58.5	68.7	58.0	55.0	59.3	52.7	56.7	54.2	NR	NR	58.6	52.0
2	52.9	63.0	60.8	58.8	67.9	58.0	50.0	55.2	65.2	56.8	55.4	NR	NR	60.7	53.3
3	54.4	61.2	62.2	59.4	68.2	58.0	55.0	57.7	51.3	57.9	54.6	NR	NR	61.1	54.6
4	51.7	61.0	58.6	55.8	60.9	58.0	56.0	55.5	62.8	61.7	55.7	NR	NR	61.9	54.8
5	52.4	61.6	61.8	55.3	67.4	57.0	48.0	55.7	56.7	56.7	54.5	NR	NR	62.5	55.7
6	52.8	61.2	62.5	56.8	60.5	58.0	55.0	56.8	59.2	57.2	53.2	NR	NR	62.8	53.6
Mean	52.9	61.8	60.9	57.4	65.6	57.8	53.2	56.7	58.0	57.8	54.6			61.3	54.0
Median	52.9	61.4	61.3	57.7	67.7	58.0	55.0	56.2	58.0	57.0	54.6			61.5	54.1
Std.Dev.	0.9	0.9	1.6	1.7	3.8	0.4	3.3	1.6	5.5	1.9	0.9			1.5	1.3
Rel.Std.Dev.	1.68%	1.50%	2.55%	2.96%	5.85%	0.71%	6.23%	2.78%	9.48%	3.37%	1.63%			2.50%	2.42%
PDM ³	-8.50%	7.01%	5.43%	-0.60%	13.5%	0.09%	-7.99%	-1.89%	0.35%	0.09%	-5.51%			6.03%	-6.53%

Table A23. Analytical results for fusion Sm in OREAS 102a (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	24.3	28.0	26.5	25.1	29.7	24.0	25.0	26.2	25.1	24.2	23.3	NR	NR	24.6	23.8
2	24.1	26.5	26.5	25.7	28.9	24.0	22.0	23.9	24.2	24.9	24.1	NR	NR	25.3	23.7
3	24.9	26.5	26.4	25.5	30.1	24.0	24.0	24.9	24.6	25.5	24.3	NR	NR	26.1	24.7
4	23.9	27.0	25.2	24.0	26.5	24.0	24.0	24.4	23.1	26.4	23.9	NR	NR	26.0	25.2
5	24.6	26.0	26.6	23.4	29.4	24.0	21.0	24.3	20.9	24.8	23.9	NR	NR	26.5	24.6
6	24.5	26.5	27.0	24.5	26.0	24.0	24.0	24.8	21.9	25.1	23.0	NR	NR	26.9	23.7
Mean	24.4	26.8	26.4	24.7	28.4	24.0	23.3	24.7	23.3	25.2	23.8			25.9	24.3
Median	24.4	26.5	26.5	24.8	29.1	24.0	24.0	24.6	23.7	25.0	23.9			26.1	24.2
Std.Dev.	0.4	0.7	0.6	0.9	1.7	0.0	1.5	0.8	1.6	0.7	0.5			0.8	0.6
Rel.Std.Dev.	1.48%	2.58%	2.31%	3.63%	6.12%	0.00%	6.5%	3.18%	7.05%	2.96%	2.09%			3.25%	2.55%
PDM ³	-1.15%	8.45%	6.90%	0.14%	15.2%	-2.70%	-5.40%	0.25%	-5.54%	1.96%	-3.71%			5.05%	-1.60%

Table A24. Analytical results for fusion Tb in OREAS 102a (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	2.75	3.40	3.10	2.90	3.97	< 8	NR	3.06	3.20	3.22	3.42	NR	NR	3.01	2.66
2	2.71	3.20	3.10	3.00	3.91	< 8	NR	2.91	3.30	3.18	3.43	NR	NR	3.15	2.76
3	2.74	3.00	3.10	3.00	4.05	< 8	NR	2.97	3.20	3.25	3.51	NR	NR	3.18	2.95
4	2.70	3.20	3.00	2.80	3.55	< 8	NR	2.90	3.00	3.38	3.49	NR	NR	3.18	2.83
5	2.71	3.20	3.10	2.80	3.89	< 8	NR	2.92	2.80	3.16	3.40	NR	NR	3.28	2.92
6	2.75	3.20	3.20	2.90	3.53	< 8	NR	2.95	2.80	3.19	3.39	NR	NR	3.28	2.78
Mean	2.73	3.20	3.10	2.90	3.82	< 8		2.95	3.05	3.23	3.44			3.18	2.82
Median	2.73	3.20	3.10	2.90	3.90	< 8		2.93	3.10	3.21	3.43			3.18	2.81
Std.Dev.	0.02	0.13	0.06	0.09	0.22	-		0.06	0.22	0.08	0.05			0.10	0.11
Rel.Std.Dev.	0.83%	3.95%	2.04%	3.08%	5.74%	-		2.06%	7.11%	2.48%	1.42%			3.14%	3.84%
PDM ³	-10.7%	4.77%	1.49%	-5.06%	24.9%	-		-3.40%	-0.15%	5.75%	12.6%			4.11%	-7.70%

Table A25. Analytical results for fusion Th in OREAS 102a (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	38.3	39.0	41.0	39.3	43.4	38.0	NR	38.9	39.7	39.6	40.1	NR	NR	42.8	41.1
2	37.5	37.0	40.7	39.8	43.4	38.0	NR	36.2	41.5	38.9	40.8	NR	NR	43.3	43.4
3	37.3	38.0	40.1	40.4	44.3	38.0	NR	37.6	38.7	39.7	40.3	NR	NR	42.8	42.4
4	36.1	38.5	40.2	39.3	44.0	38.0	NR	36.7	39.4	42.2	40.9	NR	NR	46.4	41.7
5	37.3	40.0	40.5	38.3	44.1	37.0	NR	37.1	36.6	38.6	40.2	NR	NR	45.6	39.8
6	37.9	39.5	39.1	41.1	42.6	38.0	NR	36.9	38.2	38.7	39.5	NR	NR	46.3	42.7
Mean	37.4	38.7	40.3	39.7	43.6	37.8		37.2	39.0	39.6	40.3			44.5	41.8
Median	37.4	38.8	40.4	39.6	43.7	38.0		37.0	39.1	39.3	40.3			44.5	42.0
Std.Dev.	0.7	1.1	0.7	1.0	0.6	0.4		0.9	1.6	1.3	0.5			1.7	1.3
Rel.Std.Dev.	1.99%	2.79%	1.64%	2.45%	1.38%	1.08%		2.51%	4.19%	3.40%	1.27%			3.92%	3.01%
PDM ³	-5.45%	-2.25%	1.80%	0.36%	10.2%	-4.36%		-5.89%	-1.36%	0.15%	1.88%			12.6%	5.77%

