



# National Institute of Standards & Technology

## Certificate of Analysis

### Standard Reference Material<sup>®</sup> 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 ( $\text{Na}_2\text{CO}_3$ ) 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  $\text{Na}_2\text{CO}_3$ . 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<sup>(a)</sup> for SRM 351a Sodium Carbonate

Sodium Carbonate (mass fraction)	Certified Value and Uncertainty		
$w_{\text{Na}_2\text{CO}_3}$	99.970 %	±	0.014 %

<sup>(a)</sup> 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 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 %.

**Expiration of Certificate:** The certification of SRM 351a is valid, within the measurement uncertainties specified until **01 April 2017**, 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) will facilitate notification.

Coulometric analyses were performed in the NIST Analytical Chemistry 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.

The support aspects involved in the preparation of this SRM were coordinated through the NIST Measurement Services Division.

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Certificate Issue Date: 13 November 2007

Robert L. Watters, Jr., Chief  
Measurement Services Division

## NOTICE AND WARNINGS TO USERS

This SRM is certified for acidimetric assay **ONLY**. For pH standardizations near pH 10, use the current release of SRM 191, pH standards Sodium Bicarbonate and Sodium Carbonate.

**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 ( $\text{CO}_2$ ) from the air and may form a hard cake containing hydrated sodium carbonate ( $\text{Na}_2\text{CO}_3$ ) and/or sodium bicarbonate ( $\text{NaHCO}_3$ ) on extended storage. Drying as described below expels absorbed water and carbon dioxide ( $\text{CO}_2$ ) yielding pure  $\text{Na}_2\text{CO}_3$ .

**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,  $\text{Mg}(\text{ClO}_4)_2$ . 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 chloride ( $\text{NaCl}$ ) 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, C.; Fassett, J.; Greenberg, R.; Guenther, F.; Kramer, G.; Wise, S.; Gills, T.; Colbert, J.; Gettings, R.; MacDonald, B.; *Definitions of Terms and Modes Used at NIST for Value-Assignment of Reference Materials for Chemical Measurements*; NIST Special Publication 260-136, U.S. Government Printing Office: Washington, DC (2000); available at <http://ts.nist.gov/MeasurementServices/ReferenceMaterials/upload/sp260-136.pdf>.
- [2] ISO; *Guide to the Expression of Uncertainty in Measurement*; ISBN 92-67-10188-9, 1st ed.; International Organization for Standardization: Geneva, Switzerland (1993); 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://physics.nist.gov/Pubs/pdf.html>.
- [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).

*Users of this SRM should ensure that the certificate in their possession is current. This can be accomplished by contacting the SRM Program at: telephone (301) 975-6776; fax (301) 926-4751; email [srminfo@nist.gov](mailto:srminfo@nist.gov); or via the Internet at <http://www.nist.gov/srm>.*