



Standard Test Method for Vickers Indentation Hardness of Advanced Ceramics¹

This standard is issued under the fixed designation C 1327; 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 the Vickers indentation hardness of advanced ceramics.

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:²

- E 4 Practices for Force Verification of Testing Machines
- E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods
- E 380 Practice for Use of the International System of Units (SI) (the Modernized Metric System)
- E 384 Test Method for Microhardness of Materials
- E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

2.2 European Standard:

- CEN ENV 843-4 Advanced Technical Ceramics, Monolithic Ceramics, Mechanical Properties at Room Temperature, Part 4: Vickers, Knoop and Rockwell Superficial Hardness³

2.3 Japanese Standard:

- JIS R 1610 Testing Method for Vickers Hardness of High Performance Ceramics⁴

2.4 ISO Standard:

- ISO 6507/2 Metallic Materials—Hardness test—Vickers test—Part 2: HV0.2 to less than HV5⁵

3. Terminology

3.1 Definition:

3.1.1 *Vickers hardness number (HV), n*—an expression of hardness obtained by dividing the force applied to a Vickers indenter by the surface area of the permanent impression made by the indenter.

3.1.2 *Vickers indenter, n*—a square-based pyramidal-shaped diamond indenter with face angles of 136° 00′.

4. Summary of Test Method

4.1 This test method describes an indentation hardness test using a calibrated machine to force a pointed, square base, pyramidal diamond indenter having specified face angles, under a predetermined load, into the surface of the material under test and to measure the surface-projected diagonals of the resulting impression after removal of the load.

NOTE 1—A general description of the Vickers indentation hardness test is given in Test Method E 384. The present method is very similar, has most of the same requirements, and differs only in areas required by the special nature of advanced ceramics. This test method also has many elements in common with standards ENV 843-4 and JIS R 1610, which are also for advanced ceramics.

5. Significance and Use

5.1 For advanced ceramics, Vickers indenters are used to create indentations whose surface-projected diagonals are measured with optical microscopes. The Vickers indenter creates a square impression from which two surface-projected diagonal lengths are measured. Vickers hardness is calculated from the ratio of the applied load to the area of contact of the four faces of the undeformed indenter. (In contrast, Knoop indenters are also used to measure hardness, but Knoop hardness is calculated from the ratio of the applied load to the projected area on the specimen surface.)

5.2 Vickers indentation hardness is one of many properties that is used to characterize advanced ceramics. Attempts have been made to relate Vickers indentation hardness to other hardness scales, but no generally accepted methods are available. Such conversions are limited in scope and should be used with caution, except for special cases where a reliable basis for the conversion has been obtained by comparison tests.

¹ This test method is under the jurisdiction of ASTM Committee C28 on Advanced Ceramics and is the direct responsibility of Subcommittee C28.01 on Properties and Performance.

Current edition approved October 1, 2003. Published December 2003. Originally approved in 1996. Last previous edition approved in 1999 as C 1327 – 99.

² 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.

³ Available from European Committee for Standardization, Brussels, Belgium.

⁴ Available from Japanese Standards Association, Tokyo, Japan.

⁵ Available from International Standards Organization, Geneva, Switzerland.