Table A26. Analytical results for fusion Ti in OREAS 102a (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	0.180	0.170	0.170	0.210	0.156	0.180	0.180	0.176	0.170	NR	0.180	NR	NR	0.168	0.171
2	0.180	0.160	0.174	0.212	0.159	0.180	0.170	0.165	0.170	NR	0.180	NR	NR	0.168	0.174
3	0.170	0.170	0.173	0.213	0.160	0.180	0.170	0.173	0.168	NR	0.180	NR	NR	0.168	0.171
4	0.180	0.170	0.172	0.212	0.145	0.180	0.170	0.173	0.168	NR	0.180	NR	NR	0.168	0.169
5	0.180	0.170	0.172	0.200	0.160	0.180	0.170	0.173	0.167	NR	0.180	NR	NR	0.168	0.172
6	0.180	0.160	0.171	0.205	0.161	0.180	0.170	0.172	0.169	NR	0.180	NR	NR	0.168	0.173
Mean	0.178	0.167	0.172	0.209	0.157	0.180	0.172	0.172	0.169		0.180			0.168	0.172
Median	0.180	0.170	0.172	0.211	0.159	0.180	0.170	0.173	0.169		0.180			0.168	0.171
Std.Dev.	0.004	0.005	0.001	0.005	0.006	0.000	0.004	0.004	0.001		0.000			0.000	0.002
Rel.Std.Dev.	2.29%	3.10%	0.82%	2.46%	3.81%	0.00%	2.38%	2.18%	0.73%		0.00%			0.00%	0.90%
PDM ³	3.88%	-2.92%	0.19%	21.5%	-8.74%	4.85%	-0.01%	0.10%	-1.64%		4.85%			-2.22%	-0.07%

Table A27. Analytical results for fusion Tm in OREAS 102a (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	1.60	1.80	1.70	NR	1.97	< 10	1.60	1.63	1.56	1.68	1.61	NR	NR	1.82	1.49
2	1.60	1.80	1.70	NR	2.00	< 10	1.40	1.49	1.70	1.66	1.67	NR	NR	1.80	1.59
3	1.60	1.80	1.70	NR	2.00	< 10	1.50	1.59	1.63	1.74	1.59	NR	NR	1.86	1.62
4	1.50	1.80	1.60	NR	1.78	< 10	1.60	1.53	1.57	1.77	1.63	NR	NR	1.85	1.64
5	1.60	1.80	1.70	NR	1.97	< 10	1.40	1.53	1.55	1.64	1.62	NR	NR	1.84	1.62
6	1.70	1.80	1.70	NR	1.74	< 10	1.50	1.54	1.59	1.66	1.57	NR	NR	1.84	1.54
Mean	1.60	1.80	1.68		1.91	< 10	1.50	1.55	1.60	1.69	1.62			1.84	1.58
Median	1.60	1.80	1.70		1.97	< 10	1.50	1.54	1.58	1.67	1.62			1.84	1.61
Std.Dev.	0.06	0.00	0.04		0.12	-	0.09	0.05	0.06	0.05	0.03			0.02	0.06
Rel.Std.Dev.	3.95%	0.00%	2.43%		6.17%	-	5.96%	3.17%	3.54%	3.05%	2.14%			1.18%	3.55%
PDM ³	-2.70%	9.46%	2.37%		16.1%	-	-8.78%	-5.56%	-2.70%	2.87%	-1.79%			11.6%	-3.71%

Table A28. Analytical results for fusion V in OREAS 102a (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	50.0	29.0	40.0	33.9	40.0	NR	22.1	31.0	40.0	41.0	NR	NR	20.0	28.6
2	<50	50.0	30.0	40.0	35.1	41.0	NR	20.0	27.0	40.0	42.0	NR	NR	22.0	30.2
3	<50	50.0	31.0	40.0	33.1	40.0	NR	21.3	29.0	40.0	58.0	NR	NR	20.0	30.1
4	<50	<50	29.0	40.0	31.0	41.0	NR	19.7	27.0	45.0	49.0	NR	NR	23.0	28.5
5	<50	<50	30.0	40.0	33.5	40.0	NR	20.8	32.0	39.0	45.0	NR	NR	22.0	31.1
6	<50	50.0	30.0	40.0	34.5	41.0	NR	20.6	26.0	41.0	50.0	NR	NR	23.0	30.3
Mean	<50	50.0	29.8	40.0	33.5	40.5		20.7	28.7	40.8	47.5			21.7	29.8
Median	<50	50.0	30.0	40.0	33.7	40.5		20.7	28.0	40.0	47.0			22.0	30.2
Std.Dev.	-	0.0	0.8	0.0	1.4	0.5		0.9	2.4	2.1	6.3			1.4	1.0
Rel.Std.Dev.	-	0.00%	2.52%	0.00%	4.26%	1.35%		4.22%	8.45%	5.23%	13.2%			6.31%	3.45%
PDM ³	-	43.7%	-14.3%	15.0%	-3.69%	16.4%		-40.4%	-17.6%	17.4%	36.5%			-37.7%	-14.3%

Table A29. Analytical results for fusion Y in OREAS 102a (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	103	106	104	113	117	100	NR	102	103	104	109	NR	NR	102	106
2	101	108	105	114	114	100	NR	96	113	102	108	NR	NR	103	109
3	101	106	103	116	118	99	NR	101	113	104	110	NR	NR	103	103
4	103	112	102	112	103	100	NR	97	111	111	110	NR	NR	104	103
5	103	104	101	108	115	100	NR	101	104	102	110	NR	NR	105	103
6	104	104	101	110	102	100	NR	100	103	103	107	NR	NR	106	105
Mean	103	107	103	112	112	100		100	108	104	109			104	105
Median	103	106	103	113	115	100		101	108	103	109			104	104
Std.Dev.	1	3	2	3	7	0		2	5	3	1			2	2
Rel.Std.Dev.	1.23%	2.82%	1.59%	2.55%	6.32%	0.41%		2.39%	4.63%	3.31%	1.17%			1.56%	2.11%
PDM ³	-2.52%	1.27%	-2.53%	6.49%	6.04%	-5.22%		-5.41%	2.37%	-1.11%	3.01%			-1.57%	-0.56%

Table A30. Analytical results for fusion Yb in OREAS 102a (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	10.7	8.4	11.5	11.0	13.6	11.0	NR	11.3	10.1	10.6	11.2	NR	NR	11.1	9.7
2	10.8	7.9	11.5	11.0	13.4	11.0	NR	10.5	11.0	10.5	11.5	NR	NR	11.7	10.1
3	10.7	8.1	11.5	11.2	13.2	11.0	NR	11.0	10.6	10.9	11.2	NR	NR	11.8	10.4
4	10.8	8.5	11.0	10.4	11.8	11.0	NR	10.6	10.4	11.1	11.4	NR	NR	11.6	10.0
5	10.7	8.5	11.9	10.5	13.2	11.0	NR	10.5	9.8	10.3	11.4	NR	NR	11.9	10.7
6	10.8	9.0	11.7	10.8	11.9	11.0	NR	10.6	10.0	10.6	10.9	NR	NR	11.7	10.1
Mean	10.8	8.4	11.5	10.8	12.9	11.0		10.7	10.3	10.6	11.3			11.6	10.2
Median	10.8	8.4	11.5	10.9	13.2	11.0		10.6	10.3	10.6	11.3			11.7	10.1
Std.Dev.	0.1	0.4	0.3	0.3	0.8	0.0		0.3	0.4	0.3	0.2			0.3	0.4
Rel.Std.Dev.	0.51%	4.48%	2.60%	2.89%	6.06%	0.00%		3.12%	4.27%	2.90%	2.10%			2.36%	3.44%
PDM ³	-1.25%	-23.1%	5.8%	-0.64%	18.1%	1.04%		-1.44%	-5.23%	-2.25%	3.34%			6.98%	-6.54%

