



Standard Test Method for Monotonic Compressive Strength of Advanced Ceramics at Ambient Temperature¹

This standard is issued under the fixed designation C 1424; 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 compressive strength including stress-strain behavior, under monotonic uniaxial loading of advanced ceramics at ambient temperature. This test method is restricted to specific test specimen geometries. In addition, test specimen fabrication methods, testing modes (load or displacement), testing rates (load rate, stress rate, displacement rate, or strain rate), allowable bending, and data collection and reporting procedures are addressed. Compressive strength as used in this test method refers to the compressive strength obtained under monotonic uniaxial loading. Monotonic loading refers to a test conducted at a constant rate in a continuous fashion, with no reversals from test initiation to final fracture.

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.*

1.3 This test method is intended primarily for use with advanced ceramics that macroscopically exhibit isotropic, homogeneous, continuous behavior. While this test method is intended for use on 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.

1.4 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 773 Test Method for Compressive (Crushing) Strength of Fired Whiteware Materials²
- C 1145 Terminology on Advanced Ceramics³

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 15.02.

³ Annual Book of ASTM Standards, Vol 15.01.

D 695 Test Method for Compressive Properties of Rigid Plastics⁴

E 4 Practices for Force Verification of Testing Machines⁵

E 6 Terminology Relating to Methods of Mechanical Testing⁵

E 83 Practice for Verification and Classification of Extensometers⁵

E 337 Test Method for Measured Humidity with Psychrometer (the Measurement of Wet-and Dry-Bulb Temperatures)⁶

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

E 1012 Practice for Verification of Specimen Alignment Under Tensile Loading⁵

3. Terminology

3.1 *Definitions*—The definitions of terms relating to compressive testing appearing in Terminology E 6, Test Method D 695, and Terminology C 1145 may apply to the terms used in this test method. Pertinent definitions as listed in 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, n*—a highly engineered, high-performance predominately nonmetallic, inorganic, ceramic material having specific functional attributes. (C 1145)

3.1.2 *axial strain, n [L/L]*—the average longitudinal strains measured at the surface on opposite sides of the longitudinal axis of symmetry of the specimen by two strain-sensing devices located at the mid length of the reduced section. (E 1012)

3.1.3 *bending strain, n [L/L]*—the difference between the strain at the surface and the axial strain. In general, the bending strain varies from point to point around and along the reduced section of the test specimen. (E 1012)

3.1.4 *breaking load, n [F]*—the load at which fracture occurs. (E 6)

3.1.5 *compressive strength, n [F/L²]*—the maximum compressive stress which a material is capable of sustaining.

⁴ Annual Book of ASTM Standards, Vol 08.01.

⁵ Annual Book of ASTM Standards, Vol 03.01.

⁶ Annual Book of ASTM Standards, Vol 11.03.

⁷ Annual Book of ASTM Standards, Vol 14.02.