



Reference Material Data Sheet

IAG DBC-1 Ball Clay

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Description of the reference material

The ball clay test material, DBC-1, was produced by Sibelco Europe under the direction of Bartek Prusisz and Kevin Young. The test material was evaluated for homogeneity by XRF analysis at the Open University and as a result, the material was considered suitable for use as a proficiency testing sample. The material was characterised as a reference material using the GeoPT33/2013 round of the International Association of Geoanalysts' GeoPT proficiency testing scheme. The Proficiency Testing Steering Committee for this round was Prof. M. Thompson (statistician), Dr P.C. Webb (results coordinator), Prof. P.J. Potts, Bartek Prusisz and Kevin Young.

Intended use

This reference material is designed for use by laboratories undertaking the determination of the major and trace element mass concentration fractions of sediments and silicate materials 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

On the basis of the homogeneity results and an assessment of the methods used to contribute results to the GeoPT33 round, the minimum sample size recommended for use as a test portion is 0.2 g.

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.

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Reference values							
<i>Assigned value elemental/oxide concentrations and uncertainties from the GeoPT33 report 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
SiO ₂	51.98	0.14	75	Lu	0.430	0.022	46
TiO ₂	1.123	0.009	81	Mo	2.5	0.1	43
Al ₂ O ₃	31.82	0.12	80	Nb	25.8	0.6	60
Fe ₂ O ₃ T	0.94	0.01	81	Nd	51.7	1.0	61
MgO	0.36	0.01	75	Ni	24.0	0.7	76
K ₂ O	2.64	0.02	79	Pb	53.5	1.3	73
P ₂ O ₅	0.071	0.002	76	Pr	14.2	0.4	50
	mg kg ⁻¹	mg kg ⁻¹		Rb	194	3	66
Ba	476	10	76	Sc	17.3	0.7	56
Be	3.88	0.16	39	Sm	9.53	0.23	57
Ce	120	3	63	Sr	134	2	75
Cr	105	4	73	Ta	2.63	0.17	41
Cs	64.0	1.4	51	Tb	1.01	0.04	49
Dy	5.52	0.20	51	Th	18.3	0.8	62
Eu	1.77	0.06	49	Tl	1.35	0.08	35
Ga	53.3	1.3	60	Tm	0.411	0.023	40
Gd	7.23	0.31	48	U	6.18	0.18	61
Hf	5.0	0.3	47	V	138	3	75
Ho	0.97	0.06	48	Y	26.4	1.1	70
La	64.4	1.7	67	Yb	2.91	0.09	52
Li	135	4	39	Zr	183	4	67

Reference values are the GeoPT assigned values assessed from the robust statistical analysis of results submitted to the GeoPT33 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.

n is the number of laboratories reporting results for that element/oxide in the GeoPT33 round.

Fe₂O₃T is the total iron expressed as Fe₂O₃.

Assessment of reference values

The reference values were determined as a 'consensus', based on the statistical location of the participants' results to the GeoPT33 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.

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Information values

Oxide / element	Value g 100 g ⁻¹	Uncertainty g 100 g ⁻¹	n	Element	Value mg kg ⁻¹	Uncertainty mg kg ⁻¹	n
CaO	0.20	0.01	76	Er	2.8	0.2	48
Na ₂ O	0.39	0.02	75	Ge	3.0	0.3	25
LOI	10.1	0.2	69	Hg	0.71	0.03	13
	mg kg ⁻¹	mg kg ⁻¹		Sb	2.8	0.3	31
As	9.0	0.7	41	Se	3.0	0.5	18
Bi	2.0	0.1	28	Sn	24.4	1.3	41
C(tot)	6700	300	14	W	16.1	1.0	39
Co	2.1	0.1	63	Zn	21.0	1.3	76
Cu	21.4	0.5	77				

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 reference 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.

n is the number of laboratories reporting results for that element/oxide in the GeoPT33 round.

LOI is the loss on ignition.

C(tot) is the total carbon

Metrological traceability

Traceability was not formally demonstrated for this reference material. However, traceability could be demonstrated by the 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 material characterisation report

Further details of the procedures used, the results, their statistical analysis and assessment, on which the property values listed in this certificate are based, can be found in the GeoPT33 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 powders containing heavy metals can cause harm especially if inhaled 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.

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Revisions

This Reference Material Data Sheet is revision 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

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Approvals

This reference material information sheet was approved on behalf of 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

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