Designation: D3531 – 99 (Reapproved 2009)

Standard Test Method for Resin Flow of Carbon Fiber-Epoxy Prepreg[1]

This standard is issued under the fixed designation D3531; 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 Department of Defense.

1. Scope

1.1 This test method covers the determination of the amount of resin flow that will take place from prepreg tape or sheet under given conditions of temperature and pressure.

1.2 The values stated in SI units are to be regarded as standard. The values in parentheses are for reference only.

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. Summary of Test Method

2.1 A weighed specimen consisting of two plies a minimum size of 50-mm (2.0-in.) square 0–1.57 rad (0 to 90°) crossplied tape is sandwiched between bleeder material and release film. The sandwich is placed in a platen press heated to either temperature A, 120°C (250°F), or temperature B, 175°C (350°F) or any other temperature specified. The press is closed to provide a pressure of 700 kPa (100 psi). The pressure is held for 15 min or until the resin gels. The cooled sandwich assembly is removed and the resin that has flowed to the edges of the specimen is removed and the specimen reweighed. The change in weight is expressed as a percent of the original weight and reported as percent flow.

3. Significance and Use

3.1 This test method is used to obtain the resin flow of carbon fiber-epoxy prepreg tape or sheet material. It is suitable for comparing lots of material of supposedly the same characteristics and also for comparative evaluation of materials produced by different vendors using different resin-fiber combinations.

3.2 Composite parts are laminated from prepreg material at various pressures and temperatures. Production process design will require a flow test be run at a temperature and a pressure close to that of the actual molding conditions. All methods of measuring resin flow are dependent on the size and geometry of the specimen. This test method uses the smallest quantity of tape that will give reproducible results.

3.2.1 The percent resin flow of a single fiber and resin system at a temperature and pressure varies with the volatile content, degree of advancement of epoxy resin, and with the resin content of the prepreg tape or sheet.

3.2.2 As volatile content and degree of resin cure (advancement) change with time, this test method is useful in comparing the life of prepreg tape and sheet.

4. Apparatus

4.1 *Cutting Template*, square metal, 50 by 50 mm (2.0 by 2.0 in.), minimum.

4.2 *Cutting Template*, metal, 100 by 100 mm (4.0 by 4.0 in.), minimum.

4.3 *Cutting Knife*, single edge.

4.4 *Analytical Balance* capable of weighing to the nearest 0.001 g.

4.5 *Glass Bleeder Cloth*, Style 1581 or 181.

4.6 *TFE-Fluorocarbon Coated, Woven Separator Cloth,*[2] porous.

4.7 *Release Film* of 0.03 to 0.06 mm (0.001 to 0.002 in.) thickness polyester, aluminum, etc.

4.8 *Platen Press*, capable of being heated to 175 ± 3°C (350 ± 5°F) and capable of applying 4000 N (900 lbf).

5. Interferences

5.1 This test method depends on platen force being supplied evenly to the specimen. For this to be done, the platen must load evenly across its surface and not point load to the point of initial contact. When bleeder materials are used on the top and bottom of the specimen, the effect of uneven pressure application is less pronounced than if no bleeder materials are used. Bleeders tend to minimize pressure effects, since if resin flows into the bleeder it will do so within a broad pressure range. Sometimes, platen pressure needs to be increased gradually to assure even loading.

5.2 The platen flatness must be sufficient for the specimen to load evenly. For this reason the specimen thickness should be

[1] This test method is under the jurisdiction of ASTM Committee D30 on Composite Materials and is the direct responsibility of Subcommittee D30.03 on Constituent/Precursor Properties.

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[2] DuPont product TX-1040 or equivalent has been found satisfactory for this purpose.