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AMIS0501

Certified Reference Material

Vanadium bearing titanomagnetite, Eastern Bushveld Limb, Mapochs Mine, South Africa

Certificate of Analysis

Certified Concentrations and Limits[1. 2.]
(at two Standard Deviations)

Certified Concentrations

Fe 4A_MICP	53.66	±	1.5	%
Fe FUS	53.76	±	0.72	%
Ti 4A_MICP	7.48	±	0.49	%
Ti FUS	7.67	±	0.57	%
V 4A_MICP	0.946	±	0.035	%
V FUS	0.971	±	0.076	%
U 4A_MICP	0.20	±	0.06	ppm
SG	4.65	±	0.060	Dimensionless
S Comb/LECO	0.031	±	0.005	%

1. *Manufacturers recommended limits for use of the material as control samples, based on two standard deviations, calculated using "Between Laboratory" statistics for treatment of the data for trivial, non-trivial and technically invalid results. See sections 1, 10 and 13.*
2. *There is additional uncertified element data presented as an appendix.*
3. *Where possible, independent analytical methods were used to determine the major element concentrations, e.g. for Fe_2O_3, XRF and a sodium peroxide / lithium tetraborate fusion (denoted as FUS) with ICP, AA or gravimetric finish were used. The statistical analysis of the data sets generated from each of independent analytical methods shows that there is sufficient evidence to conclude that the data sets are not significantly different at a level of confidence of 95%.*
4. *Reference: (J. S. Afr. Inst. Min. Metal/., vol. 85 no. 5. May 1985. Page 143. Vanadium in South Africa (Metal Review Series no. 2) by B. ROHRMANN*)*

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Major Oxides[3]

Certified Concentrations (at two Standard Deviations)

Al_2O_3 XRF	4.19	±	0.13	%
CaO XRF	0.13	±	0.02	%
Cr_2O_3 XRF	0.47	±	0.02	%
Fe_2O_3 FUS	75.6	±	3.8	%
Fe_2O_3 XRF	76.4	±	1.3	%
MgO XRF	1.75	±	0.061	%
MnO XRF	0.24	±	0.01	%
SiO_2 XRF	1.87	±	0.063	%
TiO_2 XRF	13.1	±	0.62	%
V_2O_5 XRF	1.7	±	0.09	%

Informational Concentrations

GOI	0.34	%
K_2O XRF	0.01	%
Na_2O XRF	0.03	%
P_2O_5 XRF	0.01	%

GOI is 'gain-on-ignition'

1. Intended Use: AMIS0501 is a certified reference material which may be used to demonstrate the validity of measurement results of a single analysis of vanadium bearing titaniferous magnetite ores hosted by mafic-ultramafic rocks.

It is a matrix matched Certified Reference Material, fit for use as control samples in routine assay laboratory quality control when inserted within runs of samples and measured in parallel to the unknown.

Its purpose is to monitor inter-laboratory or instrument bias and within lab precision. It can be used, indirectly, to establish the traceability of results to an SI system of units.

The recommended concentrations and limits for this material are property values based on a measurement campaign (round robin) and reflect consensus results from the laboratories that participated in the round robin.

Slight variations in analytical procedures between laboratories will reflect as slight biases to the recommended concentrations (see 19). Good laboratories will report results within the two standard deviation levels with a failure rate of <10 %. The material can also be used for method development and for the calibration of equipment.

2. Origin of Material: The Material originates from Mapochs Mine in the Limpopo Province, near the town of Roosenekal
It is taken from a stock pile at the mine, which was mined from the Main Magnetite layer on the Eastern Bushveld Limb.

