



Standard Test Method for Low Level Determination of Total Carbon, Inorganic Carbon and Organic Carbon in Water by Ultraviolet, Persulfate Oxidation, and Membrane Conductivity Detection¹

This standard is issued under the fixed designation D 6317; 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 total carbon (TC), inorganic carbon (IC), and total organic carbon (TOC) in water in the range from 10 to 1000 µg/L of carbon. This method is for laboratory or grab sample applications and has been subjected to an interlaboratory study under the guidelines of D 2777. Test Method D 5997 can be used for on-line determinations. The test method utilizes persulfate or ultraviolet oxidation of organic carbon, or both coupled with a CO₂ selective membrane to recover the CO₂ into deionized water. The change in conductivity of the deionized water is measured and related to carbon concentration in the oxidized sample. Inorganic carbon is determined in a similar manner without the oxidation step. In both cases, the sample is acidified to facilitate CO₂ recovery through the membrane. The relationship between the conductivity measurement and carbon concentration is described by a set of chemometric equations for the chemical equilibrium of CO₂, HCO₃⁻, and H⁺, and the relationship between the ionic concentrations and the conductivity. The chemometric model includes the temperature dependence of the equilibrium constants and the specific conductances resulting in linear response of the method over the stated range of TOC. See Test Method D 4519 for a discussion of the measurement of CO₂ by conductivity.

1.2 This test method has the advantage of a very high sensitivity detector that allows very low detection levels on relatively small volumes of sample. Also, use of two measurement channels allows determination of CO₂ in the sample independently of organic carbon. Isolation of the conductivity detector from the sample by the CO₂ selective membrane results in a very stable calibration, with minimal interferences.

1.3 This test method was used successfully with reagent water spiked with various organic materials. It is the user's responsibility to ensure the validity of this test method for waters of untested matrices.

1.4 In addition to laboratory analyses, this test method may be adapted to on line monitoring. See Test Method D 5997.

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

2. Referenced Documents

2.1 ASTM Standards:²

- D 1129 Terminology Relating to Water
- D 1192 Specification for Equipment for Sampling Water and Steam³
- D 1193 Specification for Reagent Water
- D 2777 Practice for Determination of Precision and Bias of Applicable Methods of Committee D19 on Water
- D 3370 Practices for Sampling Water from Closed Conduits
- D 4210 Practice for Intralaboratory Quality Control Procedures and a Discussion on Reporting Low-Level Data³
- D 5997 Test Method for On-Line Monitoring of Total Carbon, Inorganic Carbon in Water by Ultraviolet, Persulfate Oxidation, and Membrane Conductivity Detection
- D 4519 Test Method for Determination of Anions and Carbon Dioxide in High Purity Water by Cation Exchange and Degassed Cation Conductivity

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminology D 1129.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *inorganic carbon (IC)*—carbon in the form of carbon dioxide, carbonate ion, or bicarbonate ion.

3.2.2 *refractory material*—that which cannot be oxidized completely under the test method conditions.

3.2.3 *total carbon (TC)*—the sum of IC and TOC.

¹ This test method is under the jurisdiction of ASTM Committee D19 on Water and is the direct responsibility of Subcommittee D19.03 on Sampling of Water and Water-Formed Deposits, Surveillance of Water, and Flow Measurement of Water. Current edition approved Sept. 10, 1998. Published November 1998.

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 Withdrawn.

