



Designation: D 4130 – 99

Standard Test Method for Sulfate Ion in Brackish Water, Seawater, and Brines¹

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1. Scope

1.1 This test method covers the turbidimetric determination of sulfate ion in brackish water, seawater, and brines. It has been used successfully with synthetic brine grade waters; however, it is the user's responsibility to ensure the validity of this test method to other matrices.

1.2 This test method is applicable to waters having an ionic strength greater than 0.65 mol/L and a sulfate ion concentration greater than 25 mg/L. A concentration less than 25 mg/L sulfate can be determined by using a standard addition method.

1.3 For brines having an ionic strength of less than 0.65 mol/L, refer to Test Methods D 516.

1.4 *This standard does not purport to address all of the safety problems, 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 516 Test Methods for Sulfate Ion in Water²

D 1129 Terminology Relating to Water²

D 1192 Specification for Equipment for Sampling Water and Steam²

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

E 275 Practice for Describing and Measuring Performances of Ultraviolet, Visible, and Near Infrared Spectrophotometers³

3. Terminology

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

4. Summary of Test Method

4.1 A sulfate ion is converted to a barium sulfate suspended under controlled conditions. A glycerin-acid solution is added to acidify and stabilize the suspension. A calculated volume of a NaCl solution is added to adjust the ionic strength to a set value of 2 mol/L (Note 1). The turbidity resulting upon addition of barium chloride is determined by a photoelectric colorimeter and compared to a curve prepared from standard sulfate solutions.

NOTE 1—The ionic strength (IS) of the sample is calculated from the concentration of the major ion constituents (Na^+ , Ca^{++} , Mg^{++} , Cl^-), (K^+ and Sr^{++} if their concentration exceeds 2000 mg/L) as follows:

where:
 $IS, \text{ mol/L} = 1/2 \sum C_i Z_i^2$,
 $C_i = \text{g/L ion } i/\text{molecular weight ion, } i$, and
 $Z_i = \text{valence of ion } i$.

5. Significance and Use

5.1 The determination of sulfate and other dissolved constituents is important in identifying the source of brines produced during the drilling and production phases of crude oil or natural gas.

6. Interferences

6.1 Suspended matter in the sample must be removed. Dark colors that cannot be compensated for in the procedure interfere with the measurement of suspended barium sulfate (BaSO_4).

7. Apparatus

7.1 *Photometer*—A filter photometer or a spectrophotometer for measurements between 400 to 450 nm, the preferable wavelength being 425 nm. The cell for the instrument must have a light path of 20 ± 2 mm and hold a volume of 25 mL. Filter photometers, spectrophotometers, and photometric practices prescribed in this test method shall conform to Practice E 275.

8. Reagents

8.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the committee on Analytical Reagents of the American Chemical Society,

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 *Annual Book of ASTM Standards*, Vol 03.06.