The Mapochs Mine is located approximately 90km northeast of Middelburg, 75km south of Steelpoort in Limpopo Province, South Africa. In this region, the Main magnetite seam dips westwards at an angle of about 13 degrees, which nearly coincides with the topography in the vicinity of the Mine. At the Mine, magnetite fragments and boulders, often referred to as rubble ore, occur to the east of the seam outcrop. Between the Main seam outcrop and the rubble ore lies weathered pavement ore, which is about 0,75 to 1 m thick. The pavement overburden is of negligible proportions. The Main seam follows the pavement on the dip.[4]

3. Approximate Mineral and Chemical Composition: The Main magnetite seam has a remarkably consistent tenor of 1.6 +- 0.2 per cent vanadium pentoxide. This seam can be traced for hundreds of kilometres round the elliptical rim of the Complex. The highly magnetic titanomagnetite grains from the Main seam consists of closely packed, almost equant grains, with interstitial minor accessory silicates. The titanium in the ore is present mainly as a solid solution in the titanium-rich magnetite phase (ulvospinel, Fe_2TiO_4), and to a lesser degree as ilmenite. The ilmenite is present as individual grains, as elongated intergranular bodies, or as exsolution lamellae arranged parallel to the octahedral planes of the magnetite. The vanadium occurs in the ore as a solid solution within the magnetite-ulvospinel, where V^{3+}has replaced Fe^{3+}. Researchers have suggested that the vanadium is distributed uniformly throughout the magnetite grains excluding the ilmenite lamellae, and does not occur as a separate mineral phase. Where exposed to weathering, the magnetite has been oxidized to vanado-maghemite, $(FeTi)_2O_3)'$ and small concentrations of hematite, without any alteration in the texture of the ore.[4]

4. Appearance: The material is a very fine powder. It is Grayish Red (Corstor 10R 4/3).

5. Handling instructions: The material is packaged in Laboratory Packs and Explorer Packs that must be shaken or otherwise agitated before use. Normal safety precautions for handling fine particulate matter are suggested, such as the use of safety glasses, breathing protection, gloves and a laboratory coat.

6. Method of Preparation: The material was crushed, dry-milled and air-classified to <54um. Wet sieve partic**l**e size analysis of random samples confirmed the material was 98.5% <54um. It was then blended in a bi-conical mixer, systematically divided and then sealed into 1kg Laboratory Packs. Explorer Packs are subdivided from the Laboratory packs as required. Samples were scientifically selected for homogeneity testing and third party analysis. Statistical analysis of both homogeneity and the consensus test results were carried out by independent statisticians.

7. Methods of Analysis requested:

1. Multi element scan to include Fe, Ti, V: Fusion, ICP-OES or ICP-MS
2. Multi element scan: Multi-acid digest, ICP-OES or ICP-MS to include Fe, Ti, V
3. Major oxides (Al_2O_3, CaO, Cr_2O_3, Fe_2O_3, K_2O, MgO, MnO, Na_2O, P_2O_5, SiO_2, TiO_2, V_2O_5) XRF
4. LOI (TGA) – 105°C, 1000°C
5. S – combustion analysis
6. SG, gas pycnometer

8. Information requested

1. State aliquots used for all determinations.
2. All results for major elements to be reported as oxides in percentages.
3. All results for multi-element scans to be reported in ppm.
4. Report all QC data, to include replicates, blanks and certified reference materials used.
5. State and provide brief description of analytical techniques used.
6. Send a PDF and excel of the results.

9. Method of Certification: Eleven laboratories were each given eight scientifically selected packages of sample. Nine laboratories of the eleven laboratories submitted results in time for certification.

Final limits were calculated after first determining if all data was compatible within a spread normally expected for similar analytical methods done by reputable laboratories. Data from any one laboratory was then removed from further calculations when the mean of all analyses from that laboratory failed a “t test” of the global means of the other laboratories. The means and standard deviations were then re-calculated using all remaining data. Any analysis that fell outside of the new two standard deviations was removed from the ensuing data base. The mean and standard deviations were again calculated using the remaining data.

The “between-laboratory” standard deviation is used in the calculation to eliminate technically and statistically invalid data. Upper and lower limits are based on the standard deviation of the remaining data, which reflect individual analyses and can be used to monitor accuracy in routine laboratory quality control. This is different to limits based on standard deviations derived from grouped set of analyses (see 13), which provide important measures for precision and trueness, but which are less useful for routine QC.

