



Reference Material Data Sheet

IAG OU-10 Longmyndian Greywacke

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Description of the reference material

IAG OU-10 Longmyndian Greywacke was collected from Bayston Hill quarry, Shrewsbury, Shropshire. This material was employed as the test material for Round 24 of the GeoPT proficiency testing programme. The Proficiency Testing Committee for this round was Prof M. Thompson (Statistician), Dr P.C. Webb (Results coordinator), Prof P.J. Potts and Mr J. S. Watson. The material was tested for homogeneity by WDXRF at The Open University, Milton Keynes, UK by WDXRF for a range of major and trace elements and the data tested for consequential degree of homogeneity according to the Fearn test. In none of the cases for which valid data were obtained was any significant lack of homogeneity found, therefore the sample was considered suitable for use in the GeoPT proficiency testing programme.

Intended use

This reference material is designed for use by laboratories undertaking the major and trace element concentration analysis of silicate rocks and equivalent matrices for the calibration of a measurement system, the assessment of a measurement procedure, assigning values to other materials, and quality control. Note that the material may be used only for a single purpose in the same measurement process. For example, it must not be used for calibration and method validation at the same time.

Minimum sample size

Homogeneity for the purposes of proficiency testing was established by WDXRF analysis. On this basis and taking account of the distribution of data reported from a range of measurement techniques submitted to the GeoPT24 round, the minimum sample size is recommended to be 0.2 g.

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Reference values							
<i>Assigned value elemental/oxide mass concentration fractions and uncertainties from the GeoPT24 report, reworked where necessary, on a dried (105 °C) basis</i>							
Oxide / element	Reference value g 100 g ⁻¹	Uncertainty g 100 g ⁻¹	n	Element	Reference value mg kg ⁻¹	Uncertainty mg kg ⁻¹	n
SiO₂	73.12	0.12	67	Ho	0.75	0.02	39
TiO₂	0.534	0.005	71	La	18.8	0.4	54
Al₂O₃	10.97	0.05	70	Li	26.5	1.3	29
Fe₂O₃T	4.92	0.03	73	Lu	0.34	0.01	40
MnO	0.120	0.001	70	Nb	7.56	0.30	51
MgO	1.77	0.02	69	Nd	18.8	0.4	49
CaO	2.34	0.01	72	Ni	17.7	0.5	59
Na₂O	2.43	0.02	68	Pb	27.0	0.9	57
K₂O	1.28	0.01	69	Pr	4.71	0.12	40
P₂O₅	0.090	0.002	65	Rb	36.0	0.6	57
	mg kg ⁻¹	mg kg ⁻¹		Sc	11.3	0.4	44
Ba	312	6	61	Sm	3.91	0.08	43
Be	1.17	0.09	28	Sr	175	3	62
Cd	2.85	0.16	35	Ta	0.57	0.02	32
Ce	38.0	0.9	51	Tb	0.61	0.02	41
Co	12.0	0.3	54	Th	5.04	0.21	50
Cr	34.0	1.2	60	Tl	0.22	0.03	16
Cs	1.68	0.03	39	Tm	0.33	0.02	34
Cu	22.4	1.0	61	U	1.09	0.03	44
Dy	3.65	0.09	42	V	77.5	1.4	56
Er	2.21	0.05	40	Y	20.6	0.6	57
Eu	1.00	0.03	40	Yb	2.18	0.06	43
Ga	12.0	0.4	50	Zn	54.1	1.2	63
Gd	3.73	0.11	39	Zr	123	3	60
Hf	3.25	0.17	39				

Reference values are the GeoPT assigned values assessed from the robust statistical analysis of results submitted to the GeoPT34 round, following an assessment of both the consistency of data distribution and the agreement between methods, where possible.

Uncertainties are the robust standard deviation of the mean or median of the assigned value expanded by a coverage factor of two, and rounded up.

Both reference values and uncertainties are based on a reworking of the original GeoPT data set using more recent methods of data assessment and small differences arise in some cases when compared with values listed in the original report.

n is the number of laboratories reporting results for that element/oxide in the GeoPT34 round.

Fe₂O₃T is the total iron expressed as Fe₂O₃

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Information values						
Oxide / element	Value	Uncertainty		Element	Value	Uncertainty
	g 100 g ⁻¹	g 100 g ⁻¹			mg kg ⁻¹	mg kg ⁻¹
LOI	2.20	0.03		Mo	0.92	0.05
	mg kg ⁻¹	mg kg ⁻¹		Sb	0.28	0.03
As	1.91	0.32		Sn	1.12	0.06
Bi	0.09	0.02		W	0.39	0.10
Ge	1.31	0.19				

Information values are 'provisional' data from the relevant GeoPT report with additional 'information' values for elements that gave a reasonably cohesive data distribution. In both cases, data distributions were judged not to be good enough to meet the criteria for designation as assigned values. These data are provided for information purposes only and **not** for the calibration of methods or the assessment of data.

Uncertainties are the robust standard deviation of the mean or median expanded by a coverage factor of two, and rounded up. Uncertainties for modes were derived from a bootstrap approach.

LOI is the loss on ignition.

Period of validity

Provided the storage and handling conditions are met, this reference material is not expected to deteriorate with time. On exposure to air, the material may absorb moisture, and instructions for handling must be followed.

Storage information

Store in a sealed container in a cool dry environment.

Instructions for handling

Before any measurements are made, every portion of the test sample must be dried at 105 ± 5 °C for at least 2 hours. Avoid contamination and cross contamination of the test material.

Assessment of reference values

The reference values were determined as a 'consensus', based on the statistical location of the participants' results to the GeoPT24 round. This location was determined as a robust mean if the distribution of results was unimodal and, outliers aside, close to symmetrical. If a slight asymmetry was apparent in a unimodal distribution, the median was chosen as an alternative. If a noteworthy skew was apparent and an objective explanation for the outcome was forthcoming, the mode of the results might be used. In other circumstances, notably when the number of valid results contributing to the location was less than 15 or their dispersion was unusually great, no reference value was assigned, although values may be reported as information values. These judgements were made by the IAG Proficiency Testing Steering Committee.

Metrological traceability

Traceability was not formally demonstrated for this reference material. However, traceability could be demonstrated by the use by laboratories participating in this round by the use of certified reference materials as calibrators or for performance assessment (although this information is not currently recorded by the GeoPT programme). Furthermore, traceability is implied by the overall agreement between datasets for individual elements/oxides submitted by laboratories that contributed to the GeoPT programme.

Reference to reference material characterisation report

Full details of the measurement methods used, the results, their statistical analysis and assessment, on which the property values listed in this certificate are based, can be found in the GeoPT24 report. This report can be freely downloaded for personal use from the International Association of Geoanalysts web site (<http://www.geoanalyst.org/index.php>).

Safety information

Silicate rock powders can cause harm especially if ingested or in contact with the skin. User organisations must undertake a health and safety risk assessment and ensure that the appropriate procedures are followed in the handling and use of this material. Further details are available on the relevant Material Safety Data Sheet.

Legal notice – Terms and conditions

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Revisions

This Reference Material Data Sheet is version number 1.00. Any revisions to this reference material data sheet will be made available on the IAGeo Ltd web site (www.iageo.com).

Acknowledgements

The contribution of Pete Webb in undertaking a revised assessment of the original GeoPT results is gratefully acknowledged.

Approvals

This reference material information sheet was approved by the Reference Material and Certification Committee of the International Association of Geoanalysts.

Name Philip J. Potts **Position:** Chair of the IAG Certification and Reference Material Committee **Date:** 21st December 2015