



Standard Test Method for Operating Performance of Anion-Exchange Materials for Strong Acid Removal¹

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1. Scope

1.1 This test method covers the determination of the operating capacity of anion-exchange materials when used for the removal of hydrochloric and sulfuric acid from water. It is designed to simulate operating conditions for strong acid removal and is intended for use in testing both new and used materials.

1.2 The values stated in SI units are to be regarded as the standard. The inch-pound units given in parentheses are for information only.

1.3 *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.* Specific precautionary statements are given in Note 1.

2. Referenced Documents

2.1 ASTM Standards:

- D 1067 Test Methods for Acidity or Alkalinity of Water²
- D 1125 Test Methods for Electrical Conductivity and Resistivity of Water²
- D 1129 Terminology Relating to Water²
- D 1193 Specification for Reagent Water²
- D 2687 Practices for Sampling Particulate Ion-Exchange Materials³

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 The test method consists of repeated cycles of backwash, base regeneration, rinse, and exhaustion of the sample in the form of a bed in a transparent column. The exhaustion medium used is an ion-exchange test water.

5. Significance and Use

5.1 This test method can be used for evaluating performance of commercially available anion-exchange materials regardless of the basic strength of the ion exchange groups. When previous operating history is known, a good interpretation of resin fouling or malfunction can be obtained by comparison against a reference sample of unused ion-exchange material evaluated in the same way.

5.2 While resistivity has been chosen as the preferred analytical method for defining the exhaustion end point, with titration as the alternative, it is understood that observation of pH during rinse and the service run can yield useful information. The variations in pH observed with an ion exchange material suspected of having degraded, can be helpful in interpretation of performance when compared with similar data for a reference sample of unused material exhausted in the same way.

6. Apparatus

6.1 **Test Assembly** (see Fig. 1), consisting of the following:
6.1.1 **Column**, transparent, vertically supported, 25.4 ± 2.5 -mm (1.0 ± 0.1 -in.) inside diameter and approximately 1.5 m (60 in.) long. The bottom of the column shall be closed and provided with an outlet of approximately 6-mm ($\frac{1}{4}$ -in.) inside diameter. Connections shall be provided at the top and bottom for the admission and removal of the solutions described in Section 7. Adequate means for measuring and regulating the flow shall also be provided. The column shall be calibrated in such a manner that the volume readings required by the method can be made (see Section 9). All measurements shall be made at $25 \pm 5^\circ\text{C}$.

6.1.2 Support the sample at least 50 mm (2 in.) above the bottom of the column outlet using quartz, gravel, glass beads or other material from 1.5 to 3.5 mm ($\frac{1}{16}$ to $\frac{1}{8}$ in.) in diameter, insoluble in the reagents used, and retained on a corrosion-resistant screen. However, other supports may be used at the discretion of the interested parties.

7. Reagents

7.1 **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 D19.08 on Membranes and Ion Exchange Materials.

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² *Annual Book of ASTM Standards*, Vol 11.01.

³ *Annual Book of ASTM Standards*, Vol 11.02.