



National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material[®] 1800b

Eighteen Non-Methane Hydrocarbon Compounds in Nitrogen

(Nominal Amount-of-Substance Fraction – 5 nmol/mol)

This certificate reports the certified values for Lot 1800-B-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 non-methane hydrocarbon (NMHC) 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 m³ (25.8 ft³) of useable mixture. The cylinder is the property of the purchaser and is equipped with a CGA-350 stainless steel valve, which is the recommended outlet for this NMHC mixture.

Certified Value: This SRM mixture has been certified for individual NMHC concentration. The certified values, given in Table 1, apply to the identified cylinder and NIST sample number.

Cylinder Number: SAMPLE
Hydrotest Date: February 2003

NIST Sample Number: SAMPLE
Blend Date: April 2003

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 $k = 2$. The true value for the individual NMHC amount-of-substance fraction is asserted to lie in the interval defined by the certified value $\pm U$ with a level of confidence of approximately 95 % [3].

Expiration of Certification: The certification of **SRM 1800b Lot No. 1800-B-XX** is valid from this certificate issue date, within the measurement uncertainties specified, until **18 August 2016**, 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 °C to 30 °C.

The overall direction and coordination of the technical work required for certification of this SRM were performed by F.R. Guenther of the NIST Analytical Chemistry Division.

Stephen A. Wise, Chief
Analytical Chemistry Division

Robert L. Watters, Jr., Chief
Measurement Services Division

Gaithersburg, MD 20899
Certificate Issue Date: 15 July 2011
Certificate Revision History on Last Page

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The analytical measurements leading to the certification of the current SRM lot were performed by G.C. Rhoderick of the NIST Analytical Chemistry Division.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Measurement Services Division.

Table 1. Certified Values for Non-Methane Hydrocarbon Compound

Compound	Concentration nmol/mol (ppb)	CAS Registry Number
Ethane	SAMPLE ± SAMPLE	74-84-0
Propane	SAMPLE ± SAMPLE	74-98-6
Propene	SAMPLE ± SAMPLE	115-07-1
iso-Butane	SAMPLE ± SAMPLE	75-28-5
n-Butane	SAMPLE ± SAMPLE	106-97-8
iso-Butene	SAMPLE ± SAMPLE	115-11-7
iso-Pentane	SAMPLE ± SAMPLE	78-78-4
n-Pentane	SAMPLE ± SAMPLE	109-66-0
1-Pentene	SAMPLE ± SAMPLE	109-67-1
n-Hexane	SAMPLE ± SAMPLE	110-54-3
n-Heptane	SAMPLE ± SAMPLE	142-82-5
Benzene	SAMPLE ± SAMPLE	71-43-2
iso-Octane	SAMPLE ± SAMPLE	540-84-1
n-Octane	SAMPLE ± SAMPLE	111-65-9
Toluene	SAMPLE ± SAMPLE	108-88-3
Nonane	SAMPLE ± SAMPLE	111-84-2
ortho-Xylene	SAMPLE ± SAMPLE	95-47-6
Decane	SAMPLE ± SAMPLE	124-18-5

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) will facilitate notification.

Mixture Preparation: The gas mixtures comprising this SRM lot were prepared in accordance with NIST technical specifications by the NIST Gas Metrology Group. The specifications stipulate that each SRM mixture be individual in NMHC concentration and stable with time.

Analytical Methods: Analyses of the NMHC concentration for this lot of cylinders were conducted by comparing each cylinder mixture to a representative cylinder chosen from the lot, the lot standard (LS), using gas chromatography with flame-ionization detection (GC/FID). Assignment of the individual NMHC concentration to the LS was accomplished by comparison to primary gravimetric standards using GC/FID.

Homogeneity Analysis: Each of the NMHC mixtures that comprise this SRM lot was compared to the LS using GC/FID. A statistical analysis of the analytical results indicated that sample-to-sample NMHC concentration differences were statistically significant. This indicates that, within the precision of the NIST measurements, all of the cylinders comprising this SRM lot have different NMHC concentrations. Therefore, different concentrations have been assigned to each cylinder in this SRM lot.

NMHC Concentration Value Assignment: The certified NMHC 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 NMHCs in nitrogen, CAS Registry number: 7727-37-9. NMHC CAS Registry Numbers are listed in Table 1, above.

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 <http://www.nist.gov/pml/pubs/index.cfm/> (accessed July 2011).
- [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: Gaithersburg, MD (2000); available at <http://www.nist.gov/srm/publications.cfm> (accessed July 2011).
- [3] JCGM 100:2008; *Evaluation of Measurement Data — Guide to the Expression of Uncertainty in Measurement (ISO GUM 1995 with Minor Corrections)*; Joint Committee for Guides in Metrology (JCGM) (2008); available at http://www.bipm.org/utls/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed July 2011); 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 <http://www.nist.gov/pml/pubs/index.cfm> (accessed July 2011).

Certificate Revision History: 15 July 2011 (Extension of certification period and editorial changes); 07 October 2004 (Original certificate date).

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) 926-4751; e-mail srminfo@nist.gov; or via the Internet at <http://www.nist.gov/srm>.