

Standard Reference Material[®] 1665b Propane in Air

(Nominal Amount-of-Substance Fraction 3 $\mu\text{mol/mol}$)
Lot 85-J-XX

CERTIFICATE OF ANALYSIS

Purpose: The certified value delivered by this Standard Reference Material (SRM) is intended for the calibration of instruments used for propane determinations and for other applications.

Description: 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 m³ (25.8 ft³) of useable mixture. The cylinder is the property of the purchaser and is equipped with a CGA-590 brass valve, which is the recommended outlet for this propane mixture.

Certified Value: A NIST certified value is a value for which NIST has the highest confidence in that all known or suspected sources of bias and imprecision have been taken into account in the generation of concentration uncertainty [1]. This SRM mixture has been certified for propane amount-of-substance fraction (mole fraction, sometimes termed “molar concentration”). This certified value is traceable to the International System of Units (SI) through the gravimetric primary standards and procedures used in the preparation of this mixture. The certified value given below applies to the identified cylinder and NIST sample number.

Propane Concentration: 3.0482 $\mu\text{mol/mol}$ \pm 0.0084 $\mu\text{mol/mol}$

Cylinder Number: SAMPLE
Hydrotest Date: January 2013

NIST Sample Number: SAMPLE
Blend Date: November 2013

^(a) The certified value is expressed as $x \pm U_{95\%}(x)$, where x is the value and $U_{95\%}(x)$ is the expanded uncertainty of the value. The true value of the analyte lies within the interval $x \pm U_{95\%}(x)$ with 95 % confidence. For guidance in propagating this uncertainty, see reference 2.

Additional Information: Appendix A lists information on other components in the mixture.

Period of Validity: The certified value delivered by **SRM 1665b Lot No. 85-J-XX** has an expiration date of **18 October 2029**. The certified values are nullified if the material is stored or used improperly, damaged, contaminated, or otherwise modified or the internal pressure drops below the internal pressure drops below 0.7 MPa (100 psig).

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>).

Cylinder and Gas Handling Information: NIST recommends the use of a high-purity, two-stage pressure regulator with a stainless steel diaphragm and CGA-590 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.

Storage: This SRM should be stored under normal laboratory conditions within the temperature range of 15 °C to 30 °C.

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, designated as the SRM lot standard (LS). The LS was compared to NIST primary gravimetric standards using gas chromatography with a flame ionization detector (GC/FID). Each of the propane mixtures that comprise this SRM lot was then compared to the LS using GC/FID. Within the precision of the NIST measurements, all of the cylinders comprising this SRM lot have identical propane mole fractions.

CAS Registry Numbers: This SRM is certified for propane in air. The relevant CAS Registry numbers for these components are propane CAS Registry 74-98-6, and compressed air CAS Registry 132259-10-0. Other relevant CAS Registry numbers are provided in Appendix A.

NOTICE TO USERS

NIST strives to maintain the SRM inventory supply, but NIST cannot guarantee the continued or continuous supply of any specific SRM. Accordingly, NIST encourages the use of this SRM as a primary benchmark for the quality and accuracy of the user's in-house reference materials and working standards. As such, the SRM should be used to validate the more routinely used reference materials in a laboratory. Comparisons between the SRM and in-house reference materials or working measurement standards should take place at intervals appropriate to the conservation of the SRM and the stability of relevant in-house materials. For further guidance on how this approach can be implemented, contact NIST by email at srms@nist.gov.

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 (NIST SP) 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 Aug 2024).
- [2] Possolo, A.M.; *Evaluating, Expressing, and Propagating Measurement Uncertainty for NIST Reference Materials*; NIST Special Publication (NIST SP) 260-202; U.S. Government Printing Office: Washington, DC (2020); available at <https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.260-202.pdf> (accessed Aug 2024).

If you use this SRM in published work, please reference:

Cecelski C, Harris K, Goodman C, Kimes W, Liu Q, Miller W, Carney J (2021) Certification of NIST Gas Mixture Standard Reference Materials. (National Institute of Standards and Technology, Gaithersburg, MD), NIST Special Publication (SP) 260-222. <https://doi.org/10.6028/NIST.SP.260-222>

Certificate Revision History: 26 August 2024 (Change of period of validity; updated format; editorial changes); 31 July 2014 (Original certificate date).

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>.

*** * * * * End of Certificate of Analysis * * * * ***

SAMPLE

APPENDIX A

Values of Potential Interest to Users: Results for additional analyses performed during the certification process are given below. The concentrations reported are **NOT** certified values. A value of potential interest to users is considered to be a value for which insufficient information is available to assess adequately the uncertainty associated with the value, or only a limited number of analyses were performed [1]. Values of potential interest to users cannot be used to establish metrological traceability.

Balance Gas: The balance gas for SRM 1665b Lot 85-J-XX is air. The air composition includes:

Argon: The best estimate of the mole fraction of argon in this mixture is 0.96 % mol/mol. Argon was detected using gas chromatography with thermal conductivity detection (GC-TCD); argon CAS Registry 7440-37-1.

Carbon Dioxide: The best estimate of the mole fraction of carbon dioxide in this mixture is 389 $\mu\text{mol/mol}$. Carbon dioxide was detected using Gas chromatography with flame ionization detector and methanator (GC/FID/Meth); carbon dioxide CAS Registry 124-38-9.

Oxygen: The best estimate of the mole fraction of oxygen in this mixture is 20.9 % mol/mol. Oxygen was detected using a paramagnetic analyzer; oxygen CAS Registry 7782-44-7.

Nitrogen: Balance (CAS Registry 7727-37-9)

Trace Components: Trace components in SRM 1665b Lot 85-J-XX include:

Water: The mole fraction of water in this mixture is expressed as a maximum allowable purity level of $<1 \mu\text{mol/mol}$. While the best estimate of the water mole fraction lies within the interval [0 to 1] $\mu\text{mol/mol}$, this interval may not include the true value. Water was detected using an electrolytic analyzer; water CAS Registry 7732-18-5

Total Hydrocarbons expressed as Propane: The mole fraction of total hydrocarbons in this mixture is expressed as a maximum allowable purity level of $<10 \text{ nmol/mol}$. While the best estimate of the total hydrocarbons mole fraction lies within the interval [0 to 10] nmol/mol , this interval may not include the true value. Total hydrocarbons expressed as propane was detected using Total hydrocarbon analyzer (THC).

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