



Standard Test Method for Aluminum in Water¹

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1. Scope

1.1 This test method covers the direct flame atomic absorption determination of aluminum in the nitrous oxide-acetylene flame.

1.2 This test method is applicable to waters containing dissolved and total recoverable aluminum in the range from 0.5 to 5.0 mg/L. Aluminum concentrations as high as approximately 50 mg/L can be determined using this test method without dilution. However, no precision and bias data are available for concentrations greater than 5.0 mg/L.

1.3 This test method was tested on reagent, natural, and potable waters. It is the user's responsibility to ensure the validity of this test method for waters of untested matrices.

1.4 The same digestion procedure may be used to determine total recoverable nickel (Test Methods D 1886), chromium (Test Methods D 1687), cobalt (Test Methods D 3558), copper (Test Methods D 1688), iron (Test Methods D 1068), lead (Test Method D 3559), manganese (Test Method D 858), and zinc (Test Methods D 1691).

1.5 Precision and bias data have been obtained on reagent, natural, and potable waters. It is the responsibility of the user to ensure the validity of this test method on untested matrices.

1.6 *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.* For specific hazard statements, see Note 1, Note 2, and Note 3.

1.7 Former Test Methods A (Fluorometric) and B and C (Spectrophotometric) were discontinued. Refer to Appendix X1 for historical information.

2. Referenced Documents

2.1 ASTM Standards:

- D 858 Test Method for Manganese in Water²
- D 1066 Practice for Sampling Steam²
- D 1068 Test Methods for Iron in Water²
- D 1129 Terminology Relating to Water²
- D 1193 Specification for Reagent Water²

¹ These test methods are under the jurisdiction of ASTM Committee D-19 on Water and are 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.

D 1687 Test Methods for Chromium in Water²

D 1688 Test Methods for Copper in Water²

D 1691 Test Methods for Zinc in Water²

D 1886 Test Methods for Nickel in 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 3558 Test Methods for Cobalt in Water²

D 3559 Test Method for Lead in Water²

D 4841 Practice for Estimation of Holding Times for Water Samples Containing Organic and Inorganic Constituents²

3. Terminology

3.1 *Definitions*—For definitions of terms used in these test methods, refer to Terminology D 1129.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *total recoverable aluminum*—an arbitrary term relating to the forms of aluminum recovered in the acid digestion procedure specified in this test method.

4. Summary of Test Method

4.1 Aluminum is determined by direct atomic absorption with only the addition of an ionization suppressor and sensitivity enhancer (optional).

5. Significance and Use

5.1 Although there is little information available concerning the toxicological significance of aluminum in man, the American Water Works Association has established a water quality guideline or goal of a maximum of 0.05 mg/L. Under the National Pollution Discharge Elimination System, some permits may set aluminum discharge limits. Some evidence does exist to indicate that low levels (5 mg/L) will interfere with activated sludge processes. For the above reasons monitoring of aluminum may be desirable.

5.2 Aluminum is monitored in boiler make-up water, where alum has been used, to determine whether aluminum is present after pretreatment. Residual aluminum may consume ion exchange capacity or consume boiler water treatment chemicals added to stoichiometrically chelate hardness ions (that is, calcium and magnesium) in boiler feed water.

5.3 Aluminum is monitored in cooling water make-up, since its presence may result in deactivation of anionic substances in scale or corrosion inhibitor treatment chemicals, or both. Deactivation may result in decreased performance of inhibitors.