

Certificate of Analysis

CERTIFIED REFERENCE MATERIAL HRM – 1009A

Sodium Cyclamate

Batch Number

STY-0051-001

Description

A unit of the certified reference material (CRM) consists of 250 mg of sodium cyclamate in a screw-capped amber vial. Quantitative nuclear magnetic resonance (qNMR) approach was adopted to determine the mass fraction (mg/g) of sodium cyclamate in the reference material using a benzoic acid CRM (HRM-1002A) from Health Sciences Authority (HSA) as internal standard.

The CRM was produced with reference to the requirements set out in ISO/IEC 17025:2017 [1], ISO 17034:2016 [2] and ISO 33405:2024 [3].

Certified Mass Fraction Value

A certified value is a value for which a laboratory has the highest confidence in its accuracy. The certified mass fraction value given below is based on the results obtained by the qNMR approach:

Certified Mass Fraction Value: 992.4 ± 5.3 mg/g

The final result is expressed as the certified value $\pm$ the expanded uncertainty.

The uncertainty listed with the certified value is an expanded uncertainty about the mean, with coverage factor 2 (approximately 95 % confidence). The certified value has an associated measurement uncertainty attributed to uncertainty contribution from the characterisation of the material (u_{char}), uncertainty in the homogeneity of the material (u_{bb}) and uncertainty in the stability of the material (u_{stab}). The u_{char} was evaluated by combining uncertainties from method precision, purity of the internal standard, molecular weight of sodium cyclamate, molecular weight of benzoic acid and weighing, in accordance with ISO/IEC Guide 98-3:2008 [4].

Homogeneity

Homogeneity testing on sodium cyclamate was performed on two sub-samples taken from eleven bottles (a total of 22 samples) using qNMR. The sample size taken for homogeneity testing was approximately 75 mg. No significant differences in the between and within-bottle variances were found using one-way ANOVA at 95 % confidence level [3]. Thus, the material was regarded to be sufficiently homogeneous. The u_{bb} was evaluated from the uncertainty due to between-bottle inhomogeneity.

Stability

The short-term stability of sodium cyclamate was studied. The material was stored at 50 °C (maximum allowable transportation temperature) up to 14 days. This was carried out as “isochronous measurements”, i.e. all samples of the stability study were analysed under repeatability conditions. The results showed that sodium cyclamate was stable over the study period.

The long-term stability of sodium cyclamate at room temperature (18 °C to 25 °C) was evaluated on six occasions up to about 5 years after preparation. The results showed that sodium cyclamate was stable over the study period. The u_{stab} was evaluated based on the differences up to about 5 years using one-way ANOVA.

Validity of Certified Mass Fraction Value

The certified mass fraction value is valid within the specified measurement uncertainty until **07 Nov 2028**, provided that the reference material is subjected to the same handling and storage conditions as stated in this Certificate of Analysis (COA). The validity of the certified mass fraction value has been confirmed using a 500 MHz NMR (Bruker Avance Ascend 500) at the Chemical Metrology Laboratory, HSA.

The CRM will be continuously monitored during the validity period to determine if any substantive change to the certified value has occurred. If necessary, its user will be advised properly if the value of the CRM is found to have changed or an updated COA may be issued.

Analytical Methods

The determination of the purity of the sodium cyclamate reference material was carried out using a 500 MHz Bruker Ultra Shield NMR at the Department of Chemistry, National University of Singapore. Benzoic Acid CRM (HRM-1002A) was used as the internal standard for the determination. The certified value was calculated from the mean of 22 results obtained from one determination each on the 22 sub-samples prepared from the reference material and the internal standard.

The cation present in the compound is confirmed to be sodium using Inductively Coupled Plasma Mass Spectrometry (ICP-MS).

Metrological Traceability

The certified mass fraction value is traceable to the International System of Units (SI) through the use of benzoic acid CRM (HRM-1002A) from HSA.

Intended Use

The CRM is intended for use as a calibrant or quality control (QC).

Instructions for Use

Prior to use, the bottle should be equilibrated to room temperature and rotated gently before sampling. After use, the bottle must be tightly re-capped and protected from moisture and light. The minimum

sample size should be 75 mg for each analysis. If results differ from certified value in subsequent sampling, customers are advised to purchase a new CRM.

Storage

The CRM should be properly sealed and stored at room temperature (18 °C to 25 °C) in a dry and cool area in its original bottle when not in use. Protect the material from moisture and light.

Safety Precautions for Users

Treat the material as hazardous substance. Use appropriate work practices when handling to avoid skin or eye contact, ingestion or inhalation of dust.

Further Information

Please direct all enquiries regarding this CRM to the contact above.

References

- [1] ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories.
- [2] ISO 17034:2016 General requirements for the competence of reference material producers.
- [3] ISO 33405:2024 Reference materials – Approaches for characterisation and assessment of homogeneity and stability.
- [4] ISO/IEC Guide 98-3:2008 Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995).

Certificate Revision Records

Certificate Ref. No.	Date of issue	Reason for issuance
CML-HRM-1009A/01	7 Nov 2014	Issuance of first certificate
CML-HRM-1009A/02	6 Nov 2015	Extension of expiry date
CML-HRM-1009A/03	21 Oct 2016	Extension of expiry date
CML-HRM-1009A/04	16 Oct 2018	Extension of expiry date
CML-HRM-1009A/05	10 Oct 2019	Update on measurement uncertainty
CML-HRM-1009A/06	17 Sep 2020	Extension of expiry date
CML-HRM-1009A/07	27 Aug 2021	Extension of expiry date
CML-HRM-1009A/08	18 Oct 2023	Extension of expiry date
CML-HRM-1009A/09	3 Nov 2025	Extension of expiry date

Note

HSA does not assume any liability with respect to any loss caused by improper use and/or storage of the reference material by the customer.



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