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Designation: D 6071 – 96

Standard Test Method for Low Level Sodium in High Purity Water by Graphite Furnace Atomic Absorption Spectroscopy [1]

This standard is issued under the fixed designation D 6071; 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 trace sodium in high purity water. The method range of concentration is 1 to 40 µg/L sodium. The analyst may extend the range once its applicability has been ascertained.

NOTE 1—It is necessary to perform replicate analysis and take an average to accurately determine values at the lower end of the stated range.

1.2 This test method is a graphite furnace atomic absorption spectrophotometric method for the determination of trace sodium impurities in ultra high purity water.

1.3 This test method has been used successfully with a high purity water matrix.[2] It is the responsibility of the analyst to determine the suitability of the test method for other matrices.

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 1066 Practice for Sampling Steam[3]

D 1129 Terminology Relating to Water[3]

D 1192 Specification for Equipment for Sampling Water and Steam in Closed Conduits[3]

D 1193 Specification for Reagent Water[3]

D 2777 Practice for Determination of Precision and Bias of Applicable Test Methods of Committee D-19 on Water[3]

D 3370 Practices for Sampling Water from Closed Conduits[3]

D 3919 Practice for Measuring Trace Elements in Water by Graphite Furnace Atomic Absorption Spectrophotometry[3]

D 4453 Practice for Handling of Ultra-Pure Water Samples[3]

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this test method, refer to Terminology D 1129.

4. Summary of Test Method

4.1 Sodium is determined by atomic absorption utilizing a graphite furnace for sample atomization.

4.2 A sample volume of several microlitres, depending upon the concentration of the analyte, is deposited on a graphite tube housed within an electrical furnace, and the system is heated in an inert gas environment. The sample is evaporated to dryness, ashed (charred or pyrolyzed), and atomized.

4.3 Ground-state atoms are produced during the atomization stage of the temperature program. The ground-state atoms absorb the energy at a specific wavelength produced from a source as they are bombarded by the energy. The amount of energy absorbed is proportional to the concentration of the analyte in the sample.

4.4 The absorption signal produced during atomization is recorded on a chart recorder or stored in microprocessor memory and compared to those standards taken through the same process by means of an analytical curve.

4.5 A general guide for graphite furnace applications is given in Practice D 3919.

5. Significance and Use

5.1 Small quantities of sodium, 1 to 10 µg/L, can be significant in high pressure boiler systems and in nuclear power systems. Steam condensate from such systems must have less than 10 µg/L. In addition, condensate polishing system effluents should have less than 1 µg/L. Graphite furnace atomic absorption spectroscopy (GFAAS) represents technique for determining low concentrations of sodium.

6. Interferences

6.1 No known interferences from other constituents are found in high purity waters.

6.2 For a complete discussion on interferences with graphite furnace procedures, refer to Practice D 3919.

6.3 Sodium is a common contaminant in many reagents. The analyst must ensure that the quality of the reagent used in the procedure is sufficiently high to determine trace levels of sodium.

6.4 All plasticware and apparatus must be cleaned and maintained to eliminate high background levels of sodium

[1] This test method is under the jurisdiction of ASTM Committee D-19 on Water and is the direct responsibility of Subcommittee D19.11 on Water for Power Generation and Process Use.

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[2] RP2712 Sub Program—Grab Sample Method Validation Report Results, Electric Power Research Institute, Palo Alto, CA 1987.

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

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