Designation: D4982 – 20

Standard Test Methods for Flammability Potential Screening Analysis of Waste[1]

This standard is issued under the fixed designation D4982; 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 These test methods are used to indicate the fire-producing or fire-sustaining potential of wastes. The following test methods can be applied to waste liquids, sludges, or solids:

	Sections
Test Method A—Test Specimen Exposed to Heat and Flame	8 – 10
Test Method B—Test Specimen Exposed to Spark Source	11 and 12

1.2 This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire hazard or fire risk assessment of the materials, products, or assemblies under actual fire conditions.

1.3 Fire testing is inherently hazardous. Adequate safeguards for personnel and property shall be employed in conducting these tests.

1.4 These test methods are designed and intended as preliminary tests to complement quantitative analytical techniques that are useful to determine flammability. These test methods offer the option and the ability to screen waste for hazardous flammability potential when the analytical techniques are not available or the total waste composition is unknown.

1.5 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.6 *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.* Specific hazard information is given in Section 6, 9.3.1, and 10.4.3.

1.7 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D5681 Terminology for Waste and Waste Management

D8174 Test Method for Finite Flash Point Determination of Liquid Wastes by Small-Scale Closed Cup Tester

D8175 Test Method for Finite Flash Point Determination of Liquid Wastes by Pensky-Martens Closed Cup Tester

3. Terminology

3.1 For definitions of terms used in these test methods, refer to Terminology D5681.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *screening analysis*—a *preliminary* qualitative or semi-quantitative test that is designed to efficiently give the user specific information about a waste that will aid in determining waste identification, process compatibility, and safety in handling.

4. Summary of Test Methods

4.1 *Method A*—A test specimen is exposed to heat and flame. The sample is reported as having a positive or negative flammability potential as described in the test procedure.

4.2 *Method B*—Sparks from a flint lighter are introduced to the vapor space immediately above a representative specimen of a waste, and observation is made for a flash in the vapor space or ignition of the specimen. A flash in the vapor space or ignition and burning of the waste indicates a positive flammability potential at ambient temperature.

5. Significance and Use

5.1 These test methods are intended for use by those in the waste management industries to aid in identifying the flammability potential or waste materials. In addition to the test

[1] These test methods are under the jurisdiction of ASTM Committee D34 on Waste Management and is the direct responsibility of Subcommittee D34.01.05 on Screening Methods.

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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.

*A Summary of Changes section appears at the end of this standard

methods described here, flash points specific to liquid waste can be determined according to Test Method D8174 or D8175.

6. Hazards

6.1 Avoid inhalation, skin and eye contact of any hazardous materials.

6.2 Standard laboratory hygiene practices shall be followed when conducting these tests.

6.3 All tests must be performed in a laboratory hood.

6.4 Waste containing or suspected of containing highly volatile organics or peroxides shall be tested using a smaller specimen than that used in 10.2.

6.5 The aluminum weighing boat shall be placed on an inert, nonflammable surface.

7. Sampling

7.1 Sample containers must be kept tightly sealed until tested.

7.2 Samples shall be analyzed as soon as possible after collection.

7.3 If necessary, allow the sample to come to room temperature in a tightly sealed container. For example, frozen material shall be allowed to thaw to room temperature.

TEST METHOD A—EXPOSURE TO HEAT AND FLAME

8. Interferences

8.1 Drafts in the laboratory fume hood where the test is performed have the potential to cause cooling and false negative results. A properly operating fume hood with a face velocity of 100 ft/min typically provides consistent, usable results.

8.2 Ignition sources that provide excessive heating rates alone or combined with a very small test specimen have the potential to obscure results. That is, it is feasible that the sample will be decomposed, sintered, fused, evaporated, or otherwise consumed before positive or negative evidence of flammability is observed. The use of sufficiently large test specimens and of heating rates typical of a bunsen burner is likely to resolve this problem.

8.3 An inadequate source of heating will limit the volatilization of flammable components and provide false negative results.

8.4 The potential exists for false negative results from difficult-to-observe flames that result from the burning of certain compounds (for example, methanol). If the presence of these compounds is suspected, the presence of flammability shall be confirmed by the insertion of a watch glass just above the test material. The watch glass is then examined for combustion products (for example, moisture and soot).

NOTE 1—The watch glass method cannot distinguish between vaporized water or water produced by combustion.

8.5 The potential exists for false positive results from an improperly adjusted gas burner (for example, with an insufficiently aerated flame) that introduces unburnt gas into or immediately above the sample. This unburnt gas will briefly support a flame after the source of ignition is removed, providing the appearance of a flammable sample.

8.6 Separation of materials within a sample will result in a non-representative specimen from the sample. Sufficient agitation of the sample before selecting a test specimen will typically resolve this problem.

9. Apparatus

9.1 *Gas Burner,* (for example, a bunsen burner) with an adjustable air shutter and an adjustable gas orifice is needed. The gas burner and fuel supply line must be appropriate to the gas supplied: natural gas, artificial gas (including propane and butane), or liquified petroleum gas (LP gas or LPG). Where a gas supply line cannot be provided, a propane torch is an appropriate substitute.

9.2 *Lighter,* (for example, piezo lighter) for the burner is required.

