

# National Bureau of Standards

## Certificate

### Standard Reference Material 2638

#### Carbon Monoxide in Nitrogen

#### (Mobile- Source Emission Gas Standard)

(In Cooperation with the Motor Vehicle Manufacturers Association)

This Standard Reference Material is a gas mixture of carbon monoxide in high purity nitrogen and is supplied in high-pressure, compressed gas cylinders. The statistical uncertainty in each step of the preparation and analysis of this mixture has been carefully evaluated at the 95% confidence level. This Standard Reference Material should be used sparingly as a valuable primary standard to which daily working standards may be related.

Carbon monoxide concentration:  $\pm$   $\mu\text{mol/mol}$  (ppm)

Cylinder number: \* Sample number:

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  $\pm 0.3$  percent of the average for the lot and all samples are considered identical within the stated limits of accuracy.

The research and development leading to the certification of this Standard Reference Material were supported by the Motor Vehicle Manufacturers Association of the United States, Inc. (MVMA), Detroit, Michigan.

The development and evaluation of the gravimetric primary standards used to certify this Standard Reference Material were performed at the National Bureau of Standards by MVMA Research Associates W. R. Miller and W. J. Thorn.

The overall direction and coordination of the technical measurements leading to certification were performed under the chairmanship of E. E. Hughes and H. L. Rook of the NBS Gas and Particulate Science Division.

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. E. Gills.

Washington, D.C. 20234  
October 2, 1979

George A. Uriano, Chief  
Office of Standard Reference Materials

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**Analysis:**

Carbon monoxide in this Standard Reference Material was determined by comparison with a batch standard that had been previously intercompared with a set of primary gravimetric standards. The intercomparison involved measurements by a nondispersive infrared technique and/or by gas chromatography. The imprecision of intercomparison is less than 0.2 percent relative and the inaccuracy of the primary gravimetric standard is less than 0.4% relative. The upper limit of the total uncertainty including both the imprecision of intercomparison and the inaccuracy of the gravimetric standards is less than 1% relative at the 95% confidence level.

**Stability:**

These samples are contained in aluminum cylinders. The stability is considered excellent and no losses of carbon monoxide have been observed for similar samples contained in aluminum cylinders for periods of time greater than 3 years. However, the value appearing on this certificate is considered valid for only 2 years from date of purchase. Periodic reanalyses of representative samples from this lot will be performed, and if significant changes are observed within the 2 year period the purchasers of other samples from the lot will be notified.

**Cylinder:**

These gases are supplied in cylinders at 12.4 MPa (1800 psi) pressure with a delivered volume of 0.88 m<sup>3</sup> (31 cubic feet) at STP. The cylinders conform to a DOT specification and are equipped with CGA-350 valves.

These cylinders are the property of the purchaser. However, if desired they may be returned, prepaid, to the National Bureau of Standards for disposal.