Standards with an RSD of near or less than 5 % are termed “Certified”, RSD’s of between near 5 % and 15 % are termed “Provisional”, and RSD’s over 15 % are termed “Informational”.

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10. Participating Laboratories: The 9 laboratories that provided results timeously were (not in same order as in the table of assays):

1. Bureau Veritas Ultratrace Australia
2. Genalysis Laboratory Services Perth
3. SGS Mineral Services Lakefield (Canada)
4. Shiva Analyticals India (Pty) Ltd
5. Metchem Laboratories
6. SGS South Africa
7. Set Point Laboratories (Isando) SA
8. Mintek (South Africa)
9. SGS Vancouver (Canada)

11. Assay Data: Data as received from the laboratories for the important certified elements and informational concentrations listed on p1 and 2 are set out below

Fe	Fe	Fe_2O_3	Ti	Ti	Ti	Ti	V	V	V	V	U	GOI	GOI	S	S	SG
4A_MICP	FUS	FUS	4A_MICP	4A_MICP	FUS	FUS	4A_MICP	4A_MICP	FUS	FUS	4A_MICP			Comb/LECO	Comb/LECO	Pyc
ppm	ppm	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	%	%	%	%	Dimensionless
526000	536000	76.09	7.24	7.5	7.62	7.38	9524	9700	9400	9940	0.2	-0.29	-0.36	0.03	0.03	4.67
531000	535000	76.22	7.28	7.6	7.64	7.34	9409	9500	9350	9980	0.2	-0.3	-0.36	0.03	0.03	4.68
525000	540000	76.13	7.23	7.4	7.67	7.32	9298	9500	9350	9870	0.2	-0.28	-0.35	0.03	0.03	4.68
536000	540000	76.22	7.31	7.6	7.62	7.34	9472	9900	9400	9810	0.2	-0.3	-0.35	0.03	0.03	4.65
527000	540000	76.21	7.27	7.4	7.65	7.52	9239	9300	9450	9760	0.2	-0.32	-0.37	0.03	0.03	4.68
536000	539000	76.05	7.30	7.4	7.65	7.67	9484	9900	9450	10100	0.2	-0.3	-0.41	0.03	0.03	4.65
528000	540000	76.28	7.40	7.6	7.66	7.69	9375	9500	9500	10000	0.2	-0.33	-0.38	0.03	0.03	4.68
536000	540000	76.04	7.38	7.7	7.61	7.78	9474	9500	9450	9770	0.2	-0.28	-0.24	0.03	0.03	4.66
543800	538700	74.50	7.58		7.49	7.78	9290		9229	9761	0.17	-0.43	-0.19	0.03	0.03	4.64
536400	534200	77.50	7.70		7.47	7.59	9230		9197	9766	0.17	-0.45	-0.26	0.03	0.03	4.6
530300	535300	73.50	7.75		7.47	7.92	9360		9179	9986	0.17	-0.4	-0.13	0.03	0.03	4.62
540400	537600	74.60	7.94		7.47	7.78	9360		9169	9832	0.17	-0.38	-0.41	0.03	0.03	4.65
530100	538500	74.20	7.56		7.53	7.77	9190		9318	9927	0.19	-0.46	-0.34	0.04	0.03	4.59
542600	532000	76.30	7.75		7.43		9300		9380	9759	0.18	-0.44	-0.37	0.03	0.03	4.64
540000	537300	74.80	8.00		7.5		9670		9244	9695	0.18	-0.39	-0.22	0.03	0.03	4.6
543400	534900		7.84		7.49		9380		9327	9850	0.18	-0.48		0.04	0.03	4.67
539000	530110		7.40		7.94		9400		9790		0.24	-0.15		0.03		4.68
548000	540230		7.55		7.99		9600		10100		0.21	-0.15		0.03		4.66
536000	537429		7.28		8.02		9600		10100		0.23	-0.2		0.03		4.65
543000	546951		7.06		8.09		9400		10200		0.22	-0.1		0.03		4.66
537000	535564		7.37		8.22		9500		10300		0.27	-0.2		0.03		4.66
548000			7.36		7.52		9400		10200		0.22	-0.5		0.03		4.6
535000			7.22		7.43		9500		10200		0.21	-0.45		0.03		4.64
			7.37		7.43		9400		10300		0.22	-0.38		0.03		4.64