Table A31. Analytical results for 4-acid U in OREAS 102a (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	651	629	624	667	731	590	676	648	659	580	>500	600	580	639	680
2	618	624	637	688	694	590	662	653	656	570	>500	610	580	619	682
3	665	659	634	667	714	570	663	619	647	580	>500	620	570	627	686
4	643	651	627	668	737	590	679	577	683	590	>500	620	580	637	695
5	641	640	619	660	741	570	665	608	661	580	>500	650	580	630	687
6	652	633	633	667	706	580	668	616	630	570	>500	620	590	631	688
Mean	645	639	629	670	721	582	669	620	656	578	>500	620	580	631	686
Median	647	637	630	667	723	585	667	617	658	580	>500	620	580	631	687
Std.Dev.	15	13	7	10	19	10	7	28	17	8	-	17	6	7	5
Rel.Std.Dev.	2.38%	2.10%	1.09%	1.42%	2.58%	1.69%	1.06%	4.49%	2.66%	1.30%	-	2.70%	1.09%	1.14%	0.73%
PDM ³	1.02%	0.13%	-1.48%	4.86%	12.9%	-8.90%	4.76%	-2.88%	2.75%	-9.42%	-	-2.89%	-9.16%	-1.25%	7.51%

Table A32. Analytical results for 4-acid Ce in OREAS 102a (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	521	634	541	560	615	520	630	612	559	>500	>500	>500	>500	515	583
2	488	606	531	560	597	530	660	599	558	500	>500	>500	>500	495	586
3	524	605	547	550	615	500	700	594	546	>500	>500	>500	>500	501	583
4	514	607	554	560	626	520	650	579	572	>500	>500	>500	>500	535	590
5	505	628	542	570	648	480	690	611	560	>500	>500	>500	>500	527	589
6	522	645	493	570	594	520	640	617	480	>500	>500	>500	>500	528	587
Mean	513	621	535	562	616	512	662	602	546	>500	>500	>500	>500	517	586
Median	518	618	542	560	615	520	655	605	559	>500	>500	>500	>500	521	586
Std.Dev.	14	17	22	8	20	18	28	14	33	-	-	-	-	16	3
Rel.Std.Dev.	2.72%	2.76%	4.07%	1.34%	3.21%	3.59%	4.21%	2.38%	6.10%	-	-	-	-	3.11%	0.49%
PDM ³	-10.6%	8.28%	-6.75%	-2.04%	7.40%	-10.8%	15.4%	4.98%	-4.80%	-	-	-	-	-9.86%	2.27%

Table A33. Analytical results for 4-acid Co in OREAS 102a (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	38.7	45.0	38.3	39.6	42.6	38.0	40.0	36.3	42.0	35.8	39.2	38.0	33.2	42.0	38.5
2	37.5	40.0	38.5	40.7	39.6	39.0	39.0	36.2	42.0	36.3	40.5	38.5	33.7	38.0	38.2
3	37.4	45.0	38.0	39.2	41.7	40.0	39.0	34.9	41.0	36.6	40.6	39.5	34.1	41.0	38.0
4	36.8	40.0	38.2	39.3	42.2	38.0	39.0	38.4	41.0	36.3	40.6	39.2	33.2	40.0	39.7
5	37.8	45.0	40.3	38.9	44.2	39.0	39.0	36.4	40.0	35.7	40.8	40.5	33.1	39.0	38.1
6	37.2	40.0	40.1	39.9	39.6	39.0	41.0	36.2	42.0	36.4	41.6	39.0	34.3	39.0	38.3
Mean	37.6	42.5	38.9	39.6	41.6	38.8	39.5	36.4	41.3	36.2	40.6	39.1	33.6	39.8	38.5
Median	37.5	42.5	38.4	39.5	42.0	39.0	39.0	36.3	41.5	36.3	40.6	39.1	33.5	39.5	38.2
Std.Dev.	0.6	2.7	1.0	0.6	1.8	0.8	0.8	1.1	0.8	0.4	0.8	0.9	0.5	1.5	0.6
Rel.Std.Dev.	1.72%	6.44%	2.63%	1.61%	4.28%	1.94%	2.12%	3.09%	1.98%	0.98%	1.91%	2.20%	1.53%	3.70%	1.67%
PDM ³	-3.43%	9.25%	0.00%	1.80%	7.06%	-0.17%	1.54%	-6.43%	6.25%	-6.99%	4.24%	0.55%	-13.6%	2.40%	-1.08%

Table A34. Analytical results for 4-acid Cu in OREAS 102a (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	301	276	302	291	267	350	310	290	280	277	286	272	284	306	313
2	302	272	304	298	259	350	302	290	283	262	288	275	282	286	310
3	301	276	302	289	272	360	299	284	280	281	306	283	278	293	312
4	299	274	307	290	256	360	326	306	281	281	299	282	283	304	312
5	303	278	318	287	264	350	303	298	266	275	298	290	284	298	312
6	304	268	322	293	256	350	308	285	289	279	295	286	284	292	312
Mean	302	274	309	291	262	353	308	292	280	276	295	281	283	297	312
Median	302	275	306	291	261	350	306	290	281	278	297	283	284	295	312
Std.Dev.	2	4	9	4	6	5	10	8	8	7	7	7	2	8	1
Rel.Std.Dev.	0.58%	1.31%	2.81%	1.31%	2.45%	1.46%	3.15%	2.83%	2.71%	2.60%	2.51%	2.40%	0.83%	2.60%	0.30%
PDM ³	4.05%	-5.50%	6.63%	0.48%	-9.51%	21.9%	6.23%	0.75%	-3.48%	-4.86%	1.86%	-2.97%	-2.56%	2.29%	7.52%

Table A35. Analytical results for 4-acid Dy in OREAS 102a (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	12.2	15.1	13.4	12.2	NR	19.0	NR	13.7	12.3	NR	10.9	14.8	NR	NR	NR
2	11.3	14.3	12.1	12.2	NR	18.0	NR	13.7	12.1	NR	10.5	14.8	NR	NR	NR
3	12.0	14.4	12.5	11.8	NR	17.0	NR	13.3	12.2	NR	11.1	15.2	NR	NR	NR
4	12.1	14.4	13.5	11.9	NR	17.0	NR	12.4	13.0	NR	10.8	14.8	NR	NR	NR
5	11.8	15.0	12.9	11.8	NR	18.0	NR	13.1	12.6	NR	11.2	15.0	NR	NR	NR
6	12.1	14.9	12.8	11.9	NR	18.0	NR	13.1	11.6	NR	11.3	15.3	NR	NR	NR
Mean	11.9	14.7	12.9	12.0		17.8		13.2	12.3		10.9	14.9			
Median	12.0	14.7	12.9	11.9		18.0		13.2	12.3		11.0	14.9			
Std.Dev.	0.3	0.4	0.6	0.2		0.8		0.5	0.5		0.3	0.2			
Rel.Std.Dev.	2.78%	2.41%	4.37%	1.56%		4.22%		3.66%	3.85%		2.79%	1.44%			
PDM ³	-7.36%	14.1%	0.06%	-7.04%		38.5%		2.67%	-4.45%		-15.0%	16.1%			

Table A36. Analytical results for 4-acid Er in OREAS 102a (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	6.6	7.7	7.9	7.6	NR	11.0	NR	7.3	7.9	NR	6.4	8.5	NR	NR	NR
2	6.2	7.8	7.1	7.4	NR	11.0	NR	7.1	7.9	NR	6.1	8.6	NR	NR	NR
3	6.5	8.9	7.4	7.2	NR	10.0	NR	6.8	8.0	NR	6.5	8.7	NR	NR	NR
4	6.6	8.4	7.9	7.2	NR	10.0	NR	7.1	8.6	NR	6.5	8.6	NR	NR	NR
5	6.4	7.8	6.9	7.1	NR	11.0	NR	7.3	8.1	NR	6.5	8.8	NR	NR	NR
6	6.7	7.9	7.0	7.1	NR	11.0	NR	7.4	7.6	NR	6.7	8.9	NR	NR	NR
Mean	6.5	8.1	7.4	7.3		10.7		7.2	8.0		6.4	8.7			
Median	6.5	7.8	7.2	7.2		11.0		7.2	8.0		6.5	8.7			
Std.Dev.	0.2	0.5	0.4	0.2		0.5		0.2	0.3		0.2	0.1			
Rel.Std.Dev.	2.91%	5.79%	5.97%	2.71%		4.84%		3.01%	4.13%		2.86%	1.59%			
PDM ³	-12.0%	9.00%	-0.45%	-1.71%		44.3%		-3.06%	8.43%		-13.0%	17.3%			

