



Standard Test Method for Radium-226 in Water¹

This standard is issued under the fixed designation D3454; 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 measurement of soluble, suspended, and total radium-226 in water in concentrations above 3.7×10^{-3} Bq/L. This test method is not applicable to the measurement of other radium isotopes.

1.2 This test method may be used for quantitative measurements by calibrating with a radium-226 standard, or for relative measurements by comparing the measurements made with each other.

1.3 This test method does not meet the current requirements of Practice [D2777](#).

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

1.5 Hydrofluoric acid (HF) is very hazardous and should be used in a well-ventilated hood. Wear rubber gloves, safety glasses or goggles, and a laboratory coat. Avoid breathing any HF fumes. Clean up all spills promptly and wash thoroughly after using HF.

1.6 *This standard does not purport to address all of the other 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.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[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 Closed Conduits](#)

¹ This test method is under the jurisdiction of ASTM Committee [D19](#) on Water and is the direct responsibility of Subcommittee [D19.04](#) on Methods of Radiochemical Analysis.

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² 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.

[D3648 Practices for the Measurement of Radioactivity](#)

[D3649 Practice for High-Resolution Gamma-Ray Spectrometry of Water](#)

[D3856 Guide for Management Systems in Laboratories Engaged in Analysis of Water](#)

[D4448 Guide for Sampling Ground-Water Monitoring Wells](#)

[D5847 Practice for Writing Quality Control Specifications for Standard Test Methods for Water Analysis](#)

[D6001 Guide for Direct-Push Groundwater Sampling for Environmental Site Characterization](#)

[D7282 Practice for Set-up, Calibration, and Quality Control of Instruments Used for Radioactivity Measurements](#)

3. Terminology

3.1 For definitions of terms used in this test method, refer to Terminology [D1129](#). For terms not defined in this test method or in Terminology [D1129](#), reference may be made to other published glossaries.

4. Summary of Test Method

4.1 This test method³ is based on the emanation and scintillation counting of ²²²Rn, a gaseous daughter product of ²²⁶Ra, from a solution.

4.2 ²²⁶Ra is collected from water by coprecipitation on a relatively large amount of barium sulfate. The barium-radium sulfate is decomposed by fuming with phosphoric acid, and the resulting glassy melt is dissolved by evaporation with dilute hydrochloric acid to form soluble barium-radium phosphates and chlorides. These salts are dissolved and the solution is stored for ingrowth of ²²²Rn. After a suitable ingrowth period, the radon gas is removed from the solution by purging with gas and transferred to a scintillation counting chamber. About 4 h after ²²²Rn collection, the scintillation chamber is counted for alpha activity. The ²²⁶Ra concentration is calculated from the alpha count rate of ²²²Rn and its immediate daughters. The radioactive decay characteristics of ²²⁶Ra and its immediate decay progeny are listed in [Table 1](#).

³ This test method is based on a previously published method by Rushing, D.E., Garcia, W.J., and Clark, D.A. "The Analysis of Effluents and Environmental Samples from Uranium Mills and of Biological Samples for Radium, Polonium and Uranium," Radiological Health and Safety in Mining and Milling of Nuclear Materials, Vol. II, IAEA, Vienna, Austria, 1964), p. 187.