National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material® 2647a

Propane in Nitrogen

(Nominal Amount-of-Substance Fraction 2500 µmol/mol)

This certificate reports the certified values for Lot 104-D-XX.

This Standard Reference Material (SRM) is a primary gas mixture for which the amount-of-substance fraction, expressed as concentration [1], may be related to secondary working standards. This SRM is intended for the calibration of instruments used for propane determinations and for other applications.

This SRM mixture is supplied in a DOT 3AL-specification aluminum (6061 alloy) cylinder with a water volume of 6 L. Mixtures are shipped with a nominal pressure exceeding 12.4 MPa (1800 psig), which provides the user with 0.73 m^3 (25.8 ft^3) of useable mixture. The cylinder is the property of the purchaser and is equipped with a CGA-350 brass valve, which is the recommended outlet for this propane mixture.

Certified Value: This SRM mixture has been certified for propane concentration. The certified value given below applies to the identified cylinder and NIST sample number.

Propane Concentration:	2482.0 µmol/mol ± 8.5 µmol/mol
Cylinder Number: SAMPLE	NIST Sample Number: SAMPLE
Hydrotest Date: October 2016	Blend Date: September 2017

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 taken into account [2]. The uncertainty of the certified value includes the estimated uncertainties in the NIST standards, the analytical comparisons to the lot standard (LS), and the uncertainty of comparing the LS with each of the mixtures comprising this lot. The uncertainty is expressed as an expanded uncertainty $U = ku_c$ with u_c determined by experiment and a coverage factor $k = 2.0$. The true value for the propane amount-of-substance fraction is asserted to lie in the interval defined by the certified value ± U with a level of confidence of approximately 95 % [3].

Expiration of Certification: The certification of **SRM 2647a Lot No. 104-D-XX** is valid from this certificate issue date, within the measurement uncertainties specified, until **19 July 2026**, provided the SRM is handled and stored in accordance with the instructions given in this certificate (see "Cylinder and Gas Handling Information"). The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Cylinder and Gas Handling Information: NIST recommends the use of a high-purity, two-stage pressure regulator with a stainless steel diaphragm and CGA-350 outlet to safely reduce the pressure and to deliver this SRM mixture to the instrument. The regulator should be purged to prevent accidental contamination of the SRM by repeatedly (minimum three times) opening the valve and pressurizing the regulator, then closing the valve and releasing the pressure safely into a vent line. This SRM should not be used after the internal pressure drops below 0.7 MPa (100 psig). This SRM should be stored under normal laboratory conditions within the temperature range of 15 ºC to 30 ºC.

Overall direction and coordination of the technical work required for certification of this SRM were performed by J.T. Hodges of the NIST Chemical Sciences Division.

Carlos A. Gonzalez, Chief
Chemical Sciences Division

Gaithersburg, MD 20899
Certificate Issue Date: 25 February 2020

Steven J. Choquette, Director
Office of Reference Materials

Analytical measurements leading to the certification of the current SRM lot were performed by W.R. Miller and M.E. Kelley of the NIST Chemical Sciences Division.

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

Traceability: The measurand is the total concentration of propane in nitrogen and the certified value is metrologically traceable to the SI unit of micromoles of propane per total moles of propane and nitrogen.

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.

Mixture Preparation: The gas mixtures comprising this SRM lot were prepared in accordance with NIST technical specifications by a commercial specialty gas vendor under contract to NIST. The specifications stipulate that each SRM mixture be identical in propane concentration and stable with time.

Analytical Methods: Analyses of the propane concentration for this lot of cylinders were conducted by comparing each cylinder mixture to a representative cylinder chosen from the lot, the LS, using a gas chromatograph equipped with a thermal conductivity detector (GC/TCD) to primary gravimetric standards.

Homogeneity Analysis: Each of the propane mixtures that comprise this SRM lot was compared to the LS using a GC/TCD. A statistical analysis of the analytical results indicated that sample-to-sample propane concentration differences were not statistically significant. This indicates that, within the precision of the NIST measurements, all of the cylinders comprising this SRM lot have identical propane concentrations. Therefore, one concentration has been assigned to the entire SRM lot.

Propane Concentration Value Assignment: The certified propane concentration for this SRM lot was computed from the assigned concentration for the lot standard and the homogeneity analysis.

CAS Registry Numbers: This SRM is certified for propane in nitrogen. The relevant CAS Registry numbers for these components are: propane CAS Registry 74-98-6; nitrogen CAS Registry 7727-37-9.

Information Values: Results for additional analyses performed during the certification process are given below. The concentrations reported are NOT certified values. These values are given for informational purposes only. An information value is considered to be a value that will be of interest to the SRM user, but for which insufficient information is available to assess adequately the uncertainty associated with the value, or only a limited number of analyses were performed [3]. Information values cannot be used to establish metrological traceability.

Constituent	Concentration/Method	CAS Registry
Water	< 1 µmol/mol (as determined by P_2O_5 adsorption)	7732-18-5
Total hydrocarbons	78 nmol/mol (as determined by GC/FID - Expressed as Propane)	74-98-6
Nitrogen	Balance	7727-37-9

REFERENCES

[1] Thompson, A.; Taylor, B.N.; *Guide for the Use of the International System of Units (SI)*; NIST Special Publication 811; U.S. Government Printing Office: Washington, DC (2008); available at https://www.nist.gov/pml/special-publication-811 (accessed Feb 2020).

[2] 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 https://www.nist.gov/system/files/documents/srm/SP260-136.PDF (accessed Feb 2020).

[3] 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/utils/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Feb 2020); 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 Feb 2020).

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, e-mail srminfo@nist.gov; or via the Internet at https://www.nist.gov/srm.