Al_2O_3	Al_2O_3	CaO	CaO	Cr_2O_3	Fe_2O_3	K_2O	MgO	MgO	MnO	Na_2O	P_2O_5	SiO_2	TiO_2	TiO_2	V_2O_5	V_2O_5
XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF
%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
4.17	4.25	0.12	0.13	0.48	76.50	0.01	1.75	1.79	0.24	0.04	0.01	1.91	12.81	13.40	1.68	1.69
4.19	4.25	0.12	0.12	0.48	76.40	0.01	1.73	1.79	0.24	0.02	0.01	1.89	12.81	13.40	1.67	1.70
4.17	4.27	0.12	0.12	0.48	76.50	0.01	1.74	1.80	0.24	0.02	0.01	1.89	12.76	13.40	1.67	1.70
4.19	4.30	0.12	0.13	0.48	76.60	0.01	1.75	1.79	0.24	0.03	0.01	1.90	12.78	13.40	1.67	1.68
4.18	4.30	0.12	0.12	0.48	76.50	0.01	1.73	1.79	0.24	0.02	0.01	1.89	12.76	13.40	1.67	1.71
4.17	4.27	0.13	0.13	0.48	76.60	0.01	1.74	1.79	0.24	0.03	0.01	1.90	12.83	13.40	1.68	1.70
4.18	4.30	0.12	0.13	0.48	76.40	0.01	1.74	1.77	0.24	0.02	0.01	1.89	12.81	13.50	1.68	1.70
4.16	4.23	0.12	0.13	0.48	76.30	0.01	1.74	1.80	0.24	0.02	0.01	1.89	12.83	13.40	1.68	1.78
4.10	4.19	0.11	0.14	0.47	76.70	0.01	1.72		0.24	0.02	0.01	1.90	13.00		1.72	1.76
4.10	4.19	0.11	0.14	0.47	76.80	0.01	1.71		0.24	0.02	0.01	1.90	12.90		1.72	1.76
4.10	4.20	0.11	0.14	0.47	76.70	0.01	1.71		0.24	0.02	0.01	1.90	12.90		1.72	1.77
4.10	4.20	0.11	0.14	0.47	76.60	0.01	1.72		0.24	0.02	0.01	1.90	13.00		1.72	1.76
4.10	4.23	0.11	0.14	0.47	76.80	0.01	1.72		0.24	0.02	0.01	1.90	12.90		1.72	1.76
4.10	4.19	0.11	0.14	0.48	76.80	0.02	1.72		0.24	0.01	0.01	1.90	12.90		1.71	1.78
4.10	4.18	0.11	0.14	0.47	76.60	0.01	1.73		0.24	0.02	0.01	1.90	13.00		1.72	1.77
4.10		0.11	0.14	0.47	76.90		1.73		0.24	0.02		1.90	13.00		1.72	
4.15		0.13		0.48	75.80		1.72		0.23	0.03		1.85	12.84		1.71	
4.14		0.13		0.48	75.90		1.76		0.23	0.05		1.84	12.81		1.70	
4.14		0.13		0.48	76.00		1.73		0.23	0.05		1.85	12.79		1.70	
4.13		0.13		0.47	75.70		1.75		0.23	0.05		1.85	12.81		1.70	
4.15		0.12		0.47	75.90		1.73		0.23	0.03		1.86	12.82		1.70	
4.14		0.13		0.48	75.80		1.73		0.23	0.06		1.85	12.82		1.70	
4.16		0.12		0.48	75.90		1.72		0.23	0.05		1.85	12.82		1.70	
4.15		0.13		0.48	76.00		1.77		0.23			1.86	12.82		1.70	
4.24		0.14		0.46			1.76		0.23			1.86	13.40		1.79	
4.24		0.14		0.47			1.76		0.23			1.83	13.40		1.78	
4.26		0.13		0.47			1.72		0.23			1.85	13.40		1.80	
4.27		0.14		0.46			1.74		0.23			1.85	13.40		1.79	
4.21		0.14		0.46			1.82		0.23			1.85	13.40		1.80	
4.21		0.14		0.46			1.75		0.23			1.82	13.40		1.79	
4.21		0.14		0.46			1.76		0.23			1.83	13.40		1.79	
4.20		0.14		0.46			1.74		0.23			1.83	13.40		1.70	

