



National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Materials

Tris(hydroxymethyl)aminomethane (922)

Tris(hydroxymethyl)aminomethane hydrochloride (923)

pH Standards

These Standard Reference Materials (SRMs) are intended primarily for use in preparing standard pH buffer solutions in the physiological range and for general use in clinical chemistry. Such systems are used in the clinical laboratory in cases where phosphate buffers would cause undesirable side reactions or do not adequately approximate the required variation of pH with temperature. Coulometric assay indicates the purity of the tris(hydroxymethyl)aminomethane to be 99.99 ± 0.02 mole percent after drying in a vacuum oven at 70 °C for 24 h. Coulometric assay of the tris(hydroxymethyl)aminomethane hydrochloride as received was 99.69 ± 0.05 mole percent. SRMs 922 and 923 are provided in units of 25 g and 35 g, respectively.

The pH(S) values listed below correspond to $\log(1/\alpha_{\text{H}})$, where α_{H} is a *conventional* activity of the hydrogen (hydronium) ion referred to the standard state on the scale of molality. The values were derived from the emf of cells without liquid junction by the method of calculation described by Bates. [1] The uncertainty of the assigned values of pH(S) is estimated not to exceed ± 0.005 unit for the temperature range of 0 to 50 °C. The values listed below apply only to SRMs 922 and 923.

The solution recommended for the calibration of pH equipment is 0.01667 molal with respect to tris(hydroxymethyl)aminomethane and 0.0500 molal with respect to tris(hydroxymethyl)aminomethane hydrochloride. The pH(S) of this solution as a function of temperature is as follows:

°C	pH(S)	°C	pH(S)	°C	pH(S)
0	8.471	20	7.840	37	7.382
5	8.303	25	7.699	40	7.307
10	8.142	30	7.563	45	7.186
15	7.988	35	7.433	50	7.070

Source of Material: The tris(hydroxymethyl)aminomethane and tris(hydroxymethyl)aminomethane hydrochloride were obtained from the Sigma Chemical Company of St. Louis, MO.

Expiration of Certification: This certification is valid for five years from date of shipment from NIST.

This Certificate of Analysis has undergone editorial revision to reflect program and organizational changes at NIST and at the Department of Commerce. No attempt was made to reevaluate the certificate values or any technical data presented on this certificate.

The overall direction and coordination of technical measurements leading to the certification were performed under the chairmanship of R.A. Durst.

Gaithersburg, MD 20899
May 24, 1993
(Revision of certificate dated 12-13-73)

Thomas E. Gills, Acting Chief
Standard Reference Materials Program

(over)

The technical and support aspects involved in the original preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by T.W. Mears. Revision of this certificate was coordinated through the Standard Reference Materials Program by J.C. Colbert.

The name "tris(hydroxymethyl)aminomethane" is used preferentially in this certificate since it is the name commonly used in clinical laboratories. Under the system of nomenclature recommended by the International Union of Pure and Applied Chemistry this material is named 2-amino-2-(hydroxymethyl)-1,3-propanediol. It is also known by several trivial and proprietary names, e.g., "tris", "THAM," "trizma," "tromethamine," "tromethane," etc. However, the certified values given herein apply only to the material supplied as this NIST-SRM.

Preparation of the 0.01667 molal "tris" and 0.0500 molal "tris"-HCl solution: Transfer 2.005 g of tris(hydroxymethyl)aminomethane (SRM 922) and 7.822 g of tris(hydroxymethyl)aminomethane hydrochloride (SRM 923) to a 1-L volumetric flask. Dissolve and fill to the mark with distilled water at 25 °C. The distilled water should not contain dissolved carbon dioxide and should have a conductivity no greater than 2×10^{-6} siemens/cm. Carbon dioxide-free water can be prepared by boiling a good grade of distilled water for 10 min and guarding it with a tube of carbon dioxide absorbant. The certified pH(S) values apply for materials as received. No particular drying procedures are necessary. The tris(hydroxymethyl)aminomethane should not be heated above 80 °C and as a precaution the tris(hydroxymethyl)aminomethane hydrochloride should not be exposed to temperatures above 40 °C. (The weights given are weights in air.)

CAUTION: These Standard Reference Materials (SRMs) are intended for "in vitro" diagnostic use only. Reference electrodes containing linen-fiber junctions should not be used with this buffer. Such junctions produce large liquid-junction potentials, drift, and long equilibrium times.

Storage and Stability: SRM 922 should be stored in a well-closed container at room temperature. Exposure to high temperatures (above 50 °C) and direct sunlight should be avoided. Experience has shown this compound to be stable in storage for at least 12 years. [2] If the material degrades such that the certified values are changed, the users will be notified by NIST. It is recommended that this material not be used after 5 years from the date of shipment from NIST.

SRM 923 should be stored in a well-closed container at room temperature, preferably in a desiccator. Exposure to high temperatures (above 40 °C) and direct sunlight should be avoided. SRM 923, tris(hydroxymethyl)aminomethane hydrochloride is quite hygroscopic even at relative humidities of 30 to 50 percent. [3] Experience at NIST has indicated that, properly stored, this material is stable for at least 5 years. Weighing and other manipulations of SRM 923 should be avoided under conditions when the relative humidity exceeds 50 percent. If the material degrades such that the certified values are changed, the users will be notified by NIST. It is recommended that this material not be used after 5 years from the date of shipment from NIST.

Stability of Prepared Solution: This buffer solution is sensitive to contamination by carbon dioxide. [4] If the solution is to maintain the assigned pH(S) for a few weeks, the exclusion of carbon dioxide is essential. The solution should be replaced after a few weeks, or sooner if mold or sediment appear, or if it is repeatedly exposed to air containing carbon dioxide.

REFERENCES

- [1] R.G. Bates, Revised standard values for pH measurements from 0 to 95 °C, C.J. Research NIST **66A**, 179 (1962).
- [2] J.A. Riddick, Amine buffers as acidimetric standards, Ann. NY Acad. Sci. **92**, 357 (1961).
- [3] Sigma Tentative Technical Bulletin No. 106 B, Sigma Chemical Co., St. Louis, MO, revised 1967.
- [4] R.G. Bates and H.B. Hetzer, Absorption of carbon dioxide by solutions of 2-amino-2-(hydroxymethyl)-1,3-propanediol, Anal. Chem. **33**, 1285 (1961).