Designation: D6732 – 04 (Reapproved 2015)

Standard Test Method for Determination of Copper in Jet Fuels by Graphite Furnace Atomic Absorption Spectrometry[1]

This standard is issued under the fixed designation D6732; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of copper in jet fuels in the range of 5 µg/kg to 100 µg/kg using graphite furnace atomic absorption spectrometry. Copper contents above 100 µg/kg may be determined by sample dilution with kerosine to bring the copper level into the aforementioned method range. When sample dilution is used, the precision statements do not apply.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D4306 Practice for Aviation Fuel Sample Containers for Tests Affected by Trace Contamination

D6299 Practice for Applying Statistical Quality Assurance and Control Charting Techniques to Evaluate Analytical Measurement System Performance

3. Terminology

3.1 *Definitions:*

3.1.1 *radiant power, P, n*—the rate at which energy is transported in a beam of radiant energy.

3.1.2 *transmittance, T, n*—the ratio of the radiant power transmitted by a material to the radiant power incident upon it.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *absorbance, A, n*—the logarithm to the base 10 of the ratio of the reciprocal of the transmittance, T:

$$A = \log_{10}(1/T) = -\log_{10}T \quad (1)$$

3.2.2 *integrated absorbance, A_i, n*—the integrated area under the absorbance peak generated by the atomic absorption spectrometer.

4. Summary of Test Method

4.1 The graphite furnace is aligned in the light path of the atomic absorption spectrometer equipped with background correction. An aliquot (typically 10 µL) of the sample is pipetted onto a platform in the furnace. The furnace is heated to low temperature to dry the sample completely without spattering. The furnace is then heated to a moderate temperature to eliminate excess sample matrix. The furnace is further heated very rapidly to a temperature high enough to volatilize the analyte of interest. It is during this step that the amount of light absorbed by the copper atoms is measured by the spectrometer.

4.2 The light absorbed is measured over a specified period. The integrated absorbance A_i produced by the copper in the samples is compared to a calibration curve constructed from measured A_i values for organo-metallic standards.

5. Significance and Use

5.1 At high temperatures aviation turbine fuels can oxidize and produce insoluble deposits that are detrimental to aircraft propulsion systems. Very low copper concentrations (in excess of 50 µg/kg) can significantly accelerate this thermal instability of aviation turbine fuel. Naval shipboard aviation fuel delivery systems contain copper-nickel piping, which can increase copper levels in the fuel. This test method may be used for quality checks of copper levels in aviation fuel samples taken on shipboard, in refineries, and at fuel storage depots.

6. Interferences

6.1 Interferences most commonly occur due to light that is absorbed by species other than the atomic species of interest.

[1] This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricantsand is the direct responsibility of Subcommittee D02.03 on Elemental Analysis.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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