



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

This standard is issued under the fixed designation C 1366; 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 elevated 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. 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 which 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 test method to these materials is not recommended.

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. Refer to Section 7 for specific precautions.*

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

C 1322 Practice for Fractography and Characterization of Fracture Origins in Advanced Ceramics²

D 3379 Test Method for Tensile Strength and Young's Modulus for High-Modulus Single-Filament Materials²

E 4 Practices for Force Verification of Testing Machines³

E 6 Terminology Relating to Methods of Mechanical Testing³

E 21 Practice for Elevated Temperature Tension Tests of Metallic Materials³

E 83 Practice for Verification and Classification of Extensometers³

E 220 Method for Calibration of Thermocouples by Comparison Techniques⁴

E 337 Test Method for Measure 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 Loading³

2.2 Military Handbook:

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

3. Terminology

3.1 Definitions:

3.1.1 Definitions of terms relating to tensile testing and advanced ceramics as they appear in Terminology E 6 and Terminology C 1145, respectively, apply to the terms used in this test method. Pertinent definitions are shown in the following with the appropriate source given in parenthesis. Additional terms used in conjunction with this test method are defined in the following.

3.1.2 *advanced ceramic, n*—a highly engineered, high performance predominately non-metallic, inorganic, ceramic material having specific functional attributes. (See Terminology C 1145.)

3.1.3 *axial strain $[LL^{-1}]$, n*—the average longitudinal strains measured at the surface on opposite sides of the

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 03.01.

⁴ Annual Book of ASTM Standards, Vol 14.03.

⁵ Annual Book of ASTM Standards, Vol 11.03.

⁶ Annual Book of ASTM Standards, Vol 14.02.

⁷ Available from Army Research Laboratory—Materials Directorate, Aberdeen Proving Ground, MD 21005.