Table A37. Analytical results for 4-acid Eu in OREAS 102a (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	3.56	4.25	3.97	3.37	NR	3.90	NR	3.90	3.94	NR	3.79	4.26	NR	NR	NR
2	3.33	4.05	3.64	3.42	NR	3.90	NR	3.90	3.91	NR	3.64	4.31	NR	NR	NR
3	3.53	4.20	3.79	3.31	NR	3.90	NR	3.70	3.89	NR	3.81	4.43	NR	NR	NR
4	3.49	4.10	4.10	3.34	NR	4.00	NR	3.60	4.04	NR	3.84	4.30	NR	NR	NR
5	3.45	4.25	3.75	3.26	NR	3.80	NR	4.00	3.96	NR	3.82	4.39	NR	NR	NR
6	3.55	3.90	3.73	3.37	NR	3.90	NR	3.90	3.58	NR	3.98	4.42	NR	NR	NR
Mean	3.49	4.13	3.83	3.35		3.90		3.83	3.89		3.81	4.35			
Median	3.51	4.15	3.77	3.36		3.90		3.90	3.93		3.82	4.35			
Std.Dev.	0.09	0.14	0.17	0.06		0.06		0.15	0.16		0.11	0.07			
Rel.Std.Dev.	2.47%	3.32%	4.47%	1.66%		1.62%		3.93%	4.09%		2.85%	1.63%			
PDM ³	-9.36%	7.29%	-0.38%	-13.0%		1.44%		-0.30%	1.09%		-0.82%	13.2%			

Table A38. Analytical results for 4-acid Fe in OREAS 102a (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	6.12	5.96	5.63	8.81	4.93	5.90	NR	5.74	6.18	5.36	5.46	5.17	5.37	5.54	5.86
2	6.16	5.86	5.47	8.56	4.84	6.00	NR	5.73	6.20	5.25	5.54	5.27	5.36	5.34	5.92
3	6.14	5.85	5.42	8.46	5.12	5.60	NR	5.73	6.10	5.37	5.92	5.30	5.34	5.51	5.90
4	6.16	5.83	5.43	8.56	4.81	6.10	NR	5.68	6.04	5.42	5.71	5.39	5.32	5.47	5.99
5	6.27	5.96	5.81	8.66	4.94	6.00	NR	5.71	5.90	5.30	5.79	5.56	5.37	5.52	5.93
6	6.25	5.80	5.83	8.76	4.79	6.00	NR	5.71	6.10	5.28	5.76	5.32	5.45	5.53	5.91
Mean	6.18	5.88	5.60	8.64	4.90	5.93		5.72	6.09	5.33	5.70	5.34	5.37	5.49	5.92
Median	6.16	5.86	5.55	8.61	4.88	6.00		5.72	6.10	5.33	5.74	5.31	5.37	5.52	5.91
Std.Dev.	0.06	0.07	0.19	0.13	0.12	0.18		0.02	0.11	0.06	0.17	0.13	0.04	0.08	0.04
Rel.Std.Dev.	1.00%	1.15%	3.38%	1.52%	2.50%	2.95%		0.38%	1.78%	1.20%	2.97%	2.47%	0.83%	1.37%	0.75%
PDM ³	9.42%	3.99%	-0.90%	52.8%	-13.2%	4.99%		1.16%	7.70%	-5.68%	0.80%	-5.60%	-5.01%	-2.94%	4.68%

Table A39. Analytical results for 4-acid Gd in OREAS 102a (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	17.4	19.4	18.6	17.6	NR	24.0	NR	17.4	19.9	NR	19.8	19.8	NR	NR	NR
2	16.5	18.2	16.8	17.6	NR	24.0	NR	17.2	20.1	NR	19.1	19.9	NR	NR	NR
3	17.5	18.6	17.5	17.2	NR	24.0	NR	16.4	19.6	NR	20.0	20.5	NR	NR	NR
4	17.0	18.8	18.1	17.2	NR	24.0	NR	15.7	20.7	NR	20.0	19.4	NR	NR	NR
5	17.7	19.0	18.8	17.2	NR	23.0	NR	16.9	20.4	NR	20.1	20.3	NR	NR	NR
6	17.3	19.6	19.0	17.3	NR	24.0	NR	17.1	18.4	NR	20.8	20.7	NR	NR	NR
Mean	17.2	18.9	18.1	17.4		23.8		16.8	19.9		20.0	20.1			
Median	17.3	18.9	18.4	17.3		24.0		17.0	20.0		20.0	20.1			
Std.Dev.	0.4	0.5	0.9	0.2		0.4		0.6	0.8		0.6	0.5			
Rel.Std.Dev.	2.35%	2.73%	4.82%	1.14%		1.71%		3.76%	4.06%		2.84%	2.44%			
PDM ³	-7.13%	2.13%	-2.19%	-6.41%		28.6%		-9.47%	7.07%		7.61%	8.38%			

Table A40. Analytical results for 4-acid Ho in OREAS 102a (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	2.48	2.96	2.40	2.16	NR	2.40	NR	2.80	2.80	NR	2.05	2.74	NR	NR	NR
2	2.21	2.54	2.17	2.17	NR	2.40	NR	2.80	2.80	NR	1.98	2.75	NR	NR	NR
3	2.34	2.62	2.24	2.06	NR	2.30	NR	2.50	2.80	NR	2.09	2.81	NR	NR	NR
4	2.30	2.56	2.41	2.11	NR	2.50	NR	2.50	2.90	NR	2.10	2.76	NR	NR	NR
5	2.34	2.74	2.30	2.08	NR	2.30	NR	2.50	2.80	NR	2.10	2.80	NR	NR	NR
6	2.37	2.54	2.30	2.10	NR	2.40	NR	2.60	2.70	NR	2.17	2.81	NR	NR	NR
Mean	2.34	2.66	2.30	2.11		2.38		2.62	2.80		2.08	2.78			
Median	2.34	2.59	2.30	2.11		2.40		2.55	2.80		2.10	2.78			
Std.Dev.	0.09	0.17	0.09	0.04		0.08		0.15	0.06		0.06	0.03			
Rel.Std.Dev.	3.77%	6.22%	4.00%	2.07%		3.16%		5.63%	2.26%		3.03%	1.15%			
PDM ³	-4.42%	8.65%	-5.92%	-13.7%		-2.65%		6.88%	14.4%		-15.0%	13.5%			

