



Designation: D7938 – 21

Standard Practice for Sampling of C-14 in Gaseous Effluents¹

This standard is issued under the fixed designation D7938; 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 The intended use of this practice is for sampling of gasses containing ^{14}C in inorganic, organic or particulate forms. This sampling practice captures the ^{14}C in a media that can be submitted to a laboratory for analysis, typically by liquid scintillation counting (LSC)

1.2 This practice does not include the needed steps for the liberation of ^{14}C from the media on which it was adsorbed or those for the preparation for LSC sample preparation in the laboratory prior to liquid scintillation analysis. This practice does not include the methodology used to analyze the prepared samples by LSC.

1.3 The overall ^{14}C analytical detection capability is impacted by a number of factors including the volume sampled, the method used to desorb the ^{14}C from the media, and the analytical method used to measure ^{14}C from the media. This practice only directly addresses the volume of the gas stream from which any present ^{14}C would be adsorbed.

1.4 The values stated in pCi units are to be regarded as standard given the reporting requirements of the U.S. NRC Regulatory Guide 1.21. The Bq values given in parenthesis are mathematical conversions to SI units that are provided for information only and are not considered standard. Other values stated in SI units are to be regarded as standard.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This practice is under the jurisdiction of ASTM Committee D19 on Water and is the direct responsibility of Subcommittee D19.04 on Methods of Radiochemical Analysis.

Current edition approved Dec. 15, 2021. Published February 2022. Originally approved in 2015. Last previous edition approved in 2015 as D7938 – 15. DOI: 10.1520/D7938-21.

2. Referenced Documents

2.1 ASTM Standards:²

D1129 Terminology Relating to Water

D7282 Practice for Set-up, Calibration, and Quality Control of Instruments Used for Radioactivity Measurements

D7902 Terminology for Radiochemical Analyses

2.2 U.S. NRC Publications:³

U.S. NRC Regulatory Guide 1.21 “Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste,” revision 2, June 2009

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this standard, refer to Terminologies D1129 and D7902.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *organic ^{14}C* , *n*—any gaseous, chemical ^{14}C form (including CO) that is not particulate and not CO_2 .

3.2.1.1 *Discussion*—Although no specific organic form is determined, the major contributors are likely to be CH_4 , C_2H_6 , C_2H_4 , CO, and C_2H_2 .

3.2.2 *inorganic ^{14}C* , *n*—the gaseous, chemical form of ^{14}C as CO_2 .

3.2.2.1 *Discussion*—These chemical form categorizations are based on U.S. NRC Regulatory Guide 1.21.

4. Summary of Practice

4.1 A sample of a flowing gaseous stream is extracted at a flow rate of 30 to 3000 mL/min. The sample is filtered and split into two parallel flow paths. One flow path is passed through a furnace to convert all carbon to CO_2 . This will yield a total ^{14}C content of the sample. The other flow path collects only the CO_2 fraction of the gaseous stream. This yields the inorganic ^{14}C content of the gaseous stream. The calculated difference between the measured total and inorganic carbon content is the organic content (U.S. NRC Regulatory Guide 1.21). The concentration of ^{14}C in the particulate matter may also be determined.

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.

³ Available from U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, <http://www.nrc.gov>.