



# How Do You Measure That Ceramic Property?

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## C28 Advanced Ceramic Standards

### Introduction

By using the dozens of consensus test standards and practices developed by the Advanced Ceramics Committee of ASTM, C-28, the measurement of mechanical, physical, thermal, and performance properties can be properly performed. The “what, how, how not, and why” are clearly illustrated for beginning as well as experienced testers. Using these standards will provide accurate, reliable, and complete data for rigorous comparisons with other test results. The C-28 Committee has involved academics, and producers, and users of ceramics to write and continually update more than 45 standards since the committee’s inception in 1986.

### For further information

The C28 Committee and Standards for Ceramics  
ASTM C28 Committee Page –  
<http://www.astm.org/COMMIT/C28.htm>

List of C28 Subcommittees and Links to Standards-  
<http://www.astm.org/COMMIT/SUBCOMMIT/C28.htm>

ASTM C28 Advanced Ceramic Standards by Subject-  
<http://www.astm.org/COMMIT/CUSTOM1/C28.htm>

Chart showing ASTM C28 Advanced Ceramic Standards-  
[http://www.astm.org/COMMIT/C28\\_Standards.pdf](http://www.astm.org/COMMIT/C28_Standards.pdf)

ASTM Standards for Advanced Ceramics, Whitewares, Glass, and Ceramic Tile-  
<http://www.astm.org/Standards/glass-and-ceramic-standards.html>

### Acknowledgments

We thank the more than 90 industry, government, and academic committee members from many countries (~25% non-USA) who have volunteered many hours to develop these standards via work in six technical and four administrative subcommittees.

Visit the C28 website (<http://www.astm.org/COMMIT/COMMITTEE/C28.htm>) to purchase C28 standards or join the C28 committee.

**Monolithics**

- C 1161 Flexural strength
- C 1211 Flexural strength (High Temp)
- C 1368 Slow Crack Growth (Dynamic Fatigue)
- C 1465 Slow Crack Growth (High Temp)
- C 1576 Slow Crack Growth (Stress Rupture)
- C 1684 Flexural strength (Rods)
- C 1424 Compression strength
- C 1322 Fractography
- C 1678 Fracture Mirror
- C 1273 Tensile strength
- C 1366 Tensile strength (High T.)
- C 1291 Creep, Creep Rupture
- C 1361 Cyclic fatigue
- C 1326 Knoop hardness
- C 1327 Vickers hardness
- C 1499 Biaxial strength
- C 1198 Elastic Modulus - continuous
- C 1259 Elastic modulus - impulse
- C 1470 Thermal Guide
- C 1323 C-ring strength
- C 1495 Grinding
- C 1525 Thermal shock

**Composites, Coatings, Porous Ceramics**

- C 1275 CFCC Tensile strength
- C 1359 Tensile strength (Hi Temp)
- C 1337 Creep, Creep Rupture
- C 1360 Cyclic fatigue
- C 1468 CFCC Tensile Trans thickness
- C 1358 CFCC Compression
- C 1557 Filament Tensile strength and Elastic modulus
- C 1469 Joint strength
- C 1341 CFCC Flexure strength
- C 1674 Honeycomb Flex strength
- C 1292 CFCC Shear strength
- C 1425 Shear strength (HiTemp)
- C 1624 Coatings - Scratch Adhesion

**Powders**

- C 1274 Particle size, BET
- C 1282 Particle size, Centrifugal Sed.
- C 1494 C, N, O in silicon nitride

**NDE and Design**

- C 1239 Weibull
- C 1683 Weibull Scaling
- C 1175 NDE Guide
- C 1331 Ultrasonic velocity
- C 1332 Ultrasonic attenuation
- C 1212 Seeded voids
- C 1336 Seeded inclusions

**Terms, Workshops, Education**

- STP 1201 Life Prediction
- STP 1309 Composites
- STP 1392 Composites
- STP 1409 Fracture
- C 1145 Terminology

**Subcommittees**

- .01 Mech. Prop. + Reliability
- .03 Physical Prop. + NDE
- .04 Applications
- .07 Ceramic Matrix Composites
- .91 Terminology
- .94 ISO TAG

ASTM C28 standards are found in Vol. 15.01.

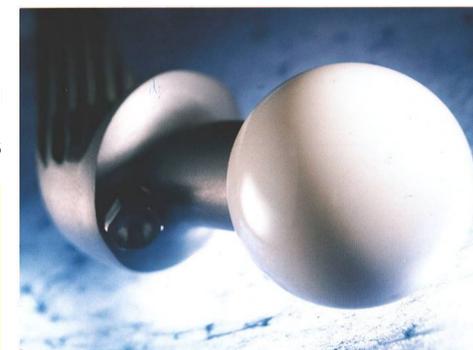
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### Standardization: Tangible Benefits

**F 1973: Standard Specification for High Purity Dense Yttria Tetragonal Zirconium Oxide Polycrystal (Y-TZP) for Surgical Implant Applications**

ASTM Committee F-04, Surgical and Medical Devices and the U.S. Food and Drug Administration used generic C-28 Advanced Ceramics for their new standard

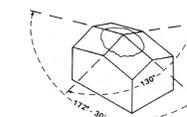
“The average flexural strength shall be 800 MPa or greater by 4 point bending in accordance with ASTM C 1161”  
“The minimum elastic modulus shall be 200 GPa in accordance with C 1198 or C 1259”  
“If Weibull modulus is tested, it shall be tested in accordance with C 1239”



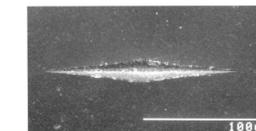
### Standardization:

### Tangible Benefits

#### Hardness Testing of Ceramics



The Knoop diamond pyramid indenter.



A Knoop indentation in a ceramic.

- Hardness standards for metals such as ASTM E 384 were often applied to ceramics. This led to problems since cracking and the indentation size effect in ceramics caused users to vary the testing conditions dramatically. As a result, it was very difficult to compare ceramic hardness values. This was a severe problem since material specifications were being written for ceramics with hardness requirements.
- Furthermore, the Harmonized Tariff Schedule of the United States classified imported ceramic wares in part by hardness, but with the archaic Mohs mineralogical scratch test.
- ASTM Knoop and Vickers ceramic hardness tests were adopted in 1996. An ISO test was adopted in 2000. The procedures are harmonious.
- NIST developed ceramic Knoop and Vickers hardness SRM's that complement the test method standards. Confusion has been eliminated and data quality has improved dramatically.
- The US Customs service acquired two Knoop SRM's disks and is working through NAFTA to replace the Mohs specifications with modern Knoop hardness specifications.