



Certificate of Analysis

Standard Reference Material[®] 351a

Sodium Carbonate

(Acidimetric Standard)

This Standard Reference Material (SRM) is certified as a chemical of known assay and is intended for use as a primary acidimetric standard. The SRM consists of highly purified sodium carbonate (Na_2CO_3) in a 50 g unit.

Certified Value and Uncertainty: Table 1 lists the certified mass fraction, $w_{\text{Na}_2\text{CO}_3}$, of total base expressed as Na_2CO_3 . A NIST certified value is a value for which NIST has the highest confidence in its accuracy in that all known or suspected sources of bias have been investigated or accounted for by NIST [1].

Table 1. Certified Values for SRM 351a Sodium Carbonate

Sodium Carbonate	Mass Fraction ^(a) (%)
$w_{\text{Na}_2\text{CO}_3}$	99.970 ± 0.014

^(a) Each result is expressed as the certified value \pm the expanded uncertainty, U , calculated as $U = ku_c$, where u_c is the combined standard uncertainty and k is the coverage factor as defined in the ISO/JCGM and NIST Guides [2]. The value of u_c is intended to represent the combined uncertainty in the certified value, at the level of one standard deviation, from material homogeneity and from all sources of uncertainty inherent to the coulometric assay technique. The coverage factor is used to control the approximate level of confidence associated with U . The value of the coverage factor used to compute U for this SRM, $k = 2.08$, corresponds to a level of confidence of approximately 95 %. The measurand is the total concentration of sodium carbonate. Metrological traceability is to the SI derived units for mass fraction, express as percentage.

Expiration of Certificate: The certification of **SRM 351a** is valid, within the measurement uncertainty specified until **01 April 2022**, provided the SRM is handled and stored in accordance with the instructions given in this certificate (see "Instructions for Use"). The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of SRM Certification: NIST will monitor this SRM over the period of its certification. 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.

Coulometric analyses were performed in the NIST Chemical Sciences Division by K.W. Pratt.

Coordination of the technical measurements leading to the certification of SRM 351a was provided by K.W. Pratt.

Statistical consultation was provided by W.F. Guthrie of the NIST Statistical Engineering Division.

Support aspects involved in the preparation of this SRM were coordinated through the NIST Office of Reference Materials.

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Certificate Revision History on Last Page

Steven J. Choquette, Director
Office of Reference Materials

NOTICE AND WARNINGS TO USERS

This SRM is certified for acidimetric assay **ONLY**.

Stability and Storage: This SRM should be stored in its original bottle at room temperature. It must be tightly re-capped after use and protected from acid fumes, moisture, and light. The material absorbs water and carbon dioxide (CO₂) from the air and may form a hard cake containing hydrated sodium carbonate (Na₂CO₃) and/or sodium bicarbonate (NaHCO₃) on extended storage. Drying as described below expels absorbed water and carbon dioxide (CO₂) yielding pure Na₂CO₃.

Homogeneity: Tests indicate that this SRM is homogeneous within the uncertainty limits for sample sizes greater than 270 mg. Samples less than 270 mg are not recommended.

INSTRUCTIONS FOR USE

Drying and Weighing Instructions: Dry at 275 °C to 280 °C for 4 h in platinum or fused silica vessels. After the SRM has been dried, store it in a desiccator over anhydrous magnesium perchlorate, Mg(ClO₄)₂. The dried material is hygroscopic. Exposure of the dried material to the atmosphere should be minimized. Weighings should be performed rapidly or in closed vessels to minimize absorption of water.

Source of Material: The sodium carbonate used for this SRM was obtained from a commercial company. The material was examined for compliance with the specification for reagent grade sodium carbonate (Na₂CO₃) as specified by the American Chemical Society [3]. The material was found to meet or exceed the minimum requirements in every respect.

Coulometric Assay: This material was assayed by automated coulometric back-titration [4], to a strong acid endpoint, of weighed, dried, samples after addition of excess coulometrically-standardized hydrochloric acid and elimination of the product carbon dioxide.

REFERENCES

- [1] May, W.; Parris, R.; Beck II, C.; Fassett, J.; Greenberg, R.; Guenther, F.; Kramer, G.; Wise, S.; Gills, T.; Colbert, J.; Gettings, R.; MacDonald, B.; *Definition of Terms and Modes Used at NIST for Value-Assignment of Reference Materials for Chemical Measurements*; NIST Special Publication 260-36 (2000); available at <http://www.nist.gov/srm/upload/SP260-136.PDF> (accessed Feb 2017).
- [2] JCGM 100:2008; *Evaluation of Measurement Data - Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), Joint Committee for Guides in Metrology (JCGM) (2008); available at http://www.bipm.org/utls/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Feb 2017); see also Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <http://www.nist.gov/pml/pubs/index.cfm> (accessed Feb 2017).
- [3] *Reagent Chemicals*, 9th ed.; American Chemical Society: Washington, DC (1999).
- [4] Pratt, K.W.; *Automated, High-Precision Coulometric Titrimetry Part I. Engineering and Implementation*; Anal. Chim. Acta, Vol. 289, pp. 135–142 (1994).

Certificate Revision History: 06 February 2017 (Change of expiration date, editorial changes); 13 November 2007 (Original certificate date).

Users of this SRM should ensure that the Certificate of Analysis in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730, email srminfo@nist.gov; or via the Internet at <http://www.nist.gov/srm>.