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12. Measurement of Uncertainty: (*ref Dr Hugh Bartlett, Hugh Bartlett Consulting CC.)*

The samples used in this certification process have been selected in such a way as to represent the entire batch of material and were taken from the final packaged units; therefore all possible sources of uncertainty (sample uncertainty and measurement uncertainty) are included in the final combined standard uncertainty determination.

The uncertainty measurement takes into consideration the between lab and the within lab variances and is calculated from the square roots of the variances of these components using the formula:

Combined standard uncertainty=sqrt((between lab.var/no of labs) + (mean square within lab.var /no of assays))

These uncertainty measurements may be used, by laboratories, as a component for calculating the total uncertainty for method validation according to the relevant ISO guidelines.

Analyte	Method	Unit	S [1]	σL [2]	SW [3]	CSU [4]
Fe	4A_MICP	ppm	7430	7969.591	5289.552	4731.591
Fe	FUS	ppm	3593	988.243	3510.209	955.135
Ti	4A_MICP	%	0.2	0.298	0.125	0.151
Ti	FUS	%	0.29	0.278	0.072	0.125
V	4A_MICP	ppm	174	134.345	145.648	71.938
V	FUS	ppm	379	459.630	109.273	206.278
U	4A_MICP	ppm	0.03	0.041	0.012	0.024
SG	SG	Dimentionless	0.030	0.032	0.023	0.019
S	Comb/LECO	%	0.003	0.002	0.000	0.001
Al_2O_3	XRF	%	0.07	0.066	0.019	0.030
CaO	XRF	%	0.01	0.010	0.004	0.005
Cr_2O_3	XRF	%	0.01	0.010	0.003	0.005
Fe_2O_3	FUS	%	1.9	1.345	0.933	0.981
Fe_2O_3	XRF	%	0.64	0.719	0.104	0.416
MgO	XRF	%	0.031	0.032	0.017	0.015
MnO	XRF	%	0.006	0.008	0.000	0.004
SiO_2	XRF	%	0.031	0.051	0.010	0.029
TiO_2	XRF	%	0.31	0.426	0.036	0.213
V_2O_5	XRF	%	0.05	0.050	0.006	0.021

1. *S - Std Dev for use on control charts.*
2. *σL - Betw Lab Std Dev, for use to calculate a measure of accuracy.*
3. *SW - Within Lab Stc Dev, for use to calculate a measure of precision.*
4. *CSU - Combined Standard Uncertainty, a component for use to calculate the total uncertainty in method validation.*

13. Certified values: The Certified and Informational values listed on p1 and 2 of this certificate fulfill the AMIS statistical criteria regarding agreement for certification and have been independently validated by Allan Fraser.

14. Metrological Traceability: The values quoted herein are based on the consensus values derived from statistical analysis of the data from an inter laboratory measurement program. Traceability to SI units is via the standards used by the individual laboratories the majority of which are accredited and who have maintained measurement traceability during the analytical process.

15. Certification: AMIS0501 is a new material.

16. Period of validity: The certified values are valid for this product, while still sealed in its original packaging, until notification to the contrary. The stability of the material will be subject to continuous testing for the duration of the inventory. Should product stability become an issue, all customers will be notified and notification to that effect will be placed on the www.amis.co.za website.

