



Certificate of Analysis

Certified Reference Material

SEEY-1

Selenium-82 labelled selenium enriched yeast Certified Reference Material

SEEY-1 is a selenium-82 labelled selenium enriched (selenized) yeast Certified Reference Material (CRM) from the National Research Council of Canada (NRC) with information on selenomethionine and total selenium content. A unit of SEEY-1 consists of approximately 5 grams of selenium enriched yeast in an amber glass vial. This material is intended for use as a matrix-matched isotopically-labelled standard for isotope dilution analysis of selenium enriched yeasts. The isotopic composition of selenium in this material is estimated as $n(^{82}\text{SeMet})/n(\text{SeMet}) = 0.942$ mol/mol.

Table 1 shows those analytes for which certified values have been established for SEEY-1. The expanded uncertainties associated with the certified values were calculated according to the Joint Committee for Guides in Metrology (JCGM) [1] and corresponds to approximately 95 % confidence ($k = 2$).

Table 1: Certified values and expanded uncertainties ($k = 2$) for SEEY-1

Compound	Mass fraction mg/kg
selenomethionine (a)	635.6 ± 17.2
selenomethionine, as Se (a)	261.2 ± 7.1
total selenium (b)	322.1 ± 5.2

Refer to the sections below for additional explanations

Period of validity: until June 2028

Storage conditions: -20 °C or below

Intended use

This certified reference material is intended for the calibration of instruments and evaluation of methods for the determination of selenomethionine and total selenium in yeast or materials of a similar matrix. The material is not intended for nutritional, medical, or diagnostic use. A minimum sample mass of 250 mg is recommended.

Preparation of material

A selenium enriched yeast sample (yeast grown in media rich in selenium-82 isotopically-labelled selenium) was fermented according to commercial protocols, washed, and freeze dried. The flakes were crushed and the material was homogenized. This material was then bottled “as is” in amber glass bottles at a 5 g nominal mass. During bottling, argon gas was used to flush the headspace of the bottles.

Characterization of material

The explanatory list of letters next to each compound (Table 1) refers to the instrumental method used for measurements:

- a) Isotope dilution high performance liquid chromatography inductively-coupled mass spectrometry (ID-HPLC-ICP-MS) [2-7]
- b) Isotope dilution inductively-coupled plasma mass spectrometry (ID-ICP-MS) [7]

Metrological traceability

Results presented in this certificate are traceable to the International System of Units (SI) through gravimetrically prepared standards of established purity and CRMs produced by National Metrology Institutes. As such, SEEY-1 serves as a suitable reference material for laboratory quality assurance programs, as outlined in ISO/IEC 17025..

Homogeneity

This material was tested for homogeneity at the NRC using ID-ICP-MS. Results from sub-samples were evaluated using Bayesian analysis of variance (ANOVA) [8] to determine both within-unit and between-unit heterogeneity components.

Stability

The transportation stability study was carried out using an isochronous approach. Selenomethionine and total selenium were deemed stable under typical transportation conditions (up to three weeks at temperatures up to 40 °C and up to eight weeks at 20 °C). Monitoring of long-term stability will continue throughout the lifecycle of the CRM.

Uncertainty

The expanded uncertainty (U) for all values is equal to $U = ku_c$, where u_c is the combined standard uncertainty calculated according to the (JCGM) [1] and k is the coverage factor. A coverage factor of $k = 2$ was applied which corresponds to a level of confidence of approximately 95 %.

All reasonable sources of uncertainty related to the certified values in Table 1 were considered. Included in the combined uncertainty estimate are uncertainties in the batch characterization, uncertainties related to possible between-unit variation, and uncertainties related to stability.

Storage

The material shall be stored at -20 °C or below.

Instructions for handling and use

Prior to use, the bottle should be allowed to warm to room temperature, then rotated and shaken to ensure the contents are well mixed. The bottle should be tightly closed thereafter and returned to -20°C storage.

Repeated sub-sampling and storage of the CRM after initial opening may impact certified values. Users shall take responsibility for demonstrating that their sub-sampling and storage procedures do not impact certified values.

Health and safety information

Only qualified personnel should handle the material and appropriate disposal methods should be used. A Safety Data Sheet (SDS) is available at doi.org/10.4224/crm.2025.seeey-1. For laboratory use only; not for human consumption, therapeutic, drug, household, or any other uses.

Period of validity

The certified values are valid until June 2028, provided the storage and instructions for handling and use specified in this certificate are followed.

Quality management system

The NRC is Canada's national metrology institute (NMI) and is a signatory of the International Committee for Weights and Measures Mutual Recognition Arrangement (CIPM MRA). The CIPM MRA was developed in a response to a growing need for an open, transparent, and comprehensive scheme to give users reliable quantitative information on the comparability of national metrology services and to provide the technical basis for wider agreements negotiated for international trade, commerce, and regulatory affairs. Our Quality Management System for measurement services and certified reference materials conforms to the requirements of ISO/IEC 17025 and ISO 17034.

Description of terms

Certified values are those for which the NRC has the highest confidence and that all known and suspected sources of bias have been considered by the NRC and are reflected in the stated expanded uncertainties.

Supplemental information

Bibliographic information and any additional technical supplemental information is available at doi.org/10.4224/crm.2025.seeey-1.

References

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Authorship

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This certificate is only valid if the corresponding material was obtained directly from the NRC or an authorized reseller. Users should ensure that the certificate they have is current. For updates, please refer to doi.org/10.4224/crm.2025.seeey-1.

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The logo for Canada, featuring the word "Canada" in a serif font with a small Canadian flag icon to the right of the letter "a".