Designation: D4982 – 12

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 Sample Exposed to Heat and Flame	7-9
Test Method B—Test Sample Exposed to Spark Source	10 and 11

1.2 These test methods should be used to measure and describe the properties of materials, in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials under actual fire conditions. However, results of these tests may be used in addition to all other factors that are pertinent to a fire hazard assessment of a particular end use.

1.3 These test methods are designed and intended as preliminary tests to complement quantitative analytical techniques that may be used 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.

1.4 *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.* Specific hazard information is given in Section 5, 8.3.1 and 9.4.3.

2. Terminology

2.1 *Definitions of Terms Specific to This Standard:*

2.1.1 *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.

3. Summary of Test Methods

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

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

4. Significance and Use

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

5. Hazards

5.1 Avoid inhalation and skin or eye contact, or both, of any hazardous materials.

5.2 Standard laboratory hygiene practices should be followed when conducting these tests.

5.3 All tests must be performed in a laboratory hood.

5.4 Waste containing or suspected of containing highly volatile organics or peroxides should be tested using a much smaller sample than that used in 9.2.

5.5 The aluminum weighing boat should be placed on an inert, nonflammable surface.

6. Sampling

6.1 Sample containers must be kept tightly sealed until tested.

6.2 Samples should be analyzed as soon as possible after collection.

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

TEST METHOD A—EXPOSURE TO HEAT AND FLAME

7. Interferences

7.1 Drafts in the laboratory fume hood where the test is performed could cause excessive cooling and false negative

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results. A properly operating fume hood with a face velocity of 100 ft/min should provide consistent, usable results.

7.2 Ignition sources that provide excessive heating rates alone or combined with a very small test portion may obscure results. That is, the sample may be decomposed, sintered, fused, evaporated, or otherwise consumed before positive or negative evidence of flammability is observed. The use of sufficiently large test portions and of heating rates typical of a bunsen burner should resolve this problem.

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

7.4 Difficult-to-observe flames resulting from the burning of certain compounds (for example, methanol) could provide false negative results. If the presence of these compounds is suspected, the presence of flammability might be confirmed by the insertion of a watchglass just above the test material. The watchglass is then examined for products of combustion (for example, moisture and soot).

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

7.5 An improperly adjusted gas burner (for example, with an insufficiently aerated flame) could introduce unburnt gas into or immediately above the sample. This unburnt gas could briefly support a flame after the source of ignition is removed, providing the appearance of a flammable sample and a false positive result.

8. Apparatus

8.1 *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 may be substituted.

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

8.3 *Aluminum Weighing Boats* or other non-flammable containers are needed.

8.3.1 **Warning—**Weighing boats of material other than aluminum should be used if the testing materials react with aluminum, for example, caustics.

8.4 *Watchglass.*

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

9. Procedure

9.1 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 good. (If the flame rises above the burner head, is very difficult to light, or tends to extinguish itself, indicates that too much air or too much air and fuel are being supplied to the burner.)

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

9.3 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 sample.

9.3.1 If ignition (a flash or burning) is observed before or after the source of ignition (the flame of the burner) is removed, the sample is said to have a positive flammability potential. A positive result may require further investigation (see 9.4.1).

9.3.2 The confirmation of flammability may require the use of a watchglass (see 7.4).

9.3.3 If there is no ignition, proceed to 9.4.

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

9.4.1 If the sample ignites, the sample is said to have a positive flammability potential.

9.4.1.1 When more accurate waste characterization is necessary, liquid samples may be quantified using a closed-cup flash point tester.

9.4.1.2 Solids with a positive flammability potential should be further investigated.

9.4.2 If the sample decomposes, boils (if a liquid), or otherwise fails to ignite after at least 15 s of continuous sample heating by the burner flame, the flammability potential is reported as negative.

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

9.5 Shut off the gas burner when not in use. Extinguish a burning sample by setting an aluminum weighing boat or watchglass atop the one containing the burning sample, (or invert a spoutless beaker over the sample container and all). Use of tongs or high temperature gloves or mittens may be necessary to handle the equipment.

TEST METHOD B—EXPOSURE TO SPARK SOURCE

10. Apparatus

10.1 *Oven Gloves.*

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

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

10.4 *Watchglass,* 100 mm.

10.5 *Metal Vessel* (with lid), of adequate depth and diameter to contain beaker and watchglass is needed.

10.6 *Thermometer.*

11. Procedure

11.1 Place approximately 100 mL of the test sample of the material to be tested into the plastic beaker (see 6.3).

11.2 Place the plastic beaker in the steel vessel, cover the beaker with the watchglass, and allow to stand at ambient conditions for 5 min.

11.3 Remove the watchglass, place the igniter immediately above the waste and strike it several times to produce sparks.

11.4 If the material does catch fire and burn, extinguish the flames by immediately placing the lid on the steel vessel, thus smothering the fire and report as positive flammability potential.

12. Report for Methods A and B

12.1 Report the following information:

12.1.1 Sample identification,

12.1.2 Date of test,

12.1.3 Sample classification: positive or negative, and

12.1.4 Reference to the procedure applied.

13. Quality Control for Methods A and B

13.1 Quality control check samples and duplications should be performed at an action level specified by the laboratory and at an appropriate frequency.

13.2 Flammability standards should 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.

14. Precision and Bias for Methods A & B

14.1 *Precision*—No information is presented about either the precision or bias of Test Method D4982 for measuring flammability potential because of waste sample variability and the test result is nonquantitative.

15. Keywords

15.1 flammability potential; ignition; screening analysis; wastes