Table A41. Analytical results for 4-acid K in OREAS 102a (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	4.06	3.40	3.73	3.68	3.49	NR	NR	3.84	3.94	3.26	3.52	3.54	3.37	3.43	3.70
2	3.92	3.53	3.71	3.69	3.42	NR	NR	3.91	3.95	3.11	3.57	3.59	3.35	3.39	3.91
3	4.03	3.56	3.63	3.64	3.55	NR	NR	3.70	3.88	3.30	3.78	3.69	3.31	3.45	3.89
4	4.02	3.55	3.65	3.65	3.32	NR	NR	3.93	3.85	3.31	3.66	3.65	3.36	3.58	3.88
5	4.09	3.64	3.87	3.69	3.45	NR	NR	3.86	3.73	3.24	3.68	3.72	3.38	3.45	3.90
6	4.08	3.35	3.70	3.74	3.33	NR	NR	3.82	3.82	3.29	3.64	3.72	3.38	3.45	3.79
Mean	4.03	3.51	3.72	3.68	3.42			3.84	3.86	3.25	3.64	3.65	3.36	3.46	3.84
Median	4.04	3.54	3.71	3.69	3.43			3.85	3.87	3.28	3.65	3.67	3.37	3.45	3.89
Std.Dev.	0.06	0.11	0.08	0.04	0.09			0.08	0.08	0.07	0.09	0.07	0.03	0.06	0.08
Rel.Std.Dev.	1.50%	3.10%	2.25%	0.96%	2.64%			2.12%	2.1%	2.28%	2.48%	2.02%	0.79%	1.85%	2.14%
PDM ³	10.9%	-3.62%	2.19%	1.23%	-5.83%			5.68%	6.18%	-10.6%	0.13%	0.41%	-7.66%	-4.91%	5.69%

Table A42. Analytical results for 4-acid La in OREAS 102a (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	307	335	340	303	325	310	320	355	307	292	319	320	309	302	336
2	291	332	335	307	312	300	330	340	303	288	323	317	309	297	347
3	305	358	346	304	324	280	340	322	299	292	333	320	302	295	342
4	301	339	353	304	330	300	330	319	319	292	328	319	306	307	343
5	299	341	337	306	345	300	340	343	304	291	329	331	304	300	351
6	313	316	306	312	319	290	320	294	256	290	330	318	303	299	340
Mean	303	337	336	306	326	297	330	329	298	291	327	321	306	300	343
Median	303	337	339	305	325	300	330	331	304	292	329	320	305	300	343
Std.Dev.	8	14	16	3	11	10	9	22	22	2	5	5	3	4	5
Rel.Std.Dev.	2.52%	4.05%	4.81%	1.07%	3.49%	3.48%	2.71%	6.65%	7.27%	0.55%	1.56%	1.59%	0.99%	1.42%	1.54%
PDM ³	-4.49%	6.22%	6.01%	-3.50%	2.80%	-6.45%	4.06%	3.64%	-6.03%	-8.29%	3.12%	1.17%	-3.66%	-5.37%	8.25%

Table A43. Analytical results for 4-acid Lu in OREAS 102a (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	0.98	1.18	1.10	0.90	1.16	1.00	1.10	NR	1.10	NR	0.89	1.16	NR	NR	NR
2	0.92	1.16	0.98	0.90	1.08	1.00	1.20	NR	1.00	NR	0.87	1.19	NR	NR	NR
3	0.96	1.14	1.01	0.90	1.10	1.00	1.20	NR	1.00	NR	0.90	1.20	NR	NR	NR
4	0.95	1.16	1.08	0.90	1.11	1.00	1.10	NR	1.10	NR	0.90	1.16	NR	NR	NR
5	0.94	1.18	1.03	0.90	1.17	1.00	1.20	NR	1.10	NR	0.90	1.20	NR	NR	NR
6	0.94	1.14	1.02	0.90	1.10	1.00	1.10	NR	0.90	NR	0.94	1.22	NR	NR	NR
Mean	0.95	1.16	1.04	0.90	1.12	1.00	1.15		1.03		0.90	1.19			
Median	0.95	1.16	1.03	0.90	1.11	1.00	1.15		1.05		0.90	1.20			
Std.Dev.	0.02	0.02	0.05	0.00	0.04	0.00	0.05		0.08		0.02	0.02			
Rel.Std.Dev.	2.16%	1.54%	4.34%	0.00%	3.21%	0.00%	4.76%		7.90%		2.53%	2.02%			
PDM ³	-9.08%	11.2%	-0.64%	-13.7%	7.28%	-4.16%	10.2%		-0.96%		-13.7%	13.9%			

Table A44. Analytical results for 4-acid Mg in OREAS 102a (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	1.44	1.32	1.31	1.36	1.23	1.30	NR	1.42	1.35	1.20	1.29	1.24	1.26	1.34	1.36
2	1.44	1.32	1.31	1.35	1.21	1.30	NR	1.37	1.34	1.18	1.31	1.24	1.25	1.30	1.37
3	1.44	1.34	1.29	1.33	1.26	1.20	NR	1.40	1.32	1.21	1.40	1.25	1.25	1.32	1.35
4	1.44	1.32	1.31	1.34	1.19	1.30	NR	1.42	1.31	1.21	1.36	1.27	1.25	1.34	1.36
5	1.45	1.35	1.29	1.36	1.23	1.20	NR	1.47	1.27	1.20	1.36	1.30	1.26	1.31	1.37
6	1.46	1.36	1.23	1.38	1.20	1.30	NR	1.43	1.24	1.19	1.35	1.25	1.27	1.29	1.36
Mean	1.45	1.34	1.29	1.35	1.22	1.27		1.42	1.31	1.20	1.35	1.26	1.26	1.32	1.36
Median	1.44	1.33	1.30	1.36	1.22	1.30		1.42	1.32	1.20	1.36	1.25	1.26	1.32	1.36
Std.Dev.	0.01	0.02	0.03	0.02	0.03	0.05		0.03	0.04	0.01	0.04	0.02	0.01	0.02	0.01
Rel.Std.Dev.	0.65%	1.32%	2.46%	1.29%	2.10%	4.08%		2.33%	3.24%	0.98%	2.93%	1.84%	0.65%	1.57%	0.73%
PDM ³	10.3%	1.74%	-1.75%	3.13%	-7.09%	-3.47%		8.09%	-0.55%	-8.68%	2.50%	-4.11%	-4.23%	0.34%	3.78%

Table A45. Analytical results for 4-acid Mn in OREAS 102a (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	471	464	413	479	396	450	NR	442	498	427	439	443	425	465	474
2	472	460	404	487	387	450	NR	440	496	417	446	443	423	444	480
3	469	472	397	471	404	450	NR	421	492	428	472	442	421	457	467
4	470	462	399	473	385	450	NR	451	486	432	459	447	423	463	471
5	474	474	421	468	393	440	NR	432	469	423	459	460	424	464	478
6	477	448	407	481	385	450	NR	421	508	421	455	441	427	453	470
Mean	472	463	407	477	392	448		435	492	425	455	446	424	458	474
Median	472	463	406	476	390	450		436	494	425	457	443	424	460	472
Std.Dev.	3	9	9	7	8	4		12	13	5	11	7	2	8	5
Rel.Std.Dev.	0.62%	2.02%	2.21%	1.49%	1.93%	0.91%		2.78%	2.69%	1.27%	2.52%	1.60%	0.48%	1.78%	1.08%
PDM ³	5.47%	3.50%	-9.12%	6.44%	-12.5%	0.15%		-2.94%	9.79%	-5.14%	1.64%	-0.37%	-5.32%	2.23%	5.77%

