



Designation: D 2577 - 86

AMERICAN SOCIETY FOR TESTING AND MATERIALS
1916 Race St., Philadelphia, Pa. 19103

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Standard Test Method for RADIOACTIVE CESIUM IN WATER¹

This standard is issued under the fixed designation D 2577; 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 method covers the determination of radioactive cesium in water in concentrations greater than 1 $\mu\text{Ci/L}$. Concentration of the sample may be used in some cases to increase the sensitivity of the test method. This test method is not applicable to artificial brine samples containing more than two milliequivalents of sodium and free acid in the 1-mL aliquot used for extraction.

1.2 This test method may be used either for absolute measurements by calibrating the nuclear radiation detector with a standard cesium radioisotope of the same mass, or for relative measurements by comparing a series of measurements to each other. This test method is limited to the cesium isotopes of mass 134, 136, 137, and 138. The 6-day isotope of mass 132 could interfere but would generally not be present in significant amounts in samples containing the fission product isotopes.

1.3 This test method does not meet the current requirements of Practice D 2777.

1.4 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems 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 1066 Practice for Sampling Steam²
- D 1129 Definitions of Terms Relating to Water²
- D 1193 Specification for Reagent Water²
- D 2777 Practice for Determination of Preci-

sion and Bias of Applicable Methods of Committee D-19 on Water²

D 3370 Practices for Sampling Water²

D 3648 Practices for the Measurement of Radioactivity³

D 3649 Practice for High-Resolution Gamma-Ray Spectrometry of Water³

3. Definitions

3.1 For definition of terms used in this test method, refer to Definitions D 1129. For terms not defined in this test method or in Definitions D 1129, reference may be made to other published glossaries.⁴

4. Summary of Test Method

4.1 Radioactive cesium is extracted, at pH 7.0, as cesium tetraphenylborate in amyl acetate with EDTA present to prevent the extraction of undesired fission product activity. A known fraction of the organic phase is gamma-counted in a standard vial. Recovery of radioactive cesium by this test method is quantitative.

4.2 The cesium tetraphenylborate solution is gamma-counted with a germanium detector and a gamma ray spectrum obtained using a multi-channel pulse height analyzer (see Practice D 3649). This spectrum is resolved into its components, by graphical or algebraic methods, and the count rate due to each isotope is obtained. For absolute measurements the observed count

¹ This test method is under the jurisdiction of ASTM Committee D-19 on Water and is the direct responsibility of Subcommittee D19.04 on Methods of Radiochemical Analysis.

Current edition approved Oct. 31, 1986. Published December 1986. Originally published as D 2577 - 67 T. Last previous edition D 2577 - 72 (1981)¹.

² Annual Book of ASTM Standards, Vol 11.01.

³ Annual Book of ASTM Standards, Vol 11.02.

⁴ ANSI N1.1, Glossary of Terms in Nuclear Science and Technology.