



## ORMS-3

### *Elevated Mercury in River Water*

ORMS-3 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 Value for Mercury

**12.6 ± 1.1 pg/g**

The certified result is the unweighted mean value of three sets of results ± the expanded uncertainty (U). The methods of analysis were cold vapour isotope dilution inductively coupled plasma mass spectrometry (IDICPMS), flow injection cold vapour atomic absorption spectrometry (CVAAS) and cold vapour atomic fluorescence spectrometry (CVAFS).

The results for 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 three methods ( $u_{char}$ ) as well as uncertainties associated with

homogeneity ( $u_{hom}$ ) and stability ( $u_{Its}$ ).

It is intended that  $U_{CRM}$  represents every aspect that reasonably attributes 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 table below lists the individual and combined uncertainties.

Source	pg/g
$u_{char}$	0.22
$u_{hom}$	0.43
$u_{Its}$	0.21
$u_c$	0.53
$U_{CRM}$	1.1

## Storage

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

## Certification

The majority of the certification work was done within the Chemical Metrology Group of the Institute for National Measurement Standards, National Research Council Canada. An external expert laboratory cooperated in the certification process.

## Expiration of Certification

The certification of this lot is valid until June 2009 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 updates will be posted on our website ([http://inms-ienm.nrc-cnrc.gc.ca/calserv/chemical\\_metrology\\_e.html](http://inms-ienm.nrc-cnrc.gc.ca/calserv/chemical_metrology_e.html)).

## Preparation

This sample of river water was collected from the Ottawa River near from 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 precleaned glass ampoules and flame sealed. The ampoules were gamma irradiated to a minimum dose of 25 kGy at the Canadian Irradiation Centre, Laval, Québec.

## 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.

## Acknowledgements

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B. Lasorsa, M. Deuth, Battelle Marine Sciences Laboratory, Sequim, WA, USA.

## 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>

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*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. This CRM is registered at the Bureau International des Poids et Mesures (BIPM) in Appendix C of the Comité International des Poids et Mesures database listing Calibration and Measurement Capabilities accepted by signatories to the Mutual Recognition Arrangement of the Metre Convention.*

### **Comments, information and inquiries should be addressed to:**

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