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17. Minimum sample size: The majority of laboratories reporting used a 0.5g sample size for the ICP and a 30g sample size for the fire assay. These are the recommended minimum sample sizes for the use of this material.

18. Availability: This product is available in Laboratory Packs containing 1kg of material and Explorer Packs containing custom weights (from 50 to 250g) of material. The Laboratory Packs are sealed bottles delivered in sealed foil pouches. The Explorer Packs contain material in standard geochem envelopes, nitrogen flushed and vacuum sealed in foil pouches.

19. Recommended use: The data used to characterize this CRM has been scrutinized using outlier treatment techniques. This, together with the number of participating laboratories, should overcome any "inter-laboratory issues" and should lead to a very accurate measure for the given methods, notwithstanding the underlying assumption that what the good inter-laboratory labs reported was accurate. However an amount of bad data might have had an effect, resulting in limits which in some situations might be too broad for the effective monitoring of a single analytical method, laboratory or production process. Users should set their own limits based on their own data quality objectives and control measurements, after determining the performance characteristics of their own particular method, using a minimum of 20 analyses using this CRM. User set limits should normally be within the limits recommended on p1 and 2 of this certificate.

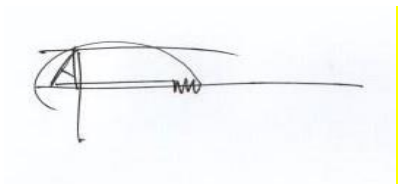
20. Legal Notice: This certificate and the reference material described in it have been prepared with due care and attention. However AMIS, a division of Torre Analytical Services (Pty) Ltd, Thivhafuni Matodzi and Allan Fraser; accept no liability for any decisions or actions taken following the use of the reference material.

03 January 2017

Certifying Officers:

African Mineral Standards: _____

Thivhafuni Matodzi



Geochemist:_____

Allan Fraser
M.Sc. (Geology), N.D. (Analytical Chem.), Pr.Sci.Nat.

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Appendix – uncertified element statistics

