Designation: ~~D2584 – 11~~ D2584 – 18

Standard Test Method for Ignition Loss of Cured Reinforced Resins[1]

This standard is issued under the fixed designation D2584; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This test method covers the determination of the ignition loss of cured reinforced resins. This ignition loss ~~can~~shall be considered to be the resin content within the limitations of 4.2.

1.2 The values stated in SI units are to be regarded as the standard.

1.3 *This standard is used to measure and describe the response of composite material to heat under controlled conditions, but does not by itself incorporate all of the factors required for fire hazard or fire assessments of the composite materials under actual fire conditions.*

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

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 ~~whoever uses~~ the user of this standard to ~~consult and~~ establish appropriate ~~safety~~ safety, health, and ~~health~~environmental practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—There is no known ISO equivalent to this standard.

1.6 *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]

D618 Practice for Conditioning Plastics for Testing

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

E2935 Practice for Conducting Equivalence Testing in Laboratory Applications

3. Summary of Test Method

3.1 The specimen contained in a crucible is ignited and allowed to burn until only ash and carbon remain. The carbonaceous residue is reduced to an ash by heating in a muffle furnace at 565°C (1050°F), cooled in a desiccator, and weighed.

4. Significance and Use

4.1 This test method ~~can be~~ is used to obtain the ignition loss of a cured reinforced resin sample. ~~This test method can also be used to examine the fiber architecture of pultruded structural shapes.~~

NOTE 2—The basic concept of burning off of the organic matrix of a reinforced polymer composite has also been shown to be a useful method for enabling a visual examination of the fiber architecture or laminate structure of some reinforcements.

4.2 If only glass fabric or filament is used as the reinforcement of an organic resin that is completely decomposed to volatile materials under the conditions of this test and the small amount of volatiles (water, residual solvent) that are potentially present are ignored, the ignition loss ~~can~~shall be considered to be the resin content of the sample.

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[1] This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.18 on Reinforced Thermosetting Plastics.

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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**

4.2.1 This test method does not provide a measure of resin content for samples containing reinforcing materials that lose weight under the conditions of the test or containing resins or fillers that do not decompose to volatile materials released by ignition.

5. Apparatus

5.1 *Crucible,* platinum or porcelain, approximately 30-mL capacity.

5.2 *Electric Muffle Furnace,* capable of maintaining a temperature of 565 ± 28°C (1050 ± 50°F).

6. Test Specimen

6.1 A minimum of three specimens shall be tested for each sample.

NOTE 3—It is often convenient to use samples obtained from specimens that have been tested for mechanical properties such as flexural or tensile strength. Specimens obtained from these samples must be dry and the fractured areas removed, leaving square, unfrayed faces, before being weighed and ignited.

6.2 The specimen shall weigh approximately 5 g with a maximum size of 2.5 by 2.5 cm by thickness (1 by 1 in. by thickness).

NOTE 4—Materials that have gross differences in the ratio of resin to reinforcement within an area as small as 2.5 by 2.5 cm (1 by 1 in.) may require a larger specimen area than that listed in 6.2. If larger specimens are utilized, it will be necessary to cut into approximately 2.5 by 2.5-cm (1 by 1-in.) pieces and place in a crucible of sufficient size to contain the specimen.

7. Conditioning

7.1 *Conditioning*—Condition the test specimens at 23± 2°C (73.4 ± 3.6°F) and 50 ± 10 % relative humidity for not less than 40 h prior to test in accordance with Procedure A of Practice D618 for those tests where conditioning is required. In cases of disagreement, the tolerances shall be ±1°C (±1.8°F) and ±5 % relative humidity. ~~The conditioning is not required if the test is only performed to examine the fiber architecture.~~

7.2 *Test Conditions*—Conduct tests in the standard laboratory atmosphere of 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 10 % relative humidity, unless otherwise specified in the test methods or in the specification. In cases of disagreement, the tolerances shall be ±1°C (±1.8°F) and ±10 % relative humidity.

8. Procedure

8.1 Heat a crucible at 500 to 600°C for 10 min or more. Cool to room temperature in a desiccator and weigh to the nearest 1.0 mg. The desiccator is not required if the test is performed only to examine the fiber architecture.

8.2 Place the specimen in the crucible and weigh to the nearest 1.0 mg. Heat the crucible and specimen in a bunsen flame until the contents ignite. Maintain such a temperature that the specimen burns at a uniform and moderate rate until only ash and carbon remain when the burning ceases.

NOTE 5—It is not absolutely necessary to ignite the specimen in a bunsen flame. Instead the crucible and contents can be placed in a muffle furnace at a temperature lower than 565°C and ignited. Care must be taken that the ignition does not proceed so rapidly that there will be a mechanical loss of the noncombustible residue.

8.3 Heat the crucible and residue in the muffle furnace at 565 ± 28°C (1050 ± 50°F) until all carbonaceous material has disappeared (Note ~~5~~6). Cool the crucible to room temperature in a desiccator and weight to the nearest 1.0 mg.

NOTE 6—The time for the carbonaceous residue to disappear is dependent largely on the specimen geometry. It can be up to 6 h but is usually much less.

8.4 Bring the crucible and residue to constant weight within 1.0 mg.

9. Calculations

9.1 Calculate the ignition loss of the specimen in weight percent as follows:

$$\text{Ignition loss, weight \%} = [(W_1 - W_2)/W_1] \times 100 \quad (1)$$

where:

W_1 = weight of specimen, g, and
W_2 = weight of residue, g.

9.2 Average the 3 specimen values to obtain the sample average.

~~$$s = \sqrt{[\sum X^2 - n(\bar{X})^2]/(n-1)} \quad (2)$$~~

$$s = \sqrt{[\sum X^2 - n(\bar{X})^2]/(n-1)} \quad (2)$$

where:

s = estimated standard deviation,