



Reference Material Data Sheet

SdAR-H1 Metalliferous sediment

International Association of Geoanalysts

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Description of the reference material

SdAR-H1 is a blended material produced by the US Geological Survey under the direction of Dr Stephen Wilson and designed to resemble sediment sampled when monitoring high levels of environmental contamination associated with discharges from mining operations. The material was characterised for use as a reference material through the GeoPT35a 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 and Dr S.A. Wilson. The material was tested for homogeneity by the US Geological Survey Laboratories and at The Open University and results indicated it was suitable for use in the GeoPT proficiency testing programme.

Intended use

This reference material is designed for use by laboratories undertaking environmental monitoring of the major and trace element mass concentration fractions of sediments 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 GeoPT35a 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 $105 \pm 5^\circ\text{C}$ for at least 2 hours. Avoid contamination and cross-contamination of the test material.

SdAR-H1 – Metalliferous sediment

Reference values

Assigned value elemental/oxide mass concentration fractions and uncertainties from the GeoPT35a report on a dried (105 °C) basis

Oxide / element	Reference value g 100g ⁻¹	Uncertainty g 100g ⁻¹	n	Element	Reference value mg kg ⁻¹	Uncertainty mg kg ⁻¹	n
SiO₂	65.45	0.18	71	La	44.9	1.0	60
TiO₂	0.560	0.004	79	Li	50.5	2.5	37
Al₂O₃	11.83	0.07	76	Lu	0.398	0.012	40
Fe₂O₃T	6.45	0.04	79	Mo	64	3	60
MnO	0.515	0.005	79	Nb	21.9	0.9	60
MgO	1.53	0.02	77	Nd	36.2	1.0	55
CaO	1.46	0.01	78	Ni	230	5	75
K₂O	4.17	0.03	77	Pb	3890	80	75
P₂O₅	0.185	0.003	72	Pr	9.97	0.23	44
	mg kg ⁻¹	mg kg ⁻¹		Rb	152.3	2.3	68
Ba	866	12	74	Sm	6.39	0.17	47
Ce	89.3	2.1	61	Sr	182.2	2.9	76
Co	55.6	1.4	65	Ta	1.41	0.08	34
Cs	4.78	0.24	40	Tb	0.78	0.03	41
Cu	1159	16	76	Th	17.7	1.0	56
Dy	4.41	0.10	41	Tl	11.1	0.5	40
Er	2.60	0.08	42	Tm	0.394	0.013	39
Eu	1.25	0.04	43	U	4.07	0.19	53
Ga	15.6	0.7	52	V	73.2	1.7	72
Gd	5.35	0.17	41	Yb	2.60	0.09	45
Ho	0.900	0.025	41	Zn	3680	60	78

Reference values are the GeoPT assigned values assessed from the robust statistical analysis of results submitted to the GeoPT35a 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 GeoPT35a 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. 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. To provide additional composition data, indicative values are listed for a limited number of elements where the GeoPT data distribution failed to identify a clear consensus. Consequently, these data are listed without uncertainties. These judgements were made by the IAG Proficiency Testing Steering Committee.

SdAR-H1 – Metalliferous sediment					
Information values					
Oxide / element	Value g 100g ⁻¹	Uncertainty g 100g ⁻¹	Element	Value mg kg ⁻¹	Uncertainty mg kg ⁻¹
Na₂O	1.1	0.1	Hg	7	1
<i>LOI</i>	5*	–	In	9.5	0.5
	mg kg ⁻¹	mg kg ⁻¹	S	4600	330
Ag	76	6	Sb	530	50
As	390	26	Sc	8.2	0.3
Be	22	2	Se	15	3
Bi	5.1	0.4	Sn	2.9	0.6
C_{tot}	9000	400	Te	9.5	1.0
Cd	25	1	W	13*	–
Cr	225	20	Y	25.4	1.5
Ge	2*	–	Zr	258	6
Hf	6.9	0.8			

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.

Indicative values are listed in italics and marked with an asterisk (*). These values are provided for guidance in recognition of the fact that the source GeoPT data set for these measurands did not provide a clear consensus.

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

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 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 GeoPT35a report (<http://www.geoanalyst.org/index.php/proficiency-testing-proficiency-testing>).

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.

Material mineralogy

The mineralogical composition of this material determined by XRD at the US Geological Survey is as follows:

SdAR-H1 – XRD Results			
Mineral	Normalised Conc'n %	Mineral	Normalised Conc'n %
Quartz	39.7	Pyrite	0.3
K-feldspar	20.2	Sphalerite	0.3
Plagioclase		Total non-clay	74.2
–albite	5.7	Clays	
–bytownite	0.8	Kaolinite (disordered)	1.4
–anorthite	3.6	Illite	20.7
Calcite	1.1	Muscovite	3.6
Siderite	0.9	Total clays	25.8
Amphibole	1.5	TOTAL	100

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Revisions

This data sheet is Version 2.00. Following a further evaluation of the original data set, minor revisions have been made to some information values, together with the addition of indicative values in the Information Value Table. Reference values are unchanged from the original data sheet. Any further revisions to this reference material data sheet will be made available on the IAGeo Ltd web site (www.iageo.com).

Acknowledgements

The contribution of Stephen Wilson (USGS) in preparing and supplying the sample is gratefully acknowledged.

Approvals

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

Name Phil Potts **Position** On behalf of the IAG Reference Material and Certification Committee **Date** 3rd April 2019
Peter Webb

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