Element	Gen Method	N	Std Mean	SD	RSD_%	Unit
Ag	4A_MICP	4	0.125	0.050	40.000	ppm
Ag	FUS	8	28.125	1.356	4.822	ppm
Al	4A_MICP	40	21407.506	830.158	3.878	ppm
Al	FUS	30	22493.333	550.193	2.446	ppm
Al	XRF	7	2680.000	407.349	15.200	ppm
Al2O3	FUS	16	4.186	0.156	3.720	%
As	4A_MICP	4	1.000	<0.0001	<0.0001	ppm
As	FUS	8	14.250	0.707	4.962	ppm
B	FUS	4	20.000	<0.0001	<0.0001	ppm
Ba	4A_MICP	31	11.228	4.543	40.456	ppm
Ba	FUS	18	26.722	7.999	29.932	ppm
Ba	XRF	7	9.071	5.109	56.317	ppm
Bi	4A_MICP	16	0.147	0.090	61.539	ppm
Bi	XRF	6	8.633	1.990	23.046	ppm
Br	XRF	2	1.200	0.141	11.785	ppm
Ca	4A_MICP	46	942.102	85.670	9.094	ppm
Ca	FUS	8	1375.000	517.549	37.640	ppm
Ca	XRF	7	360.000	18.257	5.072	ppm
CaO	FUS	7	0.121	0.016	12.959	%
Cd	4A_MICP	22	4.426	5.879	132.831	ppm
Cd	FUS	8	0.400	<0.0001	<0.0001	ppm
Cd	XRF	2	1.100	0.141	12.856	ppm
Ce	4A_MICP	16	2.043	0.132	6.463	ppm
Ce	FUS	8	3.150	0.177	5.628	ppm
Cl	XRF	8	46.225	9.283	20.083	ppm
Co	4A_MICP	46	210.844	38.641	18.327	ppm
Co	FUS	24	189.958	31.722	16.700	ppm
Co	XRF	7	24.229	2.163	8.928	ppm
Cr	4A_MICP	30	2799.467	211.100	7.541	ppm
Cr	FUS	40	3292.950	201.992	6.134	ppm
Cr	XRF	7	1131.143	43.434	3.840	ppm
Cr2O3	FUS	16	0.510	0.045	8.797	%
Cs	4A_MICP	8	0.083	0.013	15.536	ppm
Cs	FUS	7	0.300	<0.0001	<0.0001	ppm
Cu	4A_MICP	49	134.581	58.668	43.593	ppm
Cu	FUS	31	120.774	12.777	10.579	ppm
Cu	XRF	7	60.971	3.853	6.319	ppm
Dy	4A_MICP	16	0.149	0.056	37.940	ppm
Dy	FUS	8	0.256	0.018	7.207	ppm
Er	4A_MICP	16	0.095	0.031	32.387	ppm
Er	FUS	8	0.094	0.009	9.772	ppm
Eu	4A_MICP	8	0.050	<0.0001	<0.0001	ppm
Eu	FUS	8	0.078	0.019	24.627	ppm
Fe	Titration	8	555862.500	3767.507	0.678	ppm
Fe	XRF	16	383162.500	160932.205	42.001	ppm
Ga	4A_MICP	24	49.454	3.517	7.112	ppm
Ga	FUS	8	46.250	0.707	1.529	ppm
Ga	XRF	7	22.457	1.986	8.842	ppm
Gd	4A_MICP	8	0.095	0.011	11.253	ppm
Gd	FUS	8	0.325	0.054	16.529	ppm
Ge	4A_MICP	15	0.300	<0.0001	<0.0001	ppm
Ge	FUS	8	2.000	<0.0001	<0.0001	ppm
Hf	4A_MICP	24	0.842	0.221	26.220	ppm
Hf	FUS	8	3.750	0.463	12.344	ppm
Ho	4A_MICP	8	0.040	<0.0001	<0.0001	ppm
Ho	FUS	2	0.060	<0.0001	<0.0001	ppm
In	4A_MICP	23	0.107	0.019	17.477	ppm
In	FUS	8	0.425	0.046	10.892	ppm
In	XRF	8	6.425	0.599	9.329	ppm
K	4A_MICP	24	154.746	113.178	73.138	ppm
K	FUS	6	683.333	147.196	21.541	ppm
K	XRF	8	93.750	30.677	32.722	ppm
La	4A_MICP	16	0.906	0.191	21.117	ppm
La	FUS	8	5.150	0.787	15.289	ppm
Li	4A_MICP	23	1.683	0.289	17.155	ppm
Lu	4A_MICP	7	0.020	<0.0001	<0.0001	ppm
Lu	FUS	8	0.674	0.035	5.259	ppm
Mg	4A_MICP	40	10669.860	413.963	3.880	ppm
Mg	FUS	32	10450.000	361.895	3.463	ppm
MgO	FUS	16	1.857	0.140	7.528	%

