Designation: D 6130 – 97a

Standard Test Method for Determination of Silicon and Other Elements in Engine Coolant by Inductively Coupled Plasma-Atomic Emission Spectroscopy[1]

This standard is issued under the fixed designation D 6130; 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 silicon in engine coolant by inductively coupled plasma-atomic emission spectroscopy (ICP-AES). Silicon can be determined as low as the range of 5 ppm by this test method. Other elements also found in engine coolant can be determined by this method. This test method is applicable to the determination of dissolved or dispersed elements.

1.2 This test method is applicable to both new and used engine coolant.

1.3 The values stated in SI units are to be regarded as the standard.

1.4 *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:*

D 1193 Specification for Reagent Water[2]

D 1176 Standard Practice for Sampling and Preparing Aqueous Solutions of Engine Coolants or Antirusts for Testing Purposes[3]

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method[4]

2.2 *US EPA Standards:*

Method 6010, Inductively Coupled Plasma Method, SW-846, Test Methods for Evaluating Solid Waste[5]

Method 200.7, Inductively Coupled Plasma - Atomic Emission Spectrometric Method for Trace Element Analysis of Water And Wastes, EPA-600/4-79-020, revised 1984[5]

3. Summary of Test Method

3.1 Elements in solution are determined, either sequentially or simultaneously, by ICP-AES. New or used engine coolants are prepared by dilution. Samples and standards are introduced to the nebulizer using a peristaltic pump and the aerosol is injected into an argon-supported inductively coupled plasma. The high temperature of the plasma atomizes the sample and produces atomic emission intensities at wavelengths associated with the desired elements. Emission intensity is proportional to concentration. Elemental determinations are made by comparing standard and sample emission intensities.

4. Significance and Use

4.1 Some engine coolants are formulated with silicon containing additives. This test method provides a means of determining the concentration of dissolved or dispersed elements which give an indication of this additive content in the engine coolant.

5. Interferences

5.1 Interferences may be categorized as follows:

5.1.1 *Spectral*—Light emission from spectral sources other than the element of interest may contribute to apparent net signal intensity. Sources of spectral interference include direct spectral line overlaps, broadened wings of intense spectral lines, ion-atom recombination continuum emission, molecular band emission and stray (scattered) light from the emission of elements at high concentrations. Avoid overlaps by selecting alternate analytical wavelengths.

5.1.2 *Physical*—Physical interferences are effects associated with sample nebulization and transport processes such as viscosity and particulate contamination.

5.1.3 *Background*—High background effects from scattered light, etc., can be compensated for by background correction adjacent to the analyte line.

5.1.4 *Chemical*—Chemical interferences are caused by molecular compound formation, ionization effects, and thermochemical effects associated with sample vaporization and atomization in the plasma. Normally these effects are not

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[1] This test method is under the jurisdiction of ASTM Committee D15 on Engine Coolants and is the direct responsibility of Subcommittee D15.04 on Chemical Properties.

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[2] *Annual Book of ASTM Standards*, Vol 11.01.

[3] *Annual Book of ASTM Standards*, Vol 15.05.

[4] *Annual Book of ASTM Standards*, Vol 14.02.

[5] Available from U. S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, OH 45268.