



Standard Practice for Fractography and Characterization of Fracture Origins in Advanced Ceramics¹

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1. Scope*

1.1 The objective of this practice is to provide an efficient and consistent methodology to locate and characterize fracture origins in advanced ceramics. It is applicable to advanced ceramics that are brittle; that is, fracture that takes place with little or no preceding plastic deformation. In such materials, fracture commences from a single location which is termed the fracture origin. The fracture origin in brittle ceramics normally consists of some irregularity or singularity in the material which acts as a stress concentrator. In the parlance of the engineer or scientist, these irregularities are termed flaws or defects. The latter word should not be construed to mean that the material has been prepared improperly or is somehow faulty.

1.2 Although this practice is primarily intended for laboratory test piece analysis, the general concepts and procedures may be applied to component fracture analyses as well. In many cases, component fracture analysis may be aided by cutting laboratory test pieces out of the component. Information gleaned from testing the laboratory pieces (for example, flaw types, general fracture features, fracture mirror constants) may then aid interpretation of component fractures. For more information on component fracture analysis, see Ref (1 and 2).²

1.3 *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 This practice is under the jurisdiction of ASTM Committee C28 on Advanced Ceramics and is the direct responsibility of Subcommittee C28.01 on Mechanical 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.

2. Referenced Documents

2.1 ASTM Standards:³

C162 Terminology of Glass and Glass Products

C242 Terminology of Ceramic Whitewares and Related Products

C1036 Specification for Flat Glass

C1145 Terminology of Advanced Ceramics

C1161 Test Method for Flexural Strength of Advanced Ceramics at Ambient Temperature

C1211 Test Method for Flexural Strength of Advanced Ceramics at Elevated Temperatures

C1239 Practice for Reporting Uniaxial Strength Data and Estimating Weibull Distribution Parameters for Advanced Ceramics

C1499 Test Method for Monotonic Equibiaxial Flexural Strength of Advanced Ceramics at Ambient Temperature

C1678 Practice for Fractographic Analysis of Fracture Mirror Sizes in Ceramics and Glasses

F109 Terminology Relating to Surface Imperfections on Ceramics

2.2 NIST Standard:⁴

NIST Special Publication SP 960-16 Guide to Practice for Fractography of Ceramics and Glasses (2)

2.3 CEN Standard:⁵

EN 843-6 Advanced Technical Ceramics. Mechanical Properties of Monolithic Ceramics at Room Temperature. Guidance for Fractographic Investigation, European Standards Committee (CEN), 2010

3. Terminology

3.1 Definitions:

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

⁴ Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 1070, Gaithersburg, MD 20899-1070, <http://www.nist.gov>.

⁵ Available from European Committee for Standardization (CEN), Avenue Marnix 17, B-1000, Brussels, Belgium, <http://www.cen.eu>.