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AMERICAN SOCIETY FOR TESTING AND MATERIALS
100 Barr Harbor Dr., West Conshohocken, PA 19428
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Standard Test Method for Vanadium in Water¹

This standard is issued under the fixed designation D 3373; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method covers the determination of dissolved and total recoverable vanadium in most waters and wastewater by graphite furnace atomic absorption spectrophotometry.

1.2 The optimum range of this test method is 10 to 200 $\mu\text{g/L}$ of vanadium based on a 20- μL sample size. Concentrations higher than 200 $\mu\text{g/L}$ may be determined by proper dilution of sample. A detection level as low as 4 $\mu\text{g/L}$ of vanadium has been reported.

1.3 This test method has been used successfully with reagent water, lake water, tap water, river water, condensate from a medium Btu coal gasification process, and well water. It is the user's responsibility to ensure the validity of this test method for waters of untested 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 or regulatory limitations prior to use.*

1.5 Former Test Method A (Catalytic) was discontinued. Refer to Appendix X1 for historical information.

2. Referenced Documents

2.1 ASTM Standards:

- D 1066 Practice for Sampling Steam²
- D 1129 Terminology Relating to Water²
- D 1192 Specification for Equipment for Sampling Water and Steam in Closed Conduits²
- D 1193 Specification for Reagent Water²
- D 2777 Practice for Determination of Precision and Bias of Applicable Methods of Committee D-19 on Water²
- D 3370 Practices for Sampling Water from Closed Conduits²
- D 3919 Practice for Measuring Trace Elements in Water by Graphite Furnace Atomic Absorption Spectrophotometry²
- D 4841 Practice for Estimation of Holding Time for Water Samples Containing Organic and Inorganic Constituents²

¹ This test method is under the jurisdiction of ASTM Committee D-19 on Water and is the direct responsibility of Subcommittee D19.05 on Inorganic Constituents in Water.

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² Annual Book of ASTM Standards, Vol 11.01.

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method refer to Terminology D 1129.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *total recoverable vanadium*—dissolved vanadium plus that solubilized by acid digestion of particulates and organics in the sample.

4. Summary of Test Method

4.1 Vanadium is determined by an atomic absorption spectrophotometer utilizing a graphite furnace for sample atomization.

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

4.3 Ground state atoms, produced in atomization, absorb the light of their spectrum emanating from a source and passing through the sample vapor. The amount of light absorbed is proportional to the concentration of the analyte in the sample.

4.4 Since the graphite furnace uses the sample much more efficiently than does flame atomization, the detection of low concentrations of the elements of interest in small volumes is possible.

4.5 Finally, the absorption signal produced during atomization is recorded and compared to those of standards, taken through the same process, by means of an analytical curve.

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

4.7 Dissolved vanadium is determined after filtration and addition of HNO_3 to a pH of ≤ 2 .

4.8 Total recoverable vanadium is determined following acid digestion and filtration.

5. Significance and Use

5.1 Vanadium can be found in waste that result from chemical cleaning of components in which the metal is alloyed.

5.2 National Pollutant Discharge Elimination Systems permits or other standards, or both, require monitoring pollutants in waste discharged onto the water shed of, or into, navigable waters, and those disposed of in such a manner that eventual