



Designation: D 4328 – 84 (Reapproved 1993)^{€1}

Standard Practice for Calculation of Supersaturation of Barium Sulfate, Strontium Sulfate, and Calcium Sulfate Dihydrate (Gypsum) in Brackish Water, Seawater, and Brines¹

This standard is issued under the fixed designation D 4328; 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 (€) indicates an editorial change since the last revision or reapproval.

€¹ NOTE—Keywords were added editorially in July 1993.

1. Scope

1.1 This practice covers the calculation of supersaturation of barium sulfate, strontium sulfate, and calcium sulfate dihydrate (gypsum) in brackish water, seawater, and brines in which barium, strontium, and calcium ions either coexist or exist individually in solution in the presence of sulfate ions.

1.2 This practice is not applicable for calculating calcium sulfate dihydrate supersaturation if the temperatures of saline waters under investigation exceed 95°C. At temperatures above 95°C, hemianhydrite and anhydrite would be major insoluble forms.

1.3 *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 511 Test Methods for Calcium and Magnesium in Water²
- D 512 Test Methods for Chloride Ion in Water
- D 513 Test Methods for Total and Dissolved Carbon Dioxide in Water²
- D 516 Test Method for Sulfate Ion in Water²
- D 1129 Terminology Relating to Water²
- D 1192 Specification for Equipment for Sampling Water and Steam in Closed Conduits²
- D 3352 Test Method for Strontium Ion in Brackish Water, Seawater, and Brines³
- D 3370 Practices for Sampling Water from Closed Conduits²
- D 3561 Test Method for Lithium, Potassium, and Sodium Ions in Brackish Water, Seawater, and Brines by Atomic Absorption Spectrophotometry³

¹ This practice 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 11.02.

D 3651 Test Method for Barium in Brackish Water, Seawater, and Brines³

D 3986 Test Method for Barium in Brines, Seawater, and Brackish Water by Direct-Current Argon Plasma Atomic Emission Spectroscopy³

3. Terminology

3.1 *Definitions:* For definitions of terms used in this practice, refer to Terminology D 1129.

4. Significance and Use

4.1 This practice covers the mathematical calculation of the supersaturation of three principal sulfate scaling compounds found in industrial operations. Application of this standard practice to the prediction of scale formation in a given system, however, requires experience. The calculations tell the user if a water, or mixture of waters, is in a scaling mode. Whether or not scale will in fact form, how quickly it will form, where it will form, in what quantities, and what composition are subject to factors beyond the scope of this practice. An objective evaluation of the relative likelihood of scale formation can be made, however, based on how supersaturated a given water, or mixture of waters, is.

5. Procedure

5.1 Collect water samples for compositional analysis in accordance with Practices D 3370 and Specification D 1192.

5.2 Determine the calcium and magnesium concentrations in accordance with Test Methods D 511.

5.3 Determine the barium concentration in accordance with Test Methods D 3651 or D 3986.

5.4 Determine the strontium concentration in accordance with Test Method D 3352.

5.5 Determine sodium and potassium concentrations in accordance with Test Method D 3561.

5.6 Determine sulfate ion concentration in accordance with Test Method D 516.

5.7 Determine chloride ion concentration in accordance with Test Methods D 512.

5.8 Determine carbonate and bicarbonate ion concentrations