9.3 *Aluminum Weighing Boats* or other nonflammable containers are used.

9.3.1 **Warning—**Weighing boats composed of material other than aluminum shall be used if the tested materials react with aluminum, for example, caustics.

9.4 *Watch Glass.*

9.5 *Large Beaker, Tongs, Asbestos-Free High-Temperature Gloves or Mittens,* or other apparatus as needed to extinguish burning materials.

10. Procedure

10.1 Light a gas burner and adjust to a typically blue flame that is not readily blown out. A yellow flame easily affected by drafts indicates insufficient air (the air/fuel ratio is too low). A sharp, blue flame is ideal. (If the flame rises above the burner head, is very difficult to light, or tends to extinguish itself, this indicates that too much air or too much air and fuel are being supplied to the burner.)

10.2 Place a sufficient amount (approximately 5 g) of a test specimen in an aluminum weighing boat or other nonflammable container.

10.3 Using a gas burner, hold the flame immediately above and perpendicular to the test sample for 2 to 3 s without touching the visible flame to the specimen.

10.3.1 If ignition (a flash or burning) is observed before or after the ignition source (the flame of the burner) is removed, the specimen is said to have a positive flammability potential. A positive result will require further investigation (see 10.4.1.1).

10.3.2 The flammability confirmation will require the use of a watch glass (see 8.4).

10.3.3 If there is no ignition, proceed to 10.4.

10.4 Using a gas burner, briefly (for at least 10 s) apply the flame to the specimen in an attempt to ignite the specimen.

10.4.1 If the specimen ignites, the specimen is said to have a positive flammability potential.

10.4.1.1 When more accurate waste characterization is necessary, liquid samples are quantified using a closed-cup flash point tester such as described in Test Methods D8174 and D8175.

10.4.1.2 Solids with a positive flammability potential shall be further investigated.

10.4.2 If the specimen decomposes, boils (if a liquid), or otherwise fails to ignite after at least 10 s of continuous specimen heating by the burner flame, the flammability potential is reported as negative.

10.4.2.1 Continuous heating after a specimen decomposes results in a physical and/or chemical change to a test specimen (see 8.2) that no longer represents the original sample. Continuing a test (example, 300 s) with a decomposed specimen identifies the flammability potential of residual materials of interest for process compatibility. If the decomposed specimen ignites, the sample is said to have a positive flammability potential. In this case, the sample is identified as modified and classified as positive.

10.4.3 Halogenated solvents typically give off visible vapors that result in a false positive flammability potential. (**Warning—**Phosgene, an extremely toxic gas, is a combustion product of halogenated compounds burned in air.)

10.5 Shut off the gas burner when not in use. Extinguish a burning specimen by setting an aluminum weighing boat or watch glass atop the one containing the burning specimen (or invert a spoutless beaker over the specimen container and all). Use of tongs or high-temperature gloves or mittens are necessary to handle the equipment.

TEST METHOD B—EXPOSURE TO SPARK SOURCE

11. Apparatus

11.1 *Oven Gloves.*

11.2 *Flint Lighter,* the type typically used to light an air/acetylene torch is required.

11.3 *Disposable 250-mL Beaker,* of plastic is required.

11.4 *Watch Glass,* 100 mm.

11.5 *Metal Vessel* (with lid), of adequate depth and diameter to contain beaker and watch glass is needed.

11.6 *Thermometer.*

12. Procedure

12.1 Place approximately 100 mL of the test specimen of the material to be tested into a plastic beaker (see 7.3).

12.2 Place the plastic beaker in a steel vessel, cover the beaker with the watch glass, and allow the specimen to equilibrate to ambient conditions over 5 min.

12.3 Remove the watch glass, place the igniter immediately above the test specimen, and strike it several times to produce sparks.

12.4 If the material catches fire and burns, extinguish the flames by placing the lid on the steel vessel, thus smothering the fire, and report as a positive flammability potential.

13. Report for Methods A and B

13.1 Report the following information:

13.1.1 Sample identification,

13.1.2 Date of test,

13.1.3 Sample classification: positive or negative,

13.1.4 Reference to the procedure applied, and

13.1.5 Other relevant information.

14. Quality Control for Methods A and B

14.1 Quality control check samples and duplications shall be performed at an action level specified by the laboratory or by the client requesting the flammability tests, and at an appropriate frequency.

14.2 Flammability standards shall be maintained for analyst training and as reference guides. Examples are given in the following table.

Flammability Potential Screening Analysis

Methyl alcohol (methanol)	Difficult-to-see flame; flammable at or below room temperature.
Glacial acetic acid	Flammable at temperatures above normal room temperature.
Hendecane (n-undecane)	Flammable at temperatures higher than glacial acetic acid.
Kerosene (Fuel Oil No. 1)	Flammable over a range of temperatures higher than normal room temperature.
p-Xylene	Flammable at or above room temperature; freezes at 13 °C. A spiked soil sample frozen at 0 °C demonstrates interference.

15. Precision and Bias for Methods A & B

15.1 *Precision*—No information is presented about either the precision or bias of Test Methods D4982 for measuring flammability potential because the test result is nonquantitative.

16. Keywords

16.1 flammability potential; ignition; screening analysis; wastes