National Institute of Standards & Technology

Certificate

Standard Reference Materials

191a - Sodium Bicarbonate
192a - Sodium Carbonate

pH(s) Standard

These Standard Reference Materials (SRMs) are intended for use in preparing buffer solutions to calibrate electrodes for pH measuring systems. The lots of sodium bicarbonate ($NaHCO_3$) and sodium carbonate (Na_2CO_3) were prepared to ensure high-purity and uniformity. They meet the specifications of the American Chemical Society for reagent-grade materials, but should not be considered entirely free from impurities such as traces of water, free alkali, silica, chlorides, sulfur compounds, and heavy metals. SRMs 191a and 192a are supplied in units of 25 g and 30 g, respectively.

The certified pH(s) values listed below were derived from emf measurements of cells without liquid junction using hydrogen gas and AgCl/Ag electrodes (where the hydrogen gas was at 1.013×10^5 Pa (1 atmospheric pressure)) by the method of calculation described in reference.[1] The pH(s) values correspond to $\log (1/a_H)$, where a_H is the conventional activity of the hydrogen ion referred to the standard state on the molal scale. The uncertainty of the certified values of pH(s) is estimated not to exceed $\pm$ 0.005 unit for the temperature range 0 to 50 °C. Minor variations of pH(s) values (of the order of a few thousandths of a unit) may be expected to occur between SRM lots, but the listed values below, apply only to the lots issued with this certificate.

A 0.025 molal solution with respect to both $NaHCO_3$ and Na_2CO_3, is recommended for the calibration of the glass electrode and pH meter used for pH measurements. The pH(s) of this solution as a function of temperature is given below.

°C	pH(s)	°C	pH(s)	°C	pH(s)
0.0	10.316	20.0	10.062	40.0	9.884
5.0	10.244	25.0	10.011	45.0	9.850
10.0	10.178	30.0	9.965	50.0	9.819
15.0	10.118	35.0	9.922		

The sodium bicarbonate and sodium carbonate were obtained from Mallickrodt, Inc., St. Louis, MO.

The experimental work to verify values on this certificate was performed in the NIST Inorganic Analytical Research Division by Y.C. Wu and P.A. Berezansky.

Statistical design and analysis of these experiments were performed by S.B. Schiller of the NIST Statistical Engineering Division.

The overall direction and coordination of technical measurements leading to the certification were performed in the NIST Inorganic Analytical Research Division by R.L. Watters, Jr..

The technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by J.C. Colbert.

Gaithersburg, MD 20899
July 2, 1993
(Revision of Certificate dated 11-21-84)

Thomas E. Gills, Acting Chief
Standard Reference Materials Program

(over)

This certificate has undergone technical revision to reflect new analyses as well as program and organizational changes at NIST and at the Department of Commerce.

Directions for Use: Preparation of the 0.025-molal solution. Transfer 2.095 g of SRM 191a (sodium bicarbonate) and 2.644 g of SRM 192a (sodium carbonate) to a 1 L volumetric flask. Dissolve and fill to the mark with distilled water at 25 °C. The distilled water should contain no dissolved carbon dioxide and should have a conductivity no greater than 2×10^{-6} S/cm. Carbon dioxide-free water can be prepared by boiling a good grade of distilled water for 10 min and guarding it with a soda lime tube while cooling. The sodium bicarbonate should not be dried by heating; the sodium carbonate should be dried for 2 h at 275 °C before use. Although elaborate precautions to prevent contamination of the buffer solution with atmospheric carbon dioxide are usually unnecessary, the container should be kept tightly stoppered at all times when a sample is not actually being removed.

Stability of Prepared Solution: The prepared 0.025 molal solution should be replaced after a few weeks or sooner if sediment appears or if it has been exposed repeatedly to air containing carbon dioxide.

NOTICE AND WARNINGS TO USER

Expiration of Certification: This certification will be valid for five years from the date of shipment from NIST. Periodic reanalysis of representative samples from this SRM will be performed, and if significant changes are observed within the five year period, the purchaser will be notified by NIST. Please return the attached registration card to facilitate notification.

Stability and Storage of Crystalline SRMs 191a and 192a: SRMs 191a and 192a should be stored in their original bottles at room temperature. They should be tightly re-capped after use and protected from moisture and light.

REFERENCE

[1] Bates, R.G., Revised Standard Values for pH Measurements from 0 to 95 °C, J. Res. NBS, 66A, 179 (1962).