



Standard Test Method for Determination of Slow Crack Growth Parameters of Advanced Ceramics by Constant Stress-Rate Flexural Testing at Elevated Temperatures¹

This standard is issued under the fixed designation C 1465; 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 slow crack growth (SCG) parameters of advanced ceramics by using constant stress-rate flexural testing in which flexural strength is determined as a function of applied stress rate in a given environment at elevated temperatures. The strength degradation exhibited with decreasing applied stress rate in a specified environment is the basis of this test method which enables the evaluation of slow crack growth parameters of a material.

NOTE 1—This test method is frequently referred to as “dynamic fatigue” testing (Refs (1-3))² in which the term “fatigue” is used interchangeably with the term “slow crack growth.” To avoid possible confusion with the “fatigue” phenomenon of a material which occurs exclusively under cyclic loading, as defined in Terminology E 1823, this test method uses the term “constant stress-rate testing” rather than “dynamic fatigue” testing.

NOTE 2—In glass and ceramics technology, static tests of considerable duration are called “static fatigue” tests, a type of test designated as stress-rupture (Terminology E 1823).

1.2 This test method is intended primarily to be used for *negligible* creep of test specimens, with specific limits on creep imposed in this test method.

1.3 This test method applies primarily to advanced ceramics that are macroscopically homogeneous and isotropic. This test method may also be applied to certain whisker- or particle-reinforced ceramics that exhibit macroscopically homogeneous behavior.

1.4 This test method is intended for use with various test environments such as air, vacuum, inert, and any other gaseous environments.

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

1.6 *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.*

2. Referenced Documents

2.1 ASTM Standards:

- C 1145 Terminology of Advanced Ceramics³
- C 1161 Test Method for Flexural Strength of Advanced Ceramics at Ambient Temperature³
- C 1211 Test Method for Flexural Strength of Advanced Ceramics at Elevated Temperatures³
- C 1239 Practice for Reporting Uniaxial Strength Data and Estimating Weibull Distribution Parameters for Advanced Ceramics³
- C 1322 Practice for Fractography and Characterization of Fracture Origins in Advanced Ceramics³
- C 1368 Test Method for Determination of Slow Crack Growth Parameters of Advanced Ceramics by Constant Stress-Rate Flexural Testing at Ambient Temperature³
- E 4 Practices for Force Verification of Testing Machines⁴
- E 6 Terminology Relating to Methods of Mechanical Testing⁴
- E 220 Test Method for Calibration of Thermocouples by Comparison Techniques⁵
- E 230 Specification and Temperature-Electromotive Force (EMF) Tables for Standardized Thermocouples⁵
- E 337 Test Method for Measured Humidity with a 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 1823 Terminology Relating to Fatigue and Fracture Testing⁴

3. Terminology

3.1 *Definitions*—The terms described in Terminologies C 1145, E 6, and E 1823 are applicable to this test method. Specific terms relevant to this test method are as follows:

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

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 The boldface numbers in parentheses refer to the list of references at the end of this standard.

³ *Annual Book of ASTM Standards*, Vol 15.01.

⁴ *Annual Book of ASTM Standards*, Vol 03.01.

⁵ *Annual Book of ASTM Standards*, Vol 14.03.

⁶ *Annual Book of ASTM Standards*, Vol 11.03.

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