

Standard Reference Material[®] 913b

Uric Acid

CERTIFICATE OF ANALYSIS

Purpose: This Standard Reference Material (SRM) is certified as a chemical of known purity. It is intended primarily for use in the calibration and standardization of procedures for uric acid determinations employed in clinical analysis and for routine critical evaluation of the daily working standards used in these procedures.

Description: A unit of SRM 913b consists of one bottle containing 10 g of crystalline uric acid.

Certified Values: The certified value is based upon the results from several analytical techniques designed to measure impurities and on scientific judgement of these results. The measurand is the mass fraction of uric acid in the material. The certified chemical purity presented in Table 1 was determined by measuring the mass fractions of impurities, including water and residue from ashing, summing the impurities and subtracting this sum from 100 %. 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 Chemical Purity and Uncertainty for Uric Acid (Mass Fraction)

99.8 % ± 0.2 %

The results are expressed as the certified value ± the expanded uncertainty. The uncertainty in the certified value is equal to $U = ku_c$, where, u_c , is the combined standard uncertainty calculated according to the ISO/JCGM Guide [2] and, $k = 2$, is the coverage factor. The expanded uncertainty is intended to represent a 95 % confidence interval and reflects the combined effects of measurement imprecision, variability in concentrations between bottles and any systematic differences between techniques when more than one method has been used [2]. The certified value is metrologically traceable to the SI unit of mass, expressed as the mass fraction of uric acid in the material.

Non-Certified Values: Non-certified values are provided in the Appendix A.

Period of Validity: The certified values delivered by **SRM 913b** are valid within the measurement uncertainty specified until **31 December 2033**. The certified values are nullified if the material is stored or used improperly, damaged, contaminated, or otherwise modified.

Maintenance of Certified Values: NIST will monitor this SRM over the period of its validity. If substantive technical changes occur that affect the certification, NIST will issue an amended certificate through the NIST SRM website (<https://www.nist.gov/srm>) and notify registered users. SRM users can register online from a link available on the NIST SRM website or fill out the user registration form that is supplied with the SRM. Registration will facilitate notification. Before making use of any of the values delivered by this material, users should verify they have the most recent version of this documentation, available through the NIST SRM website (<https://www.nist.gov/srm>).

Storage: SRM 913b should be stored in its original bottle at temperatures between 20 °C and 25 °C. It must be tightly re-capped after use and protected from excessive moisture and light.

Use: SRM 913b is not hygroscopic under ordinary storage conditions (as described above) and can be used without preliminary drying. The minimum sample size required is 10 mg.

Source of Material: The SRM material was obtained from a commercial supplier.

Analytical Approach: All analyses for the certified and non-certified values were performed at NIST. Because uric acid does not melt, differential scanning calorimetry could not be used as an overall measure of the purity. Instead, potential impurities were evaluated using a variety of techniques that included: liquid chromatography-mass spectrometry (LC-MS), gas chromatography-mass spectrometry (GC-MS), mass loss upon drying, ashing at 800 °C, and ultraviolet (UV) spectroscopy. The results for the drying and ashing analyses are shown in Table A1. Other low level impurities may be present but were not detected by the techniques used here. The certified purity is determined by subtracting from 100 %, the sum of the mass loss upon drying and the residue after ashing.

Homogeneity Analysis: The homogeneity assessment was made at the time the certification analyses were performed. A stratified sampling plan was devised to test for homogeneity across the lot of bottles. There was no apparent trend in the data when plotted against the sequence in which the bottles were prepared.

REFERENCES

- [1] Beauchamp, C.R.; Camara, J.E.; Carney, J.; Choquette, S.J.; Cole, K.D.; DeRose, P.C.; Duewer, D.L.; Epstein, M.S.; Kline, M.C.; Lippa, K.A.; Lucon, E.; Molloy, J.; Nelson, M.A.; Phinney, K.W.; Polakoski, M.; Possolo, A.; Sander, L.C.; Schiel, J.E.; Sharpless, K.E.; Toman, B.; Winchester, M.R.; Windover, D.; *Metrological Tools for the Reference Materials and Reference Instruments of the NIST Material Measurement Laboratory*; NIST Special Publication 260-136, 2021 edition; National Institute of Standards and Technology, Gaithersburg, MD (2021); available at <https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.260-136-2021.pdf> (accessed Dec 2023).
- [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 <https://www.bipm.org/en/committees/jc/jcgm/publications> (accessed Dec 2023); 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 <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Dec 2023).

Certificate Revision History: 18 December 2023 (Change of period of validity; updated format; editorial changes); 11 June 2014 (Original certificate date).
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Certain commercial equipment, instruments, or materials may be identified in this Certificate of Analysis to adequately specify the experimental procedure. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the materials or equipment identified are necessarily the best available for the purpose.

Users of this SRM should ensure that the Certificate of Analysis in their possession is current. This can be accomplished by contacting the Office of Reference Materials 100 Bureau Drive, Stop 2300, Gaithersburg, MD 20899-2300; telephone (301) 975-2200; e-mail srminfo@nist.gov; or the Internet at <https://www.nist.gov/srm>.

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APPENDIX A

Non-Certified Values: Non-certified values are the best estimates of the true values; however, the values do not meet NIST criteria for certification. Such values are provided with associated uncertainties that may reflect only measurement precision, may not include all sources of uncertainty, or may reflect a lack of sufficient statistical agreement among multiple analytical methods [1]. Non-certified values for mass loss upon drying, residue after ashing, and molar extinction coefficients are provided in Table A1.

Molar extinction coefficients were measured for solutions of SRM 913b in a glycine-NaOH aqueous buffer (pH 9.6) and 0.0017 mol/L ammonia (pH 10.1) at 234 nm and 292 nm. The results for the molar extinction coefficients are also shown in Table A1.

Table A1. Non-certified Values for Selected Properties of SRM 913b^(a)

Components of Impurity	Mass Fraction (%)	
	Mass loss upon drying	0.13 ± 0.02
Residue after ashing	0.06 ± 0.01	
UV Absorbance of Uric Acid	Molar Extinction Coefficients (L·mol ⁻¹ ·cm ⁻¹)	
	234 nm	292 nm
In glycine-NaOH buffer, pH 9.6	9 820 ± 27	12 507 ± 43
In ammonia solution, pH 10.1	9 549 ± 70	12 515 ± 168

^(a) The results are expressed as the non-certified value ± the expanded uncertainty. The uncertainty in the non-certified value is equal to $U = k u_c$, where, u_c , is the combined standard uncertainty calculated according to the ISO/JCGM Guide [2] and, $k = 2$, is the coverage factor. The expanded uncertainty is intended to represent a 95 % confidence interval.

Maintenance of Non-Certified Values: NIST will monitor this material to the end of its period of validity. If substantive technical changes occur that affect the non-certified values during this period, NIST will update this Appendix and notify registered users. SRM users can register online from a link available on the NIST SRM website or fill out the user registration form that is supplied with the SRM. Registration will facilitate notification. Before making use of any of the values delivered by this material, users should verify they have the most recent version of this documentation, available through the NIST SRM website (<https://www.nist.gov/srm>).

***** End of Appendix A *****