



# National Institute of Standards & Technology

## Certificate of Analysis

### Standard Reference Material 1813

Carbon Tetrachloride, Chloroform, Tetrachloroethylene,  
and Vinyl Chloride in Nitrogen

(Nominal Concentration - 0.25  $\mu\text{mol/mol}$ )

(Stationary-Source Emission Gas Standard)

This Standard Reference Material (SRM) is intended for use in the calibration of instruments for the determination of volatile chlorinated aliphatic hydrocarbons (carbon tetrachloride, chloroform, tetrachloroethylene, and vinyl chloride) in stationary-source emissions. SRM 1813 consists of a mixture of these hydrocarbons in high purity nitrogen. It is not intended as a working standard, but rather as a primary standard to which the concentrations of the daily working standards may be related.

This SRM is supplied in an aluminum cylinder at a nominal pressure of 12.4 MPa (1800 psi) with a deliverable volume of 0.88 m<sup>3</sup> (31 ft<sup>3</sup>) at normal temperature and pressure. The cylinder conforms to DOT specifications and is equipped with a CGA-350 valve. The cylinder becomes the property of the purchaser.

Carbon Tetrachloride:	$\pm$	$\mu\text{mol/mol}$
Chloroform:	$\pm$	$\mu\text{mol/mol}$
Tetrachloroethylene:	$\pm$	$\mu\text{mol/mol}$
Vinyl Chloride:	$\pm$	$\mu\text{mol/mol}$

Cylinder number:

Sample number:

The certified concentration of each of these four chlorinated aliphatic hydrocarbons is relative to all other constituents of this gas mixture. The uncertainty shown is the estimated upper limit of error of each hydrocarbon concentration at the 95% confidence interval. This uncertainty includes the estimated inaccuracy of the NIST primary gravimetric standards, the imprecision of the intercomparisons of the batch standards, and the imprecision of the comparison of the SRM with the batch standards.

The certified value on this certificate is valid for 2 years from the date of shipment from the National Institute of Standards and Technology (NIST). A validation sticker is supplied with each gas cylinder to validate its certification period. Please affix this sticker to the cylinder upon the receipt of the SRM.

The original development and evaluation of this Standard Reference Material was performed at NIST by W.C. Cuthrell, W.L. Zielinski, and H.L. Rook.

The overall direction and coordination of the technical measurements leading to the certification were performed in the NIST Organic Analytical Research Division by W.D. Dorko, F.R. Guenther, and W.E. May.

The technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by T.E. Gills.

Gaithersburg, MD 20899

February 3, 1993

(Revision of certificate dated 3-16-87)

William P. Reed, Chief  
Standard Reference Materials Program

(over)

**CAUTION:** Care must be taken to avoid contamination of the sample during the use of the cylinder with any gas handling system.

Each cylinder of gas is individually analyzed, and the concentration given above applies only to the cylinder identified by cylinder number and sample number on this certificate.

#### Material Preparation

The cylinder identified on this certificate is one of a group or "lot" of cylinders. A lot contains a minimum of 50 cylinders and is prepared commercially according to rigid specifications to ensure that the lot is homogeneous and stable. Each cylinder in the lot is individually analyzed at NIST for the contents of carbon tetrachloride, chloroform, tetrachloroethylene, and vinyl chloride.

#### Analysis

The concentration of each of the chlorinated aliphatic hydrocarbons in this SRM was determined by comparison with the NIST batch standards that had been previously intercompared with a set of NIST primary gravimetric standards. The intercomparisons were performed using a gas chromatograph equipped with a flame ionization detector. Typical analyses involves the use of a gas sampling valve and a chromatographic column, such as a [305 cm by 0.32 cm (10 ft by 1/8 in)] stainless steel column packed with 20% SP-2100 and 0.1% Carbowax 1500 on (125-150  $\mu$ m mesh) Supelcoport, operated at a column temperature of 130 °C and nitrogen carrier gas flow rate of 50 mL/min.

#### Stability

The stability of this SRM is considered excellent and no changes in concentration have been observed for similar samples contained in aluminum cylinders for periods of time greater than 2 years. The value appearing on this certificate is considered valid for 2 years from date of shipment. Periodic reanalyses of representative samples from this lot will be performed, and if significant changes are observed within a 2-year period, the purchaser will be notified.

Samples from similar gas mixtures have exhibited a change in constituent concentration when the cylinder pressure fell below 1.04 MPa (150 psi). Therefore, it is recommended that the SRM not be used after the pressure has fallen below 2.1 MPa (300 psi).

#### Reanalysis

The NIST will reanalyze this SRM for the original purchaser for a fee not to exceed the analytical cost of similar SRMs available at the time of the request for reanalysis, providing the cylinder pressure is at least 6.9 MPa (1000 psi). The original purchaser should contact the NIST Organic Analytical Research Division (301) 975-3108 to arrange for this service.