Designation: C 1468 – 00

Standard Test Method for Transthickness Tensile Strength of Continuous Fiber-Reinforced Advanced Ceramics at Ambient Temperature[1]

This standard is issued under the fixed designation C 1468; 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 the determination of transthickness tensile strength (S_U^T) under monotonic uniaxial loading of continuous fiber-reinforced ceramics (CFCC) at ambient temperature. This test method addresses, but is not restricted to, various suggested test specimen geometries, test fixtures, data collection and reporting procedure. In general, round or square test specimens are tensile tested in the direction normal to the thickness by bonding appropriate hardware to the samples and performing the test. For a Cartesian coordinate system, the *x*-axis and the *y*-axis are in the plane of the test specimen. The transthickness direction is normal to the plane and is labeled the *z*-axis for this test method. For CFCCs, the plane of the test specimen normally contains the larger of the three dimensions and is parallel to the fiber layers for uni-directional, bi-directional, and woven composites. Note that transthickness tensile strength as used in this test method refers to the tensile strength obtained under monotonic uniaxial loading where monotonic refers to a continuous nonstop test rate with no reversals from test initiation to final fracture.

1.2 This test method is intended primarily for use with all advanced ceramic matrix composites with continuous fiber reinforcement: unidirectional (1-D), bidirectional (2-D), woven, and tridirectional (3-D). In addition, this test method also may be used with glass (amorphous) matrix composites with 1-D, 2-D, and 3-D continuous fiber reinforcement. This test method does not address directly discontinuous fiber-reinforced, whisker-reinforced or particulate-reinforced ceramics, although the test methods detailed here may be equally applicable to these composites. It should be noted that 3-D architectures with a high volume fraction of fibers in the "*z*" direction may be difficult to test successfully.

1.3 Values are in accordance with the International System of Units (SI) and Practice E 380.

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.* Additional recommendations are provided in 6.7 and Section 7.

2. Referenced Documents

2.1 *ASTM Standards:*

C 1145 Terminology on Advanced Ceramics[2]

C 1239 Practice for Reporting Uniaxial Strength Data and Estimating Weibull Distribution Parameters for Advanced Ceramics[2]

C 1275 Test Method for Monotonic Tensile Strength Testing of Continuous Fiber-Reinforced Advanced Ceramics With Solid Rectangular Cross-Section Specimens at Ambient Temperatures[2]

D 3878 Terminology of High-Modulus Reinforcing Fibers and Their Composites[3]

E 4 Practices for Force Verification of Testing Machines[4]

E 6 Terminology Relating to Methods of Mechanical Testing[4]

E 337 Test Method for Measuring Humidity With a Psychrometer (the Measurement of Wet-and Dry-Bulb Temperatures)[5]

E 380 Practice for Use of International System of Units (SI) (the Modernized Metric System)[6]

E 1012 Practice for Verification of Specimen Alignment Under Tensile Loading[4]

3. Terminology

3.1 *Definitions*—The definitions of terms relating to tensile testing appearing in Terminology E 6 apply to the terms used in this test method. The definitions of terms relating to advanced ceramics appearing in Terminology C 1145 apply to the terms used in this test method. The definitions of terms relating to fiber-reinforced composites appearing in Terminology D 3878 apply to the terms used in this test method. Pertinent definitions as listed in Practice E 1012, Terminology C 1145, Terminology D 3878, and Terminology E 6 are shown in the following with the appropriate source given in brackets. Terms used in conjunction with this test method are defined as follows:

3.1.1 *advanced ceramic*, *n*—a highly-engineered, high-performance predominately nonmetallic, inorganic, ceramic

[1] This test method is under the jurisdiction of ASTM Committee C28 on Advanced Ceramics and is the direct responsibility of Subcommittee C28.07 on Ceramic Matrix Composites.

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[2] *Annual Book of ASTM Standards*, Vol 15.01.

[3] *Annual Book of ASTM Standards*, Vol 15.03.

[4] *Annual Book of ASTM Standards*, Vol 03.01.

[5] *Annual Book of ASTM Standards*, Vol 11.03.

[6] Discontinued 1997—Replaced by IEEE/ASTM SI-10.

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