National Institute of Standards and Technology
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Standard Reference Material® 1936
Great Lakes Sediment
CERTIFICATE OF ANALYSIS

Purpose: The certified values delivered by this Standard Reference Material (SRM) are intended for use in validating calibration and validation materials for sediment analysis methods. The non-certified values delivered by the SRM are intended for use in harmonizing measurements of other measurands.

Description: A unit of SRM 1936 consists of 50 g of radiation-sterilized, dried sediment in amber glass bottle.

Certified Values: A NIST certified value is a value for which NIST has the highest confidence in that all known or suspected sources of bias and imprecision have been accounted [1]. Certified values for selected PAHs are provided in Table 1. These certified values are metrologically traceable to the International System of Units (SI) through the purity evaluations and gravimetric procedures used to prepare the calibration solutions used in assigning these values.

Table 1: Certified Values for Selected PAHs in SRM 1936 (Dry-Mass Basis)

Analyte	Mass Fraction (ng/g) [(a)]
3-methylphenanthrene	154 ± 8
Benzo[*b*]fluoranthene	2100 ± 170
Benzo[*ghi*]perylene	1690 ± 90
Pyrene	3590 ± 390

[(a)] Values are expressed as $x \pm U_{95\%}(x)$, where x is the certified value and $U_{95\%}(x)$ is the expanded uncertainty of the certified value. The true value of the analyte lies within the interval $x \pm U_{95\%}(x)$ with 95 % confidence. For guidance on using and propagating this uncertainty, see reference 2.

Non-Certified Values: Non-certified values for a variety of measurands are provided in Appendix A.

Period of Validity: The certification of **SRM 1936** is valid, within the measurement uncertainty specified, until **31 January 2032.**The certified values are nullified if the SRM is stored or used improperly, damaged, contaminated, or otherwise modified.

Maintenance of Certified Values: NIST will monitor this SRM to the end of the period of validity. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

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Safety: SRM 1936 IS INTENDED FOR RESEARCH USE. This material is naturally occurring lake sediment from an urban area and may contain constituents of unknown toxicities; therefore, caution should be exercised during its handling and use.

Storage: SRM 1936 must be stored in its original bottle at temperatures less than 30 °C and away from direct sunlight.

Use: Prior to removal of subsamples for analysis, the contents of the bottle should be mixed. The mass fractions of constituents in SRM 1936 are reported on a dry-mass basis. The SRM, as received, contains a mass fraction of approximately 1.6 % moisture (see "Conversion to Dry-Mass Basis"). The sediment sample should be dried to a constant mass before weighing for analysis; or a separate subsample of the sediment should be removed from the bottle at the time of analysis and dried to determine the mass fraction of a dry-mass basis. If the constituents of interest are volatile, then the moisture must be determined with a separate subsample.

Conversion to Dry-Mass Basis: The results for the constituents in SRM 1936 are reported on a dry-mass basis; however, the material "as-received" contains residual moisture. The moisture content in SRM 1936 at the time of the certification analysis was 1.64 % ± 0.056 % (95 % confidence level). Analytical results for the organic constituents were determined on an as-received basis and then converted to a dry-mass basis by dividing using the conversion factor of 0.9836 (gram dry-mass per gram as-received mass).

Source: Sediment material was collected in 2016 from three sites in Milwaukee Bay. The sediment was collected using a Ponar grab sampling device. A total of approximately 482 kg of wet sediment was collected from the site. The sediment was dried, sieved, homogenized in a cone blender, radiation sterilized, and then packaged in screw-capped amber glass bottles each containing approximately 50 g.

Analysis: Measurements used to certify SRM 1936 values were performed at NIST using a variety of analytical techniques and by participants of interlaboratory comparison studies [3].

Additional Information: Full details on the production and evaluation of SRM 1936 are provided free of charge in reference 3.

