



ORMS-4

Elevated Mercury in River Water

ORMS-4 is a river water spiked with inorganic mercury. This CRM is intended for the calibration of instruments and evaluation of methods for the determination of mercury. The material is packaged in 50 ml glass ampoules stabilized with 0.5% v/v BrCl.

Certified Mass Fraction of Mercury

22.0 ± 1.6 pg/g

The methods of analysis included cold vapour isotope dilution inductively coupled plasma mass spectrometry (ID-ICP-MS) and flow injection cold vapour atomic absorption spectrometry (CV-AAS). The certified value is the unweighted mean of the results ± the expanded ($k=2$) uncertainty (U_{CRM}).

The results generated by each of these methods were judged to be independent. The expanded uncertainty in the certified value is equal to $U = k u_c$ where u_c is the combined standard uncertainty calculated according to the ISO Guide [1] and k is the coverage factor. The value of u_c is determined from the combined uncertainties of the methods (u_{char}) as well as uncertainties associated with homogeneity (u_{hom}) and stability (u_{Its}).

It is intended that U_{CRM} encompasses every source that reasonably contributes to the uncertainty of the measurand [2,3]. A coverage factor (k) of 2 is used to give an uncertainty interval that contains roughly 95% of the underlying distribution. The adjacent table lists the individual, combined and expanded uncertainties.

Source	pg/g
u_{char}	0.52
u_{hom}	0.27
u_{Its}	0.55
u_c	0.80
U_{CRM}	1.6

Preparation

This sample of river water was collected from the Ottawa River near Ottawa, Ontario. An appropriate volume of concentrated BrCl, prepared according to reference 4, was added in addition to a spike of inorganic Hg. The water was aliquoted into 50 ml pre-cleaned glass ampoules and flame sealed. The ampoules were gamma irradiated to a minimum dose of 25 kGy at the Canadian Irradiation Centre, Laval, Québec.

Storage

It is recommended that the material be stored at room temperature and the vials opened immediately prior to use.

Certification

The certification work was performed within the Chemical Metrology Group of the Institute for National Measurement Standards, National Research Council Canada.

Expiration of Certification

The certified value is considered valid until November 2012 within the measurement uncertainty specified, provided the CRM is handled and stored in accordance with the instructions. The stability of this CRM will continue to be monitored and updates will be posted on our website (http://inms-ienm.nrc-nrc.gc.ca/calserv/chemical_metrology_e.html).

Opening the vials

PLEASE USE APPROPRIATE CAUTION WHEN OPENING THE VIALS AS SHARP GLASS EDGES MAY CAUSE INJURY.

A piece of tubing has been provided to provide protection when snapping open the prescored vial. When opening an ampoule, place the plastic tubing over the stem, grasp the tubing in one hand and the body in the other, placing thumbs tip-to-tip near the constriction. Using thumb tips as a hinge, bend the stem and the body to break the ampoule open.

It is preferable to sample directly from the vial as contamination may occur if the liquid comes in contact with freshly exposed surfaces of the vial.

Acknowledgements

The following members of staff of the Institute for National Measurement Standards, National Research Council Canada, participated in the analyses and certification: C. Scriver, S. Willie, L. Yang.

References

- [1] Guide to the Expression of Uncertainty in Measurement, ISBN 92-67-10188-9, 1st ed. ISO, Geneva, Switzerland (1993).
- [2] J. Pauwels, A. van der Veen, A. Lamberty, H. Schimmel, *Accred Qual Assur* (2000) 5:95-99.
- [3] T. P. J. Linsinger, J. Pauwels, A. Lamberty, H.G. Schimmel, A. M. H. van der Veen, L. Siekmann *Fres. J. Anal. Chem.* (2001) 370 :183-188.
- [4] USEPA, Method 1631 Revision E: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry, EPA-821-R-02-019, August 2002. Available at <http://www.epa.gov/ost/methods/1631.html>

Date of issue: December 2007

Date of expiry: November 2012

The results listed in this certificate are traceable to the SI through gravimetrically prepared standards of established purity and international measurement intercomparisons. As such, they serve as suitable reference materials for laboratory quality assurance programs, as outlined in ISO/IEC 17025.

Comments, information and inquiries should be addressed to:

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