Reference Material Data Sheet

OPC-1 Ordinary Portland Cement

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Description of the reference material

OPC-1, an ordinary Portland cement, was produced by PPC Cement, Republic of South Africa under the direction of Dr M. Loubser. This material was employed as the test material for Round 26 of the GeoPT proficiency testing programme. The Proficiency Testing Steering Committee for this round was Prof. M. Thompson (statistician), Dr P.C. Webb (results coordinator), Prof. P.J. Potts and Dr M. Loubser. The material was tested for homogeneity by WDXRF at The Open University, Milton Keynes, UK and was considered to be suitable for use in the GeoPT proficiency testing programme.

Intended use

This reference material is designed for use by laboratories undertaking the determination of the mass fractions of major and trace elements in cement 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

On the basis of the homogeneity results and an assessment of the methods used to contribute results to the relevant GeoPT 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

This material should be considered to be extremely hygroscopic. 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

Assigned value elemental/oxide mass concentration fractions and uncertainties from the GeoPT26 report on a dried (105 °C) basis

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	21.85	0.11	68		Ho	0.55	0.02	34
TiO_2	0.318	0.005	74		La	25.9	0.8	54
Al_2O_3	4.55	0.05	71		Lu	0.200	0.004	34
Fe_2O_3T	3.19	0.03	74		Nb	4.9	0.3	51
MnO	0.404	0.006	72		Nd	24.7	0.6	49
MgO	2.58	0.03	71		Pr	6.2	0.2	36
CaO	62.9	0.3	73		Rb	14.7	0.6	59
K_2O	0.34	0.01	73		Sb	0.26	0.03	20
	mg kg^{-1}	mg kg^{-1}			Sm	4.5	0.2	40
Ba	512	13	68		Sr	118.2	2.1	66
Ce	48.9	1.2	55		Ta	0.35	0.04	30
Co	21.4	0.7	55		Tb	0.52	0.02	32
Cs	1.00	0.04	32		Th	3.93	0.13	49
Dy	2.87	0.07	34		Tm	0.21	0.01	29
Er	1.52	0.03	32		U	0.83	0.03	39
Eu	1.00	0.03	36		Y	15.5	0.6	58
Ga	7.0	0.3	45		Yb	1.34	0.03	39
Gd	3.75	0.10	35		Zr	81.2	2.4	62
Hf	2.12	0.08	35					

Reference values *are the GeoPT assigned values assessed from the robust statistical analysis of results submitted to the GeoPT26 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 on 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 GeoPT26 round.*

Fe_2O_3T *is the total iron expressed as Fe_2O_3*

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Information values

Oxide / element	Value g 100 g^{-1}	Uncertainty g 100 g^{-1}		Element	Value mg kg^{-1}	Uncertainty mg kg^{-1}
Na_2O	0.11	0.01		Pb	7	1
P_2O_5	0.044	0.002		S	10000	1200
CO_2	0.49	0.04		Sc	5.6	0.7
LOI	1.2	0.1		Sn	1.1	0.2
	mg kg^{-1}	mg kg^{-1}		Ta	0.35	0.04
As	4.6	0.4		Tl	0.03	0.01
Be	0.8	0.1		V	64	3
Cu	24	2		W	0.6	0.1
Li	13	2		Zn	28	2
Ni	87	4				

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 not judged 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, where quoted, *are the robust standard deviation of the mean, median or mode expanded by a coverage factor of two, and rounded up.*

H_2O^+ *is structural water.*

CO_2 *is the total carbon content expressed as CO_2.*

LOI *is the loss on ignition.*

Assessment of reference values

The reference values were determined as a 'consensus', based on the statistical location of the participants' results. 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 through laboratories participating in this round using certified reference materials as calibrators or for data assessment (although this information is not currently recorded by the GeoPT programme) and is implied by the overall agreement between datasets for individual elements/oxides submitted to the programme.

Reference to 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 GeoPT26 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

Cement 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.

Legal notice – terms and conditions

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Revisions

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

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 Reference Material and Certification Committee* **Date** **9th April 2015**