



Designation: D5176 – 08 (Reapproved 2015)

Standard Test Method for Total Chemically Bound Nitrogen in Water by Pyrolysis and Chemiluminescence Detection¹

This standard is issued under the fixed designation D5176; 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 the total nitrogen content of water in concentrations from 0.5 to 1000 mg/L. Higher nitrogen concentrations may be determined by making the proper dilutions.

1.2 This test method does not determine molecular nitrogen (N_2).

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *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

[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](#)

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this standard, refer to Terminology [D1129](#).

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *total chemically bound nitrogen, n*—all inorganic and organic nitrogen in the sample, except molecular nitrogen (N_2).

¹ This test method is under the jurisdiction of ASTM Committee [D19](#) on Water and is the direct responsibility of Subcommittee [D19.06](#) on Methods for Analysis for Organic Substances in Water.

Current edition approved June 15, 2015. Published June 2015. Originally approved in 1991. Last previous edition approved in 2008 as D5176 – 08. DOI: 10.1520/D5176-08R15.

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.

4. Summary of Test Method

4.1 The sample of water is introduced into a stream of oxygen or inert/oxygen mix flowing through a quartz pyrolysis tube. Oxidative pyrolysis converts chemically bound nitrogen to nitric oxide (NO). The gas stream is dried and the NO is contacted with ozone (O_3) producing metastable nitrogen dioxide (NO_2^*). As the NO_2^* decays, light is emitted and detected by a photomultiplier tube. The resulting signal is a measure of the total chemically bound nitrogen in the sample.

5. Significance and Use

5.1 This test method is useful for the determination of total chemically bound nitrogen in wastewaters and other waters.

6. Apparatus³

6.1 *Pyrolysis Furnace*—An electric tube furnace capable of achieving a temperature of 1100°C. The furnace may be single or multizoned and may have common or separate and independent temperature controls.

6.2 *Pyrolysis Tube*—The pyrolysis tube must be fabricated from quartz and should be designed to ensure complete pyrolysis of a wide variety of samples.

6.3 *Chemiluminescence Detector*—The detector shall have a photomultiplier tube capable of sensing the light emission of the decaying NO_2^* . The detector shall have digital display, onboard ozone generator and analog output for data system or strip chart recorder.

6.4 *Recorder* (optional)—The recorder shall be able to accept a 1 V full scale signal and to provide a chart speed of 1 cm/min.

6.5 *Microlitre Syringe*—Any standard series of microlitre syringes with stainless steel needles is acceptable. See manufacturer's instructions for appropriate syringe sizes.

6.6 *Syringe Drive Mechanism*—The syringe drive shall be capable of driving the sample from a microlitre syringe at a controlled, reproducible rate.

³ The apparatus described in [6.1 – 6.7](#) is manufactured by Antek Instruments, Inc., Houston, TX and Dohrmann Division of Rosemount Analytical Inc., Santa Clara, CA, and was used in the validation study of this test method.