



Standard Test Method for Interlaminar Shear Strength of 1-D and 2-D Continuous Fiber-Reinforced Advanced Ceramics at Elevated Temperatures¹

This standard is issued under the fixed designation C 1425; 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 addresses the compression of a double-notched specimen to determine interlaminar shear strength of continuous fiber-reinforced ceramic composites (CFCCs) at elevated temperatures. Specimen preparation methods and requirements, testing modes (load or displacement control), testing rates (load rate or displacement rate), data collection, and reporting procedures are addressed.

1.2 *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 precautionary statements are noted in 8.1 and 8.2.

1.3 This test method is used for testing advanced ceramic or glass matrix composites with continuous fiber reinforcement having a laminated structure such as in unidirectional (1-D) or bidirectional (2-D) fiber architecture (lay-ups of unidirectional plies or stacked fabric). This test method does not address composites with nonlaminated structures, such as (3-D) fiber architecture or discontinuous fiber-reinforced, whisker-reinforced, or particulate-reinforced ceramics.

1.4 Values expressed in this test method are in accordance with the International System of Units (SI) and Practice E 380.

2. Referenced Documents

2.1 ASTM Standards:

C 1145 Terminology on Advanced Ceramics²

C 1292 Test Method for Shear Strength of Continuous Fiber-Reinforced Ceramics at Ambient Temperatures²

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 of 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.

Current edition approved May 10, 1999. Published August 1999.

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

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 Process⁷

E 220 Test Method for Calibration of Thermocouples by Comparison Techniques⁸

E 230 Temperature-Electromotive Force (EMF) Tables for Standardized Thermocouples⁸

E 337 Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet-Bulb and Dry-Bulb Temperatures)⁹

E 380 Practice for Use of International System of Units (SI)¹⁰

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.

4. Summary of Test Method

4.1 This test method addresses the determination of the interlaminar shear strength of CFCCs at elevated temperatures. The interlaminar shear strength of CFCCs, as determined by this test method, is measured by loading in compression a double-notched specimen of uniform width. Failure of the specimen occurs by interlaminar shear between two centrally located notches machined halfway through the thickness of the specimen and spaced a fixed distance apart on opposing faces. Schematics of the loading mode and the specimen are shown in Fig. 1. The procedures in this test method are similar to those in Test Method C 1292 for the determination of the interlaminar shear strength of CFCCs at ambient temperature, except

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 14.03.

⁹ Annual Book of ASTM Standards, Vol 11.03.

¹⁰ Annual Book of ASTM Standards, Vol 14.02.