



Standard Test Method for Inhibition of Respiration in Microbial Cultures in the Activated Sludge Process¹

This standard is issued under the fixed designation D 5120; 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 a batch procedure that evaluates the impact of selected wastewaters, materials, or specific compounds on the respiration rate of an aqueous microbial culture, such as activated sludge.

1.2 Alternative procedures for measurement of microbial activity, such as adenosine 5' triphosphate (ATP), specific substrate utilization, etc. are not within the scope of this test method.

1.3 The results obtained are based on comparisons in a specific test series that examines a range of concentrations of the potentially inhibitory test candidate using batch methods in a laboratory. Results are completed in a short time frame (a few hours).

1.4 The test results are specific to the microbial culture used. Microbial culture from different wastewater treatment plants will differ in kinds and numbers of organisms, and performance capability. Thus, there is no basis for comparing results for microbial cultures from different treatment facilities.

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 4478 Test Methods for Oxygen Uptake

3. Terminology

3.1 *Definitions:*

3.1.1 *respiration rate*—the quantitative consumption of oxygen by an aqueous microbial system. The consumption is generally expressed as mg O₂/L/h.

¹ This Test Method is under the jurisdiction of ASTM Committee D34 on Waste Management and is the direct responsibility of Subcommittee D34.07 on Municipal Solid Waste.

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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.

3.1.2 *EC₅₀*—the concentration of the test candidate in this procedure (volume percent or mg/L) that results in a reduction of respiration rate to 50 % of that observed for the control.

4. Summary of Test Method

4.1 This test method utilizes respiration rate as the indicator of microbial activity.

4.2 A batch system that contains a microbial culture (returned activated sludge from the process or a culture maintained in the laboratory), selected nutrient dose, and a dilution of a compound, substance, wastewater, etc. (test candidate) is prepared in a container in the laboratory. The batch system is called a “cell suspension.”

4.3 The nutrient dose introduces a large excess of biodegradable substrate thereby putting the culture at a high metabolic rate. Inhibition of respiration by the test candidate is observed under these conditions.

4.4 The prepared cell suspension is aerated for a 2-h period. At the end of the period, the respiration rate is determined using a respirometric or an oxygen uptake technique.

4.5 A lower respiration rate for a cell suspension that has received the test candidate compared to the respiration rate of a control cell suspension indicates inhibition of respiration.

5. Significance and Use

5.1 The objectives of the respiration inhibition tests may be defined by the interests of the user, but the test method is designed primarily for examination of the inhibition response with operating microbial systems such as an activated sludge process treating domestic or industrial wastes.

5.2 Different apparatus exist that facilitate continuous or continual measurement of respiration in microbial systems and each may be used as the tool to observe respiration in this test method.

5.3 Respirometry may utilize any apparatus and technique that will achieve the determination of respiration rate. A number of devices are presented in Appendix X1. Equivalency in the experimental capability of each device is not implied. The analyst should select the respirometric approach that best suits his needs.

