

National Bureau of Standards

Certificate of Analysis

Standard Reference Material 1634b

Trace Elements in Fuel Oil

This Standard Reference Material (SRM) is intended for use in the evaluation of methods and the calibration of apparatus used for the determination of trace elements in fuel oils and other materials of similar matrices. SRM 1634b is a commercial "No. 6" residual fuel oil as defined by the American Society for Testing and Materials (ASTM). This SRM was certified using two or more independent methods of analysis. Methods were selected to include those that are commonly used in analytical laboratories.

The certified values are given in Table 1 along with methods used for certification. Noncertified values are given in Table 2 and are provided for information only.

Notice and Recommended Use:

It is recommended that the SRM be shaken vigorously or stirred with a clean stirrer before sampling. Tests at NBS indicate that the best results are achieved when the material is shaken or stirred before use.

Certification of this SRM is based on a minimum sample size of 1g. This determination was based on homogeneity studies by x-ray fluorescence as well as on data from certification analyses. Therefore, a minimum sample size of 1g of the SRM should be used to assure that the sample analyzed represents the certified values as shown on this certificate.

Table 1

Element ¹	Content, $\mu\text{g/g}^2$	Element ¹	Content, Wt. % ²
Arsenic ^{b,c}	0.12 ± 0.02	Sulfur ^{d,g,h}	2.80 ± 0.05
Cobalt ^{b,c}	0.32 ± 0.04		
Iron ^{a,b,c}	31.6 ± 2.0*		
Manganese ^{b,c}	0.23 ± 0.03		
Nickel ^{a,f,c}	28 ± 2*		
Selenium ^{a,b}	0.18 ± 0.04		
Vanadium ^{a,b,c}	55.4 ± 1.1*		
Zinc ^{b,c}	3.0 ± 0.2*		

¹Methods of Analysis

^a Isotope Dilution Mass Spectrometry

^b Neutron Activation Analysis

^c Atomic Absorption Spectrometry

^d Ion Chromatography

^e X-Ray Fluorescence

^f Direct Current Plasma Emission Spectrometry

^g ASTM D-129, Bomb Combustion Methods

^h Commercial Sulfur Analyzer

ⁱ Calorimetry

^j ASTM D-482

²The listed ± uncertainties, unless noted otherwise, are two standard deviations of the certified values. [1] The listed uncertainties primarily reflect the variabilities between methods of chemical analysis.

*This uncertainty is partially based on statistical evaluation. Additional scientific judgments were used to determine the uncertainty limits.

NOTICE: The certification of SRM 1634b is valid for 2 years from date of purchase.

The statistical analysis of the certification data was performed by R.C. Paule of the National Measurement Laboratory.

The overall direction and coordination of the analytical measurements leading to certification were performed in the Inorganic Analytical Research Division, J.R. DeVoe, Chief.

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.

February 3, 1986
 Gaithersburg, MD 20899

Stanley D. Rasberry, Chief
 Office of Standard Reference Materials

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PREPARATION, TESTING, AND ANALYSIS

This SRM is a "No. 6" residual fuel oil that has a flash point of 64 °C and a kinematic viscosity value of 321.66 cSt at 50 °C. The SRM unit consists of 100 mL of the fuel oil contained in an amber glass bottle. The SRM units were sampled from the bulk oil contained in a 55-gallon steel drum.

Long-term stability of this SRM has not been rigorously established. When not in use, the material should be stored in the tightly sealed bottle. NBS will continue to monitor this material and any substantive change in its certification values will be reported to the purchasers.

Analyses for the various elements were performed in the Center for Analytical Chemistry, Inorganic Analytical Research Division, by D.A. Becker, W.A. Bowman, K.A. Brletic, T.A. Butler, M.S. Epstein, J.D. Fassett, H.M. Kingston, W.F. Koch, L.A. Machlan, J.R. Moody, T.C. Rains, T.A. Rush, and R.L. Zeisler.

The homogeneity studies were performed in the Center for Analytical Chemistry, Gas and Particulate Science Division by P.A. Pella, and M. Watson.

Supplemental Information

The analytical values and physical properties reported in Table 2 are *not certified* because they were not determined by at least two or more reliable and independent methods. These values are provided for information only.

Table 2

Element ¹	Content ² , $\mu\text{g/g}$	Physical Properties ¹	
		Heating Value ⁱ	Ash Content ^j
Aluminum ^b	(16)	42.1 MJ·kg ⁻¹	0.07 Wt. %
Barium ^c	(1.3)	(18100 Btu·lb ⁻¹)	
Calcium ^a	(15)		
Chromium ^b	(0.7)		
Lead ^a	(2.8)		
Sodium ^b	(90)		
Mercury ^c	(<0.001)		

Note: See Footnotes in Table 1.

Reference

1. Paule, R.C. and John Mandel, Consensus Values and Weighting Factors, J. Research of the National Bureau of Standards Vol. 87, No. 5, pp 377-385, 1982.