



Standard Test Method for Shear Strength of Continuous Fiber-Reinforced Advanced Ceramics at Ambient Temperatures¹

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1. Scope

1.1 This test method covers the determination of shear strength of continuous fiber-reinforced ceramic composites (CFCCs) at ambient temperature. The test methods addressed are (1) the compression of a double-notched specimen to determine interlaminar shear strength and (2) the Iosipescu test method to determine the shear strength in any one of the material planes of laminated composites. Specimen fabrication methods, testing modes (load or displacement control), testing rates (load rate or displacement rate), data collection, and reporting procedures are addressed.

1.2 This test method is used for testing advanced ceramic or glass matrix composites with continuous fiber reinforcement having uni-directional (1-D) or bi-directional (2-D) fiber architecture. This test method does not address composites with (3-D) fiber architecture or discontinuous fiber-reinforced, whisker-reinforced, or particulate-reinforced ceramics.

1.3 The values stated in SI units are to be regarded as the standard and are in accordance with 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.* Specific hazard statements are given in 8.1 and 8.2.

2. Referenced Documents

2.1 ASTM Standards:

- C 1145 Terminology of Advanced Ceramics²
- D 695 Test Method for Compressive Properties of Rigid Plastics³
- D 3846 Test Method for In-Plane Shear Strength of Reinforced Plastics⁴
- D 3878 Terminology for High-Modulus Reinforcing Fibers

¹ This test method is under the jurisdiction of ASTM Committee C-28 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 08.01.

⁴ *Annual Book of ASTM Standards*, Vol 08.02.

and Their Composites⁵

D 5379/D 5379M Test Method for Shear Properties of Composite Materials by the V-Notched Beam Method⁵

E 4 Practices for Force Verification of Testing Machines⁶

E 6 Terminology Relating to Methods of Mechanical Testing⁶

E 122 Practice for Choice of Sample Size to Estimate a Measure of Quality for a Lot or Process⁷

E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods⁷

E 337 Test Method for Measuring Humidity with Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures)⁸

E 380 Practice for Use of International System of Units (SI)⁷

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method⁷

3. Terminology

3.1 *Definitions*—The definitions of terms relating to shear strength 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. Additional terms used in conjunction with this test method are defined in the following.

3.1.1 *advanced ceramic*—an engineered high-performance predominately nonmetallic, inorganic, ceramic material having specific functional attributes.

3.1.2 *continuous fiber-reinforced ceramic matrix composite (CFCC)*—a ceramic matrix composite in which the reinforcing phase consists of a continuous fiber, continuous yarn, or a woven fabric.

3.1.3 *shear failure load*—the maximum load required to fracture a shear loaded test specimen.

3.1.4 *shear strength*—the maximum shear stress that a

⁵ *Annual Book of ASTM Standards*, Vol 15.03.

⁶ *Annual Book of ASTM Standards*, Vol 03.01.

⁷ *Annual Book of ASTM Standards*, Vol 14.02.

⁸ *Annual Book of ASTM Standards*, Vol 11.03.