Table A46. Analytical results for 4-acid Mo in OREAS 102a (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	15.1	14.0	14.8	12.6	15.1	17.0	16.0	12.8	12.7	12.9	11.9	14.3	15.0	12.6	14.2
2	14.4	13.5	14.4	12.8	14.0	14.0	14.0	13.0	12.5	13.2	12.6	14.2	14.7	12.4	13.8
3	14.0	14.5	14.6	12.0	14.4	17.0	15.0	12.4	12.3	13.0	12.2	15.0	14.7	13.2	14.1
4	14.1	14.0	14.7	12.5	14.5	15.0	14.0	13.5	12.6	13.0	12.2	14.5	14.3	13.0	14.2
5	14.2	14.5	14.4	12.2	15.1	14.0	14.0	13.0	12.2	12.7	12.3	14.7	14.1	11.5	13.8
6	14.2	13.5	14.4	12.3	13.8	15.0	13.0	12.9	13.4	12.7	12.6	14.6	14.4	12.2	13.5
Mean	14.3	14.0	14.6	12.4	14.5	15.3	14.3	12.9	12.6	12.9	12.3	14.5	14.5	12.5	13.9
Median	14.2	14.0	14.5	12.4	14.5	15.0	14.0	13.0	12.6	13.0	12.2	14.5	14.5	12.5	13.9
Std.Dev.	0.4	0.4	0.2	0.3	0.5	1.4	1.0	0.4	0.4	0.2	0.3	0.3	0.3	0.6	0.3
Rel.Std.Dev.	2.78%	3.19%	1.21%	2.34%	3.69%	8.91%	7.21%	2.75%	3.4%	1.49%	2.16%	1.97%	2.27%	4.87%	1.82%
PDM ³	5.26%	2.81%	6.85%	-8.94%	6.36%	12.6%	5.26%	-5.02%	-7.35%	-5.27%	-9.98%	6.61%	6.61%	-8.33%	2.28%

Table A47. Analytical results for 4-acid Nd in OREAS 102a (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	168	201	190	181	NR	180	NR	189	184	NR	159	190	NR	NR	NR
2	160	195	166	184	NR	170	NR	185	183	NR	154	191	NR	NR	NR
3	173	195	181	176	NR	170	NR	172	183	NR	162	195	NR	NR	NR
4	167	194	201	178	NR	170	NR	169	192	NR	162	189	NR	NR	NR
5	165	198	190	174	NR	150	NR	180	188	NR	164	192	NR	NR	NR
6	173	190	183	181	NR	160	NR	176	162	NR	168	194	NR	NR	NR
Mean	168	196	185	179		167		179	182		161	192			
Median	167	195	186	180		170		178	184		162	191			
Std.Dev.	5	4	12	4		10		8	10		5	2			
Rel.Std.Dev.	2.84%	1.91%	6.33%	2.06%		6.20%		4.25%	5.72%		2.95%	1.18%			
PDM ³	-6.78%	8.73%	2.97%	-0.45%		-7.31%		-0.71%	1.22%		-10.4%	6.50%			

Table A48. Analytical results for 4-acid Ni in OREAS 102a (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	20.0	28.0	14.3	17.0	10.9	< 20	15.0	10.4	14.0	13.1	13.0	12.7	14.4	12.4	14.6
2	15.0	32.0	14.7	15.0	10.5	< 20	16.0	10.7	15.0	13.3	13.9	12.0	14.5	15.5	14.8
3	15.0	30.0	14.9	14.0	10.7	28.0	15.0	11.1	14.0	13.5	13.5	13.0	15.3	15.3	14.8
4	13.0	28.0	14.9	14.0	10.7	< 20	15.0	11.5	15.0	14.4	13.5	12.5	13.9	12.8	15.2
5	15.0	28.0	14.2	14.0	11.3	< 20	16.0	11.3	15.0	13.3	13.5	12.7	14.4	15.3	14.8
6	15.0	28.0	14.4	15.0	10.4	< 20	15.0	10.2	14.0	13.4	13.9	12.3	14.2	13.3	14.7
Mean	15.5	29.0	14.6	14.8	10.7	28.0	15.3	10.9	14.5	13.5	13.6	12.5	14.5	14.1	14.8
Median	15.0	28.0	14.6	14.5	10.7	28.0	15.0	10.9	14.5	13.4	13.5	12.6	14.4	14.3	14.8
Std.Dev.	2.3	1.7	0.3	1.2	0.3		0.5	0.5	0.5	0.5	0.3	0.4	0.5	1.4	0.2
Rel.Std.Dev.	15.1%	5.77%	2.11%	7.88%	2.90%		3.37%	4.75%	3.78%	3.41%	2.46%	2.79%	3.24%	10.1%	1.43%
PDM ³	9.35%	105%	2.76%	4.65%	-24.2%	97.5%	8.17%	-23.3%	2.29%	-4.76%	-4.41%	-11.6%	1.94%	-0.53%	4.52%

Table A49. Analytical results for 4-acid P in OREAS 102a (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	649	600	543	530	583	530	510	NR	570	560	580	560	570	500	570
2	675	600	540	540	560	530	500	NR	570	540	590	570	580	600	581
3	663	600	528	530	572	510	510	NR	560	580	620	560	570	500	564
4	660	600	524	530	560	510	500	NR	560	590	600	570	560	500	564
5	631	600	560	520	575	540	510	NR	540	560	600	580	580	500	575
6	686	600	536	540	555	510	500	NR	560	550	600	560	580	500	572
Mean	661	600	539	532	567	522	505		560	563	598	567	573	517	571
Median	662	600	538	530	566	520	505		560	560	600	565	575	500	571
Std.Dev.	19	0	13	8	11	13	5		11	19	13	8	8	41	6
Rel.Std.Dev.	2.93%	0.00%	2.37%	1.42%	1.91%	2.55%	1.08%		1.96%	3.31%	2.22%	1.44%	1.42%	7.9%	1.13%
PDM ³	17.4%	6.63%	-4.30%	-5.51%	0.85%	-7.29%	-10.3%		-0.48%	0.12%	6.34%	0.71%	1.89%	-8.18%	1.49%

Table A50. Analytical results for 4-acid Pb in OREAS 102a (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	19.0	14.0	6.2	8.0	11.2	< 20	14.0	12.3	10.0	16.2	13.8	16.2	16.1	7.5	16.3
2	17.0	14.0	6.8	8.0	10.5	23.0	16.0	13.2	9.0	16.5	13.7	16.4	14.5	8.8	17.1
3	17.0	14.0	6.3	10.0	10.5	21.0	17.0	13.5	11.0	16.1	14.1	16.7	14.2	9.9	18.0
4	17.0	14.0	6.3	10.0	10.3	< 20	11.0	13.1	9.0	16.1	14.1	16.3	14.2	5.3	17.5
5	18.0	14.0	5.9	8.0	11.9	< 20	15.0	14.7	11.0	16.2	14.1	16.6	14.2	7.2	17.1
6	19.0	14.0	6.2	9.0	11.0	25.0	16.0	10.7	12.0	15.8	14.8	16.9	14.8	7.3	17.1
Mean	17.8	14.0	6.3	8.8	10.9	23.0	14.8	12.9	10.3	16.2	14.1	16.5	14.7	7.7	17.2
Median	17.5	14.0	6.3	8.5	10.8	23.0	15.5	13.2	10.5	16.2	14.1	16.5	14.4	7.4	17.1
Std.Dev.	1.0	0.0	0.3	1.0	0.6	2.0	2.1	1.3	1.2	0.2	0.4	0.3	0.7	1.6	0.5
Rel.Std.Dev.	5.51%	0.00%	4.66%	11.1%	5.39%	8.70%	14.4%	10.3%	11.7%	1.40%	2.73%	1.60%	5.06%	20.4%	3.16%
PDM ³	29.9%	1.96%	-54.2%	-35.7%	-20.6%	67.5%	8.03%	-5.93%	-24.7%	17.6%	2.69%	20.3%	6.82%	-44.2%	25.0%

