

National Bureau of Standards

Certificate of Analysis

Standard Reference Material 1634

Trace Elements in Fuel Oil

This Standard Reference Material is intended for use in the calibration of apparatus and evaluation of methods used in analyses of fuel oil and other materials with similar matrices for trace elements. When not in use, the material should be kept in a tightly sealed bottle. Long term stability of this SRM has not been rigorously established. NBS will continue to monitor this material and any substantive change will be reported to purchasers.

The certified values given below are based on at least a 250-mg sample of the material, the minimum amount that should be used for analysis.

Constituent	Certified Value ¹	Estimated Uncertainty ²
	<u>Percent by Weight</u>	
Sulfur	2.14 ^{a b}	0.02
	<u>µg/g</u>	
Vanadium	320 ^{a c}	15
Nickel	36 ^{c d e}	4
Iron	13.5 ^{a c e}	1.0
Zinc	0.23 ^{a e}	0.05
Lead	.041 ^{d e}	.005

- The certified values are based on the results of 4 to 15 determinations by each of at least two analytical techniques.
 - Neutron Activation
 - Combustion with Titrimetry
 - Atomic Absorption Spectrometry
 - Isotope Dilution Mass Spectrometry
 - Polarography
- The estimated uncertainties are not less than the 95% confidence limits computed for the analyses and include sample variations, possible method differences, and errors of measurement.

The overall direction and coordination of the analytical measurements leading to certification were performed in the Analytical Chemistry Division under the chairmanship of P. D. LaFleur and D. A. Becker.

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 C. L. Stanley.

PREPARATION, TESTING, and ANALYSIS

The material was obtained through a commercial supplier from a refinery on the island of Aruba in the West Indies, and is essentially a "No. 6 Fuel Oil" as defined by the American Society for Testing and Materials.

A random scheme for sample selection was designed and a statistical analysis of the homogeneity data was performed by J. Mandel of the NBS Institute for Materials Research. Fifteen of 500 bottles were selected for homogeneity tests. These samples were analyzed for vanadium by nondestructive neutron activation analysis. Replicate analyses on 250-mg samples indicated homogeneity within $\pm 2\%$ (relative) based on this element. X-ray fluorescence analyses for sulfur on bulk samples before bottling support the conclusion of acceptable material homogeneity. The homogeneity analyses were performed in the NBS Analytical Chemistry Division by T. E. Gills, M. Darr, and R. Myklebust. Analyses for the various elements were made in the NBS Analytical Chemistry Division by the following analysts: R. W. Burke, B. S. Carpenter, M. S. Epstein, E. L. Garner, T. E. Gills, J. W. Gramlich, L. A. Machlan, E. J. Maienthal, T. J. Murphy, E. Orvini, T. C. Rains, H. L. Rook, T. A. Rush, and S. A. Wicks.

The following values are not certified because they are based on a non-reference method, or were not determined by two or more independent methods. They are included for information only.

Constituent	Content ¹
	<u>$\mu\text{g/g}$</u>
Arsenic	(0.095) ^a
Beryllium	(<.01) ^b
Cadmium	(<.01) ^{a c}
Chromium	(.09) ^a
Mercury	(.0023) ^a
Manganese	(.12) ^a

1. These values are not certified.

- a. Neutron Activation
- b. Spectrophotometry
- c. Polarography