U. S. Department of Commerce
Philip M. Klutznick
Secretary

National Bureau of Standards
Ernest Ambler, Director

National Bureau of Standards

Certificate of Analysis

Standard Reference Materials 1636a, 1637a, 1638a

Lead in Reference Fuel

This Standard Reference Material is intended for use in the calibration of instruments and the evaluation of techniques used for the analysis of lead in gasoline. Samples of the reference fuel are supplied at four lead concentrations, nominally 0.03, 0.05, 0.07, and 2.0 g/gal. These Standard Reference Materials are made up of various combinations of the four concentrations, see Table 1 on the back of this certificate.

Certified Values: The certified values for the lead content, expressed in units of $\mu g/g$, are shown below. These certified values are based on results obtained by isotope dilution mass spectrometry, a definitive method of known accuracy.

Vial Identification	Nominal Lead Concentration g/gal	Certified Lead Concentration $\mu g/g$
I	0.03	11.2 ± 0.2[a]
II	0.05	18.8 ± 0.1
III	0.07	25.1 ± 0.2
IV	2.0	764 ± 4

[a]The uncertainties shown are the 95 percent confidence intervals for a single determination plus allowance for known sources of possible error.

Use: The certification of these materials is based on a minimum sample size of 1.0 gram and only samples equal to or greater than 1 gram should be used for any analytical determination to be related to the certified values of this certificate.

Stability: The ampoules should be stored at temperatures between 10-30 °C. They should not be exposed to intense sources of radiation, including ultraviolet lamps or sunlight. The ampoules should be opened only at time of use. No attempt should be made to keep the material in opened ampoules for future use.

Source and Preparation of Material: The reference fuel containing lead at the four concentration levels were supplied by Phillips Petroleum Company of Bartlesville, Oklahoma. The 91-octane number (Research Octane Number) reference fuel is a mixture of 91 percent by volume (0.899 mole-fraction) 2,2,4,-trimethylpetane and 9 percent by volume (0.101 mole-fraction) n-heptane. Lead was added in the form of tetraethyl lead motor mix.

Analyses leading to certification were performed in the Inorganic Analytical Research Division by T. J. Murphy and I. L. Barnes.

The overall direction and coordination of the technical measurements leading to this certificate were performed by E. L. Garner, Chief of the Inorganic Analytical Research Division.

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

Washington, D.C. 20234
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George A. Uriano, Chief
Office of Standard Reference Materials

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Table 1

Composition of SRM's 1636a, 1637a, 1638a

SRM	Nominal Concentration	No. Units.
1636a	0.03,0.05,0.07, 2.0 g/gal	3 vials each
1637a	0.03,0.05,0.07 g/gal	4 vials each
1638a	2.0 g/gal	12 vials each

Additional Information: Because the volume of the reference material varies with temperature, the various concentrations of lead are certified by weight, i.e.,micrograms of lead per gram of fuel. For convenience to the user, information is given for the concentration in the customary units, grams per gallon and grams per liter, at 23 °C. These data are shown in Table 2.

Table 2

Vial Identification	Nominal Concentration g/gal	Density[a] at 23 °C g/mL	Lead Concentration[b] at 23 °C g/gal	g/L
I	0.03	0.6888	0.0292	0.0077
II	0.05	0.6888	0.0490	0.0129
III	0.07	0.6888	0.0654	0.0173
IV	2.0	0.6895	1.994	0.527

[a]The density (ρ) of each concentration was measured at 23 °C using a modification of ASTM Method D1217. The temperature coefficient of these materials is 0.0008 $g.(mL)^{-1}\cdot(°C)^{-1}$

[b]The conversion of the certified values ($\mu g/g$) to C(g/gal) and C(g/L) was done using equations 1 and 2 respectively.

Eq. 1 $$C_{g/gal} = \frac{3.785 \quad \rho \, C_{\mu g/g}}{10^3}$$

Eq. 2 $$C_{g/L} = \frac{\rho \, C_{\mu g/g}}{10^3}$$