

Standard Test Method for Portable Chemiluminescent Water Quality Determination¹

This standard is issued under the fixed designation D 6592; 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 detection of water and wastewater contaminants which inhibit chemiluminescence.

1.2 This test method may be applied to ambient waters including but not exclusively river water and water from sewage treatment plants. It is the responsibility of the user of this standard to ensure the validity of the test method for waters of untested matrices.

1.3 *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:

- D 1129 Terminology Relating to Water²
- D 1192 Specification for Equipment for Sampling Water and Steam in Closed Conduits²
- D 1193 Specification for Reagent Water²
- D 2777 Determination of Precision and Bias of Applicable Methods of Committee D19 on Water²
- D 3370 Standard Practices for Committee D19 on Sampling Water²
- D 3856 Standard Guide for Good Laboratory Practices in Laboratories Engaged in Sampling and Analysis of Water²
- D 4210 Practice for Interlaboratory Quality Control Procedures and Discussion on Reporting Low Level Data²
- D 5847 Standard Practice for Writing Quality Control Specifications for Standard Test Methods for Water Analysis²

3. Terminology

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

3.2 Definitions of Terms Specific to This Standard:

3.2.1 **chemiluminescence**—the generation of light by a chemical reaction.

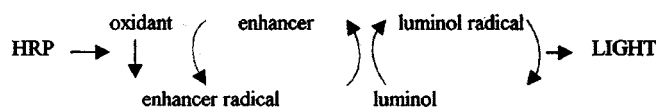


FIG. 1 Output of Luminol Radicals

3.2.2 **luminometer**—an instrument capable of measuring light emitted during a luminescent reaction, over a wide range of wavelengths.

3.2.3 **photodiode**—a semiconductor light sensor that generates a current or voltage when illuminated by light.

4. Summary of Test Method

4.1 This analytical test method is an enhanced chemiluminescent method based on the procedure of Whitehead et al.³ Luminol is oxidized by a complex formed between an oxidant and peroxidase (HRP) to form a luminol radical. This decomposes via an endoperoxide intermediate to form the excited state 3-aminophthalate dianion which decays to its ground state with the emission of light. The presence of enhancers results in a steady output of luminol radicals during the reaction (see Fig. 1). Contaminating substances (such as sewage, silage effluent, heavy metals, detergents, cyanides and pesticides containing organic residues) react with the assay reagents by scavenging radicals from the luminol or enhancer radicals, or by inhibiting the catalytic action of HRP. This results in a reduction of light output to a degree which is proportional to the amount of contaminant present. Light output is measured using a portable luminometer, which detects light by means of a silicon photodiode.

5. Significance and Use

5.1 This test method was developed for the purpose of screening for contamination in water. It is used for the analysis of waste water, process water and environmental water. Results of testing performed in the pulp and paper industry, sewage treatment plants and river water systems are presented in Appendix X1.

5.2 This method is not suitable for determining the precise concentration of specific analytes.

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.

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² *Annual Book of ASTM Standards*, Vol 11.01.

³ Whitehead T.P. Thorpe G., Lane M., Watson A., Billings C. in *Bioluminescence and Chemiluminescence: status report*, Szalay A.Z., Kricka L.N. and Stanley P.E. Wiley 1993, pp. 425-429.