Designation: C 1322 – 96a

AMERICAN SOCIETY FOR TESTING AND MATERIALS
100 Barr Harbor Dr., West Conshohocken, PA 19428
Reprinted from the Annual Book of ASTM Standards. Copyright ASTM

Standard Practice for Fractography and Characterization of Fracture Origins in Advanced Ceramics[1]

This standard is issued under the fixed designation C 1322; 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 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 which are brittle; that is, the material adheres to Hooke's Law up to fracture. 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 should not be construed to mean that the material has been prepared improperly or is somehow faulty.

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.*

2. Referenced Documents

2.1 *ASTM Standards:*

C 162 Terminology of Glass and Glass Products[2]

C 242 Terminology of Ceramic Whitewares and Related Products[2]

C 1145 Terminology of Advanced Ceramics[3]

C 1211 Test Method for Flexural Strength of Advanced Ceramics at Elevated Temperatures[3]

C 1239 Practice for Reporting Uniaxial Strength Data and Estimating Weibull Distribution Parameters for Advanced Ceramics[3]

C 1256 Practice for Interpreting Glass Fracture Surface Features[2]

F 109 Terminology Relating to Surface Imperfections on Ceramics[3]

2.2 *Military Standard:*

Military Handbook 790, Fractography and Characterization of Fracture Origins in Advanced Structural Ceramics, 1992[4]

3. Terminology

3.1 *General*—The following terms are given as a basis for identifying fracture origins that are common to advanced ceramics. It should be recognized that origins can manifest themselves differently in various materials. The photographs in Appendix X1 show examples of the origins defined in 3.8 and 3.9. Terms that are contained in other ASTM standards are noted at the end of the each definition.

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

3.3 *flaw, n*—a structural discontinuity in an advanced ceramic body that acts as a highly localized stress raiser.

NOTE 1—The presence of such discontinuities does not necessarily imply that the ceramic has been prepared improperly or is faulty.

3.4 *fracture origin, n*—the source from which brittle fracture commences. **C 1145**

3.5 *hackle, n—as used in fractography*, a line or lines on the crack surface running in the local direction of cracking, separating parallel but noncoplanar portions of the crack surface.

3.6 *mirror, n—as used in fractography of brittle materials*, a very smooth region in the immediate vicinity of and surrounding the fracture origin.

3.7 *mist, n—as used in fractography of brittle materials*, markings on the surface of an accelerating crack close to its effective terminal velocity, observable first as a misty appearance and with increasing velocity reveals a fibrous texture, elongated in the direction of crack propagation.

3.8 *Inherently Volume-Distributed Origins*:

3.8.1 *agglomerate, n, (A(V))—as used in fractography*, a cluster of grains, particles, platelets, or whiskers, or a combination thereof, present in a larger solid mass.

NOTE 2—The codes in parentheses after each term are provided for use in statistical analysis. A superscript *V* stands for inherently volume-distributed origins and a superscript *S* for inherently surface-distributed origins. **C 1145**

[1] This practice is under the jurisdiction of ASTM Committee C-28 on Advanced Ceramicsand is the direct responsibility of Subcommittee C28.05 on Processing.

Current edition approved Dec. 10, 1996. Published February 1997. Originally published as C 1322 – 96. Last previous edition C 1322 – 96ϵ[1].

[2] *Annual Book of ASTM Standards*, Vol 15.02.

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

[4] Available from Army Research Laboratory-Materials Directorate, Aberdeen Proving Ground, MD 21005.