. Department of Commerce
C. William Verity
Secretary

National Bureau of Standards
Ernest Ambler, Director

National Bureau of Standards

Certificate of Analysis

Standard Reference Material 1911

Benzene Permeation Device

This Standard Reference Material (SRM) consists of a benzene permeation device, individually calibrated, for use in the preparation of gases of known benzene content. SRM 1911 is intended for the standardization of air pollution and related chemical analyses.

Serial Number_____ Calibrated by_____ Date_____

The certified permeation rate in micrograms of benzene per minute at 25.0 °C is:_____.

The uncertainty given for this value is the 95 percent confidence limit of the mean of 20 measurements of the rate. The certified value is considered valid within the limits shown for a period of one year from the date of shipment from the National Bureau of Standards.

The overall direction and coordination of the technical effort leading to the certification of this Standard Reference Material were performed under the chairmanship of G.C. Rhoderick and H.L. Rook of the Gas and Particulate Science Division of the Center for Analytical Chemistry.

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

USE:

This device can be used to produce known concentrations of benzene in air or another gas by placing the device in a stream of the pure, dry air or gas flowing at a known rate and at a known constant temperature. The accuracy of the concentration produced depends not only on the accuracy of the certified permeation rate, but also on the accuracy with which the purity of the gas, the rate of flow, and the temperature are known. Systems for generating known concentrations using permeation devices are described in ASTM D-2914.

When the device is first placed in service, a period of at least 24 hours should be allowed for equilibration at the temperature at which it is to be used. NOTE: See "Precautions and Storage" below. It is recommended that the device be used at the calibration temperature of 25.0 °C, but if the temperature does not vary more than 5 °C from 25 °C, an adjustment to the rate may be made according to the equation:

$$\text{Log } R_T = \text{Log } R_{25} + 0.0359(T-25.0)$$

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Stanley D. Rasberry, Chief
Office of Standard Reference Materials

(over)

where R_T is the permeation rate of the device at the temperature of use, T, and R_{25} is the certified rate of the device at 25.0 °C. The constant, 0.0359, was empirically determined using observations of the temperature-rate relationships for identical devices at temperatures between 25 and 40 ° C. The additional uncertainty in the calculated value for the rate at temperatures of 1 °C above or below 25.0 °C is approximately ± 1.0 percent; and between 1 °C and 5 °C above or below 25.0 °C, the added uncertainty is ± 5 percent of the certified rate.

PRECAUTIONS AND STORAGE:

The polymers of which this tube is constructed will absorb organic compounds (including benzene) if exposed to high concentrations of these compounds during storage. Subsequent desorption of these compounds during use may result in a concentration different from that predicted by the certified rate. It is therefore essential that upon receipt this device be removed from the shipping container and stored in a chamber through which a slow flow of air or gas is continuously passed. Low temperature storage of the device is not recommended. The exposure of the device to temperatures greater than 35 °C may permanently change the permeation rate from the certified value.

CALIBRATION:

This device was individually calibrated by gravimetric determination of the weight loss at 25.0 °C. The device was held at this temperature for a period of not less than three months during which time measurements of weight were made. Each device was also compared with primary gas standards using a gas chromatograph equipped with a flame ionization detector (GC/FID) to determine any systematic error associated with the gravimetric calibration.

In addition, each device was placed into a gas flow system where it was maintained at a constant temperature (25 °C) and had a constant rate of clean, dry nitrogen passing over it. The output of this system was delivered to a GC/FID with which the benzene response was measured. The response was intercompared to that of a similar device selected and maintained at NBS as a standard, and a ratio of the responses was established. This intercomparison is made again just prior to shipment.

The NBS permeation standard is kept in a constant temperature bath (25 °C) with a stream of clean, dry nitrogen passing over it and its permeation rate is periodically determined by gravimetry.