Element	Gen Method	N	Std Mean	SD	RSD_%	Unit
Mn	4A_MICP	38	1796.575	291.282	16.213	ppm
Mn	FUS	23	1806.000	46.649	2.583	ppm
Mn	XRF	7	657.500	29.417	4.474	ppm
MnO	FUS	16	0.244	0.021	8.522	%
Mo	4A_MICP	16	2.271	1.656	72.929	ppm
Mo	FUS	3	14.667	6.351	43.301	ppm
Mo	XRF	8	4.363	0.980	22.457	ppm
Na	4A_MICP	48	285.079	69.798	24.484	ppm
Nb	4A_MICP	24	2.021	0.953	47.148	ppm
Nb	FUS	8	5.375	0.518	9.629	ppm
Nb	XRF	8	2.663	1.187	44.573	ppm
Nd	4A_MICP	16	0.625	0.222	35.538	ppm
Nd	FUS	8	1.063	0.074	7.003	ppm
Ni	4A_MICP	48	599.691	48.684	8.118	ppm
Ni	FUS	32	626.875	55.085	8.787	ppm
Ni	XRF	7	218.571	8.933	4.087	ppm
P	XRF	8	10.000	<0.0001	<0.0001	ppm
Pb	4A_MICP	23	2.891	1.832	63.363	ppm
Pb	XRF	7	5.771	2.205	38.207	ppm
Pr	4A_MICP	16	0.166	0.047	28.145	ppm
Pr	FUS	8	0.423	0.023	5.478	ppm
Rb	4A_MICP	24	0.783	0.244	31.194	ppm
Rb	FUS	8	1.638	0.177	10.796	ppm
Rb	XRF	8	9.000	1.763	19.590	ppm
S	4A_MICP	32	0.023	0.007	29.697	%
S	Combustion/LECO	52	0.032	0.004	10.978	%
S	XRF	16	0.021	0.007	33.748	%
Sb	4A_MICP	16	0.177	0.065	36.682	ppm
Sc	4A_MICP	21	26.519	1.015	3.828	ppm
Sc	FUS	16	37.063	11.138	30.053	ppm
Se	XRF	2	2.100	0.283	13.469	ppm
Si	4A_MICP	8	0.808	0.036	4.477	%
Si	FUS	14	0.900	<0.0001	<0.0001	%
Si	XRF	7	0.499	0.040	8.090	%
SiO2	FUS	8	2.096	0.043	2.047	%
Sm	4A_MICP	14	0.161	0.056	34.898	ppm
Sm	FUS	8	0.325	0.046	14.243	ppm
Sn	4A_MICP	16	1.856	0.470	25.342	ppm
Sn	FUS	16	847.813	870.357	102.659	ppm
Sr	4A_MICP	32	5.325	0.545	10.229	ppm
Sr	FUS	8	17.375	1.408	8.103	ppm
Sr	XRF	6	18.633	17.895	96.038	ppm
Ta	4A_MICP	16	0.538	0.352	65.495	ppm
Ta	FUS	8	1.938	0.052	2.671	ppm
Tb	4A_MICP	8	0.028	0.010	37.640	ppm
Tb	FUS	5	0.058	0.008	14.425	ppm
Te	4A_MICP	8	0.506	0.185	36.483	ppm
Th	4A_MICP	23	0.284	0.241	84.622	ppm
Th	FUS	8	1.250	0.107	8.552	ppm
Ti	XRF	7	2.842	0.119	4.187	%
TiO2	FUS	15	12.771	0.305	2.386	%
Tl	4A_MICP	2	0.025	0.007	28.284	ppm
Tm	FUS	6	0.050	<0.0001	<0.0001	ppm
U	FUS	8	0.585	0.040	6.898	ppm
V	XRF	7	3725.571	159.110	4.271	ppm
V2O5	FUS	16	1.715	0.053	3.064	%
V2O5	Titration	8	0.215	0.009	4.366	%
W	4A_MICP	16	0.444	0.256	57.582	ppm
W	FUS	7	3.000	<0.0001	<0.0001	ppm
W	XRF	6	5.817	1.770	30.434	ppm
Y	4A_MICP	24	0.608	0.296	48.696	ppm
Y	FUS	16	8.825	8.677	98.324	ppm
Y	XRF	7	3.400	3.325	97.784	ppm
Yb	4A_MICP	7	0.100	<0.0001	<0.0001	ppm
Yb	FUS	7	0.200	<0.0001	<0.0001	ppm
Zn	4A_MICP	36	345.920	165.908	47.961	ppm
Zn	FUS	16	316.563	20.636	6.519	ppm
Zn	XRF	7	136.900	11.657	8.515	ppm
Zr	4A_MICP	32	21.270	6.424	30.202	ppm
Zr	XRF	8	14.588	1.679	11.509	ppm

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