



Standard Test Method for Tensile Strength of Monolithic Advanced Ceramics at Ambient Temperatures¹

This standard is issued under the fixed designation C 1273; 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 tensile strength under uniaxial loading of monolithic advanced ceramics at ambient temperatures. This test method addresses, but is not restricted to, various suggested test specimen geometries as listed in the appendix. In addition, specimen fabrication methods, testing modes (load, displacement, or strain control), testing rates (load rate, stress rate, displacement rate, or strain rate), allowable bending, and data collection and reporting procedures are addressed. Note that tensile strength as used in this test method refers to the tensile strength obtained under uniaxial loading.

1.2 This test method applies primarily to advanced ceramics that macroscopically exhibit isotropic, homogeneous, continuous behavior. While this test method applies primarily to monolithic advanced ceramics, certain whisker- or particle-reinforced composite ceramics as well as certain discontinuous fiber-reinforced composite ceramics may also meet these macroscopic behavior assumptions. Generally, continuous fiber ceramic composites (CFCCs) do not macroscopically exhibit isotropic, homogeneous, continuous behavior and application of this practice to these materials is not recommended.

1.3 Values expressed in this test method 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.* Specific precautionary statements are given in Section 7.

2. Referenced Documents

2.1 ASTM Standards:

- C 1145 Terminology of Advanced Ceramics²
- C 1161 Test Method for Flexural Strength of Advanced Ceramics at Ambient Temperature²
- C 1239 Practice for Reporting Uniaxial Strength Data and

Estimating Weibull Distribution Parameters for Advanced Ceramics²

D 3379 Test Method for Tensile Strength and Young's Modulus for High-Modulus Single-Filament Materials³

E 4 Practices for Force Verification of Testing Machines⁴

E 6 Terminology Relating to Methods of Mechanical Testing⁴

E 83 Practice for Verification and Classification of Extensometers⁴

E 337 Test Method for Measured Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures)⁵

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

E 1012 Practice for Verification of Specimen Alignment Under Tensile Loading⁴

2.2 Military Handbook:

MIL-HDBK-790 Fractography and Characterization of Fracture Origins in Advanced Structural Ceramics⁷

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 on tensile testing. The definitions of terms relating to advanced ceramics testing appearing in Terminology C 1145 apply to the terms used in this test method. Pertinent definitions as listed in Practice C 1239, Practice E 1012, Terminology C 1145, and Terminology E 6 are shown in the following with the appropriate source given in parentheses. Additional terms used in conjunction with this test method are defined in the following:

3.1.1 *advanced ceramic*—a highly engineered, high performance predominately nonmetallic, inorganic, ceramic material having specific functional attributes. (See Terminology C 1145.)

3.1.2 *axial strain*—the average of longitudinal strains measured at the surface on opposite sides of the longitudinal axis of symmetry of the specimen by two strain-sensing devices

¹ This test method is under the jurisdiction of ASTM Committee C-28 on Advanced Ceramics and is the direct responsibility of Subcommittee C28.01 on Properties and Performance.

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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 *Annual Book of ASTM Standards*, Vol 14.02.

⁷ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