REFERENCES

[1] Beauchamp, C.R.; Camara, J.E.; Carney, J.; Choquette, S.J.; Cole, K.D.; DeRose, P.C.; Duewer, D.L.; Epstein, M.S.; Kline, M.C.; Lippa, K.A.; Lucon, E.; Molloy, J.; Nelson, M.A.; Phinney, K.W.; Polakoski, M.; Possolo, A.; Sander, L.C.; Schiel, J.E.; Sharpless, K.E.; Toman, B.; Winchester, M.R.; Windover, D.; *Metrological Tools for the Reference Materials and Reference Instruments of the NIST Material Measurement Laboratory*; NIST Special Publication (NIST SP) 260-136, 2021 edition; U.S. Government Printing Office: Washington, DC (2021); available at https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.260-136-2021.pdf (accessed Nov 2021).

[2] Possolo, A.M.; *Evaluating, Expressing, and Propagating Measurement Uncertainty for NIST Reference Materials*; NIST SP 260-202; U.S. Government Printing Office: Washington, DC (2020); available at https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.260-202.pdf (accessed Nov 2021).

[3] Bangma, J.T.; Ellisor, D.; Ellisor, M.B.; Heckert, N.A.; Hoguet, J.; Huncik, K.; Ness, J.; Reiner, J.L.; *Certification of Standard Reference Material® 1936 Great Lakes Sediment*; NIST SP 260-215 (2021); available at https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.260-215.pdf. (accessed Nov 2021).

If you use this SRM in published work, please reference:

Bangma JT, Ellisor D, Ellisor MB, Heckert NA, Hoguet J, Huncik K, Ness J, Reiner JL (2021) Certification of Standard Reference Material® 1936 Great Lakes Sediment. (National Institute of Standards and Technology, Gaithersburg, MD), NIST Special Publication (SP) 260-215. https://doi.org/10.6028/NIST.SP.260-215

Certain commercial equipment, instruments, or materials may be identified in this Certificate of Analysis to adequately specify the experimental procedure. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the materials or equipment identified are necessarily the best available for the purpose.

Users of this SRM should ensure that the Certificate of Analysis in their possession is current. This can be accomplished by contacting the Office of Reference Materials 100 Bureau Drive, Stop 2300, Gaithersburg, MD 20899-2300; telephone (301) 975-2200; e-mail srminfo@nist.gov; or the Internet at https://www.nist.gov/srm.

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APPENDIX A

Non-Certified Values: Non-certified values are best estimates based on currently available information. However, they do not meet NIST's criteria for certification [1]. Non-certified values are suitable for use in method development, method harmonization, and process control but do not provide metrological traceability to the International System of Units (SI) or other higher-order reference system.

Non-certified values for selected measurands are provided below in Tables 2 and 3. These dry mass values are metrologically traceable to the materials and procedures used by NIST and the interlaboratory participants.

Table 2. Non-Certified Values for Select PAHs in SRM 1936

Analyte	Mass Fraction (ng/g)[(a)]
Benzo[*c*]phenatherene	205 ± 23
Benzo[*j*]fluoranthene	745 ± 376
Dibenzothiophene	55.5 ± 6.9
Fluoranthene	3210 ± 930
Perylene	612 ± 82
Phenanthrene	1160 ± 50

[(a)] Values are expressed as $x \pm U_{95\%}(x)$, where x is the certified value and $U_{95\%}(x)$ is the expanded uncertainty of the certified value. The true value of the analyte lies within the interval $x \pm U_{95\%}(x)$ with 95 % confidence. For guidance in propagating this uncertainty, see reference 2.

Table 3. Non-Certified Values for PFOS in SRM 1936

Analyte	Mass Fraction (ng/g)[(a)]
Perfluorooctane sulfonate	0.778 ± 0.046

[(a)] Values are expressed as $x \pm U_{95\%}(x)$, where x is the certified value and $U_{95\%}(x)$ is the expanded uncertainty of the certified value. The true value of the analyte lies within the interval $x \pm U_{95\%}(x)$ with 95 % confidence. For guidance in propagating this uncertainty, see reference 2.

Maintenance of Non-Certified Values: NIST will monitor this material to the end of its period of validity. If substantive technical changes occur that affect non-certified values during this period, NIST will update this Appendix. Registration (see attached sheet or register online) will facilitate notification. However, before making use of any of the values delivered by this material, users should obtain the most recent version of this documentation, available through the https://www.nist.gov/srm website.

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