

**National Bureau of Standards**  
**Certificate of Analysis**  
**Standard Reference Material 1681**  
**Carbon Monoxide in Nitrogen**  
**(Mobile-Source Emission Gas Standard)**

This Standard Reference Material is intended for use in the calibration of instruments used for the analysis of carbon monoxide in mobile-source emissions and related uses. It is not intended as a daily working standard, but rather as a primary standard to which the concentration of the daily working standards may be related.

Carbon monoxide concentration:  $957 \pm 9$  parts per million by volume.

The concentration of carbon monoxide is relative to all other constituents of the gas.

Each cylinder of gas is individually analyzed, but the concentration appearing on this certificate applies to all samples within the lot. The concentration of all samples in the lot fell within a limit of  $\pm 0.2$  percent of the average for the lot and all samples are considered identical within the stated limits of accuracy.

The carbon monoxide in nitrogen mixtures were prepared by the Precision Gas Products Company of Rahway, New Jersey.

Chemical analyses leading to the certification of this Standard Reference Material were performed by E. C. Kuehner, W. P. Schmidt, and W. D. Dorko.

The overall direction and coordination of the technical measurements leading to certification were performed under the chairmanship of E. E. Hughes and J. K. Taylor.

The technical and support aspects involved in the preparation, certification, and issuance of this Standard Reference Material were coordinated through the Office of Standard Reference Materials by T. W. Mears.

Washington, D.C. 20234  
April 12, 1974

J. Paul Cali, Chief  
Office of Standard Reference Materials

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## Analysis

Carbon monoxide in the Standard Reference Material was determined by comparison with a secondary standard that had been previously intercompared with a set of primary gravimetric standards. The method of intercomparison involved catalytic reduction of carbon monoxide with hydrogen and subsequent analysis of the resulting methane with a flame-ionization hydrocarbon analyzer. The relative imprecision of intercomparison is less than 0.4 percent, which is the 95 percent confidence interval of the mean ( $t\sigma/\sqrt{n}$ ) based on 56 measurements, and the inaccuracy of the primary standard is considered to be less than 1 percent of the amount of carbon monoxide present.

## Stability:

These samples are contained in cylinder lined with a thin coat of ceresin wax. The stability is considered good and no loss of concentration has been observed over a three month period. However, the value appearing on this certificate is considered valid for only 1 year from date of purchase. Periodic reanalyses of representative samples from this lot will be performed, and if significant changes are observed within the 1 year period the purchasers of other samples from the lot will be notified. Validation of the concentration of carbon monoxide in cylinders which have been in the possession of the purchasers for more than one year can be made by the National Bureau of Standards on a cost reimbursement basis if more than 500 psi remains in the cylinder.

## Precaution:

This cylinder should not be reused or refilled. If the user is unable to dispose of the cylinder it may be returned to the National Bureau of Standards for disposal.

## Cylinder:

These gases are supplied in cylinders at 1800 psi pressure with a delivered volume of 31 cubic feet at STP. The cylinders conform to the DOT 3AA-2015 specification and are equipped with CGA-580 valves.