Table A51. Analytical results for 4-acid Pr in OREAS 102a (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	52.5	65.5	59.9	53.1	NR	55.0	NR	53.8	60.6	NR	50.9	62.5	NR	NR	NR
2	50.3	63.6	54.8	54.6	NR	56.0	NR	54.8	60.4	NR	49.0	62.2	NR	NR	NR
3	52.8	62.8	57.2	52.1	NR	54.0	NR	54.0	60.1	NR	51.8	64.2	NR	NR	NR
4	52.2	64.7	62.1	52.5	NR	56.0	NR	51.8	62.2	NR	51.8	61.9	NR	NR	NR
5	51.3	64.4	59.4	51.7	NR	52.0	NR	54.1	61.0	NR	52.1	63.3	NR	NR	NR
6	52.9	61.3	56.8	53.2	NR	55.0	NR	54.0	52.8	NR	53.3	63.6	NR	NR	NR
Mean	52.0	63.7	58.3	52.9		54.7		53.8	59.5		51.5	63.0			
Median	52.4	64.0	58.3	52.8		55.0		54.0	60.5		51.8	62.9			
Std.Dev.	1.0	1.5	2.6	1.0		1.5		1.0	3.4		1.4	0.9			
Rel.Std.Dev.	1.93%	2.36%	4.46%	1.94%		2.75%		1.89%	5.66%		2.80%	1.42%			
PDM ³	-8.47%	12.1%	2.68%	-6.95%		-3.79%		-5.40%	4.75%		-9.39%	10.8%			

Table A52. Analytical results for 4-acid Sm in OREAS 102a (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	24.1	27.2	26.3	23.7	NR	26.0	NR	22.7	23.6	NR	21.3	26.3	NR	NR	NR
2	23.4	26.5	23.9	24.2	NR	26.0	NR	22.5	23.4	NR	20.4	26.1	NR	NR	NR
3	24.5	27.0	25.0	23.1	NR	24.0	NR	22.7	23.3	NR	21.6	26.9	NR	NR	NR
4	23.9	27.2	27.0	23.5	NR	24.0	NR	21.4	24.3	NR	21.6	26.6	NR	NR	NR
5	23.9	27.7	25.9	23.1	NR	25.0	NR	23.2	23.4	NR	21.8	26.8	NR	NR	NR
6	24.8	26.4	25.7	23.7	NR	26.0	NR	22.9	21.6	NR	22.3	27.1	NR	NR	NR
Mean	24.1	27.0	25.6	23.6		25.2		22.6	23.3		21.5	26.6			
Median	24.0	27.1	25.8	23.6		25.5		22.7	23.4		21.6	26.7			
Std.Dev.	0.5	0.5	1.1	0.4		1.0		0.6	0.9		0.6	0.4			
Rel.Std.Dev.	2.07%	1.80%	4.14%	1.78%		3.91%		2.74%	3.84%		2.94%	1.42%			
PDM ³	-1.25%	10.6%	4.99%	-3.51%		3.12%		-7.54%	-4.67%		-11.9%	9.13%			

Table A53. Analytical results for 4-acid Tb in OREAS 102a (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	2.21	2.75	2.37	1.99	3.24	2.70	3.10	2.20	2.50	NR	2.27	3.08	NR	NR	NR
2	2.08	2.55	2.15	2.00	3.06	2.70	3.10	2.30	2.50	NR	2.20	3.08	NR	NR	NR
3	2.20	2.60	2.20	1.89	3.15	2.60	3.30	2.20	2.50	NR	2.31	3.17	NR	NR	NR
4	2.13	2.55	2.38	1.92	3.19	2.70	3.10	2.20	2.50	NR	2.32	3.07	NR	NR	NR
5	2.15	2.75	2.41	1.93	3.31	2.60	3.20	2.40	2.50	NR	2.32	3.13	NR	NR	NR
6	2.20	2.50	2.40	1.94	3.14	2.60	3.10	2.20	2.30	NR	2.42	3.17	NR	NR	NR
Mean	2.16	2.62	2.32	1.95	3.18	2.65	3.15	2.25	2.47		2.31	3.12			
Median	2.17	2.58	2.38	1.94	3.17	2.65	3.10	2.20	2.50		2.32	3.11			
Std.Dev.	0.05	0.11	0.11	0.04	0.09	0.05	0.08	0.08	0.08		0.07	0.05			
Rel.Std.Dev.	2.46%	4.13%	4.88%	2.18%	2.76%	2.07%	2.66%	3.72%	3.31%		3.12%	1.49%			
PDM ³	-15.6%	2.21%	-9.44%	-24.0%	24.3%	3.52%	23.0%	-12.1%	-3.65%		-9.90%	21.7%			

Table A54. Analytical results for 4-acid Th in OREAS 102a (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 -	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	39.6	33.2	40.5	37.5	43.1	40.0	41.0	35.7	39.9	37.0	42.6	39.7	32.4	38.4	36.5
2	36.7	33.0	41.6	38.2	40.5	39.0	41.0	36.6	41.6	37.4	41.1	39.8	31.8	36.8	36.4
3	38.8	34.4	42.3	37.1	42.1	39.0	44.0	36.5	39.7	36.6	43.4	40.5	32.1	38.7	36.7
4	38.9	34.9	42.1	37.1	42.6	39.0	42.0	34.2	40.6	37.4	43.7	39.3	30.7	39.0	36.4
5	37.7	35.0	43.4	36.7	44.5	38.0	42.0	35.1	39.7	36.2	44.2	39.1	30.9	38.7	36.4
6	39.1	32.6	41.4	37.2	40.6	39.0	41.0	35.6	33.4	36.4	45.1	40.3	32.8	38.5	36.5
Mean	38.5	33.9	41.9	37.3	42.2	39.0	41.8	35.6	39.2	36.8	43.4	39.8	31.8	38.4	36.5
Median	38.9	33.8	41.9	37.2	42.4	39.0	41.5	35.7	39.8	36.8	43.6	39.8	32.0	38.6	36.4
Std.Dev.	1.1	1.0	1.0	0.5	1.5	0.6	1.2	0.9	2.9	0.5	1.4	0.5	0.8	0.8	0.1
Rel.Std.Dev.	2.83%	3.08%	2.33%	1.37%	3.65%	1.62%	2.79%	2.52%	7.43%	1.39%	3.19%	1.37%	2.62%	2.05%	0.34%
PDM ³	0.08%	-12.0%	8.92%	-3.00%	9.86%	1.42%	8.79%	-7.38%	1.81%	-4.21%	12.7%	3.46%	-17.3%	-0.27%	-5.17%

Table A55. Analytical results for 4-acid Ti in OREAS 102a (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	0.173	0.170	0.169	0.164	0.127	0.170	NR	NR	0.180	0.149	0.159	0.159	0.155	0.144	0.165
2	0.172	0.175	0.166	0.169	0.121	0.170	NR	NR	0.180	0.140	0.163	0.162	0.154	0.144	0.168
3	0.170	0.170	0.165	0.162	0.125	0.170	NR	NR	0.180	0.150	0.172	0.165	0.154	0.145	0.165
4	0.173	0.175	0.164	0.162	0.122	0.170	NR	NR	0.180	0.151	0.167	0.165	0.155	0.144	0.167
5	0.172	0.180	0.168	0.162	0.123	0.170	NR	NR	0.170	0.148	0.167	0.169	0.155	0.143	0.172
6	0.174	0.170	0.165	0.165	0.123	0.170	NR	NR	0.180	0.151	0.166	0.168	0.155	0.143	0.166
Mean	0.172	0.173	0.166	0.164	0.123	0.170			0.178	0.148	0.166	0.165	0.155	0.144	0.167
Median	0.172	0.173	0.166	0.163	0.123	0.170			0.180	0.150	0.167	0.165	0.155	0.144	0.167
Std.Dev.	0.001	0.004	0.002	0.003	0.002	0.000			0.004	0.004	0.004	0.004	0.001	0.001	0.003
Rel.Std.Dev.	0.81%	2.36%	1.15%	1.68%	1.83%	0.00%			2.29%	2.81%	2.64%	2.26%	0.33%	0.52%	1.58%
PDM ³	4.88%	5.61%	1.21%	-0.08%	-24.9%	3.58%			8.65%	-9.73%	0.94%	0.33%	-5.77%	-12.4%	1.85%

