



Designation: D3868 – 15 (Reapproved 2023)

Standard Test Method for Fluoride Ions in Brackish Water, Seawater, and Brines¹

This standard is issued under the fixed designation D3868; 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 method² covers the determination of soluble fluoride ions in brackish water, seawater and brines by use of a fluoride selective electrode.

1.2 Samples containing from 1.0 to 25 mg/L can be analyzed by this test method.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*³

D1129 Terminology Relating to Water

D1193 Specification for Reagent Water

D2777 Practice for Determination of Precision and Bias of Applicable Test Methods of Committee D19 on Water

D3370 Practices for Sampling Water from Flowing Process Streams

D5847 Practice for Writing Quality Control Specifications for Standard Test Methods for Water Analysis

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminology D1129.

4. Summary of Test Method

4.1 A fluoride selective electrode, reference electrode, and millivoltmeter are used to determine fluoride in brine samples by a standard addition method.

4.2 The fluoride selective electrode consists of a lanthanum fluoride crystal that develops an electrode potential corresponding to the level of fluoride ion in solution.

5. Significance and Use

5.1 Identification of a brackish water, seawater, or brine is determined by comparison of the concentrations of their dissolved constituents. The results are used to evaluate the origin of the water, determine if it is a possible pollutant, or if it is related to a potential source of a valuable mineral. For example, in geochemical studies some correlation data indicate that fluoride is an indirect indicator of the presence of lithium.

6. Interferences

6.1 Metal ions such as aluminum and iron (III) interfere with the fluoride determination by forming complexes with fluoride ions. The buffer solution contains a complexing agent that preferentially complexes these metal ions. This solution also contains a pH buffer to reduce electrode interference from hydroxide ions and to prevent the formation of HF. Sodium chloride is added as ionic strength adjustor. Increasing amounts of aluminum, iron (III), and borate ions were added to 1.5 mg/L fluoride solutions and were found not to interfere up to 5, 350, and 250 mg/L (as boron), respectively.

7. Apparatus

7.1 *Millivoltmeter* (accurate to ± 0.1 mV), specific ion meter.

NOTE 1—A specific ion meter that directly reads concentration may be used.

7.2 *Fluoride Selective Electrode*, reference electrode.

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

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² Additional information is contained in the following references: Hoke, S. H., Fletcher, G. E., and Collins, A. G., “Fluoride and Iodide Selective Electrodes Applied to Oilfield Brine Analysis,” U.S. Department of Energy, Report of Investigations, BETC/RI-78/7.Rix, C. J., Bond, A. M., and Smith, J. D., “District Determination of Fluoride in Sea Water with a Fluoride Selective Ion Electrode by a Method of Standard Additions,” *Analytical Chemistry*, Vol 48, 1976, p. 1236.

³ 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.