Table A56. Analytical results for 4-acid Tm in OREAS 102a (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	0.99	1.12	1.07	0.93	NR	1.00	NR	1.10	1.10	NR	0.86	1.15	NR	NR	NR
2	0.90	1.08	0.96	0.92	NR	1.00	NR	1.00	1.20	NR	0.83	1.17	NR	NR	NR
3	0.96	1.12	0.99	0.89	NR	1.00	NR	1.00	1.20	NR	0.88	1.21	NR	NR	NR
4	0.96	1.22	1.06	0.89	NR	1.00	NR	1.10	1.20	NR	0.89	1.17	NR	NR	NR
5	0.94	1.32	1.00	0.89	NR	1.00	NR	1.10	1.20	NR	0.89	1.20	NR	NR	NR
6	0.97	1.14	1.01	0.91	NR	1.00	NR	1.00	1.20	NR	0.92	1.20	NR	NR	NR
Mean	0.95	1.17	1.02	0.91		1.00		1.05	1.18		0.88	1.18			
Median	0.96	1.13	1.01	0.90		1.00		1.05	1.20		0.89	1.19			
Std.Dev.	0.03	0.09	0.04	0.02		0.00		0.05	0.04		0.03	0.02			
Rel.Std.Dev.	3.23%	7.56%	4.17%	1.95%		0.00%		5.22%	3.45%		3.48%	1.98%			
PDM ³	-7.89%	12.7%	-1.93%	-12.6%		-3.38%		1.45%	14.3%		-15.1%	14.3%			

Table A57. Analytical results for 4-acid V in OREAS 102a (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	33.0	30.0	31.0	28.0	30.2	42.0	37.0	39.0	38.0	30.0	31.0	29.0	30.0	32.0	32.2
2	34.0	30.0	30.5	28.0	28.7	43.0	36.0	40.0	38.0	29.0	30.0	29.0	30.0	33.0	32.7
3	33.0	30.0	29.9	27.0	29.5	42.0	35.0	39.0	38.0	31.0	33.0	30.0	29.0	33.0	31.6
4	33.0	30.0	29.7	28.0	29.5	43.0	36.0	43.0	37.0	31.0	32.0	30.0	30.0	36.0	32.0
5	33.0	30.0	31.8	27.0	29.7	41.0	37.0	40.0	36.0	30.0	32.0	30.0	30.0	33.0	32.5
6	33.0	30.0	30.8	28.0	28.6	43.0	36.0	35.0	37.0	30.0	32.0	30.0	30.0	33.0	32.0
Mean	33.2	30.0	30.6	27.7	29.4	42.3	36.2	39.3	37.3	30.2	31.7	29.7	29.8	33.3	32.2
Median	33.0	30.0	30.7	28.0	29.5	42.5	36.0	39.5	37.5	30.0	32.0	30.0	30.0	33.0	32.1
Std.Dev.	0.4	0.0	0.8	0.5	0.6	0.8	0.8	2.6	0.8	0.8	1.0	0.5	0.4	1.4	0.4
Rel.Std.Dev.	1.23%	0.00%	2.51%	1.87%	2.03%	1.93%	2.08%	6.56%	2.19%	2.50%	3.26%	1.74%	1.37%	4.10%	1.19%
PDM ³	4.87%	-5.14%	-3.19%	-12.5%	-7.16%	33.9%	14.4%	24.4%	18.0%	-4.62%	0.13%	-6.20%	-5.67%	5.40%	1.71%

Table A58. Analytical results for 4-acid Y in OREAS 102a (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	62.1	76.6	63.2	66.4	65.9	97.0	65.0	59.8	75.2	60.5	66.1	68.2	60.8	50.5	64.2
2	59.6	71.7	61.9	66.9	61.2	94.0	64.0	59.7	74.8	61.6	69.0	67.0	59.9	50.3	65.2
3	57.1	72.3	63.1	65.3	63.9	87.0	63.0	59.2	73.2	60.9	67.0	69.5	61.3	50.5	63.8
4	57.6	72.8	63.4	64.8	63.6	93.0	63.0	62.2	76.7	61.8	68.0	68.3	58.4	50.6	62.7
5	59.3	76.3	62.6	65.4	68.3	94.0	63.0	60.3	74.1	60.2	67.5	69.0	58.1	51.7	64.3
6	58.4	74.1	60.5	65.6	61.6	97.0	61.0	59.9	66.9	60.4	70.3	67.4	57.8	51.1	63.8
Mean	59.0	74.0	62.5	65.7	64.1	93.7	63.2	60.2	73.5	60.9	68.0	68.2	59.4	50.8	64.0
Median	58.9	73.5	62.9	65.5	63.7	94.0	63.0	59.9	74.5	60.7	67.8	68.3	59.2	50.6	64.0
Std.Dev.	1.8	2.1	1.1	0.8	2.7	3.7	1.3	1.0	3.4	0.7	1.5	0.9	1.5	0.5	0.8
Rel.Std.Dev.	3.02%	2.81%	1.76%	1.18%	4.22%	3.92%	2.10%	1.74%	4.67%	1.09%	2.20%	1.38%	2.51%	1.03%	1.24%
PDM ³	-7.67%	15.7%	-2.29%	2.85%	0.27%	46.6%	-1.17%	-5.83%	15.0%	-4.71%	6.37%	6.76%	-7.09%	-20.5%	0.13%

Table A59. Analytical results for 4-acid Yb in OREAS 102a (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	6.9	8.4	7.0	6.8	7.4	11.0	7.4	7.7	7.6	NR	6.0	7.6	NR	NR	NR
2	6.3	7.9	6.3	6.7	7.0	11.0	7.9	7.5	7.4	NR	5.8	7.8	NR	NR	NR
3	6.8	8.1	6.5	6.5	7.1	10.0	7.8	7.3	7.6	NR	6.2	8.0	NR	NR	NR
4	6.8	8.5	6.9	6.5	7.2	10.0	7.6	7.3	7.7	NR	6.3	7.7	NR	NR	NR
5	6.7	8.5	6.9	6.5	7.5	11.0	7.5	7.4	7.6	NR	6.1	8.0	NR	NR	NR
6	6.7	9.0	6.9	6.6	7.0	11.0	7.6	7.3	7.2	NR	6.4	7.9	NR	NR	NR
Mean	6.7	8.4	6.8	6.6	7.2	10.7	7.6	7.4	7.5		6.1	7.8			
Median	6.7	8.4	6.9	6.6	7.2	11.0	7.6	7.4	7.6		6.1	7.9			
Std.Dev.	0.2	0.4	0.3	0.1	0.2	0.5	0.2	0.2	0.2		0.2	0.2			
Rel.Std.Dev.	3.12%	4.48%	4.16%	1.92%	3.02%	4.84%	2.44%	2.16%	2.44%		2.89%	2.00%			
PDM ³	-7.28%	15.7%	-6.68%	-8.75%	-0.44%	47.5%	5.53%	2.54%	3.92%		-15.3%	8.07%			