



Advanced Ceramics Property & Performance Measurements

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Introduction

Mechanical and physical properties and performance of brittle bodies, including advanced ceramics and glasses, can be difficult to measure correctly unless the proper techniques are used. ASTM Committee C28 on Advanced Ceramics has developed numerous full-consensus standards (e.g., test methods, practices, guides, terminology) to measure various properties and performance of a monolithic and composite ceramics and coatings that, in some cases, may be applicable to glasses. These standards give the "what, how, how not, why, why not, etc." for determining many mechanical, physical, and thermal, properties and performance of advanced ceramics. Use of these standards result in accurate, reliable, repeatable and complete data. Involvement in ASTM Committee C28 has included users, producers, researchers, designers, academicians, etc. who write and continually update, as well as validate through round robin test programmes, more than 45 standards since the committee's inception in 1986. Included in this poster is a pictogram of the ASTM Committee C28 standards and how to obtain them either as i) individual copies with full details or ii) a complete collection in one volume. A listing of other ASTM committees that might be of interest is included. Finally, some examples of the tangible benefits of standards for advanced ceramics are employed to demonstrate their practical application.

For further information

The C28 Committee and Standards for Ceramics
ASTM C28 Committee Page =
<http://www.astm.org/COMMITTEE/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/C28_StdsBySubject.doc

Chart showing ASTM C28 Advanced Ceramic Standards-
http://www.astm.org/COMMIT/C28StandardsGraphic_2012_StandardsChart.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.



C28 Advanced Ceramic Standards

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

<h3>Monolithics</h3> <ul style="list-style-type: none"> 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 	<h3>Composites, Coatings, Porous Ceramics</h3> <ul style="list-style-type: none"> C 1275 CFCC Tensile strength C 1773 CFCC Tube Axial Tensile C 1359 Tensile strength (Hi Temp) C 1337 Creep, Creep Rupture C 1360 Cyclic fatigue 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 1468 CFCC Tensile Trans thickness C 1557 Filament Tensile strength and Elastic modulus C 1358 CFCC Compression C 1299 CFCC Shear strength C 1425 Shear strength (HiTemp) C 1624 Coatings - Scratch Adhesion
<h3>Powders</h3> <ul style="list-style-type: none"> C 1274 Particle size, BET C 1282 Particle size, Centrifugal Sed. C 1070 Particle size, Laser Light C 1494 C, N, O in silicon nitride 	<h3>NDE and Design</h3> <ul style="list-style-type: none"> C 1212 Seeded voids C 1336 Seeded inclusions C 1239 Weibull C 1683 Weibull Scaling C 1175 NDE Guide C 1331 Ultrasonic velocity C 1332 Ultrasonic attenuation
<h3>Terms, Workshops, Education</h3> <ul style="list-style-type: none"> STP 1201 Life Prediction STP 1309 Composites STP 1392 Composites STP 1409 Fracture C 1145 Terminology 	

ASTM C28 standards are found in Vol. 15.01. 01-2014

Collaborating ASTM Committees: C08 Refractories; C21 Ceramic Whitewares and Related Products; C26 Nuclear Fuel Cycle; D30 Composite Materials; E07 Nondestructive Testing; E08 Fatigue and Fracture; E10 Nuclear Technology and Applications; E28 Mechanical Testing; F04 Medical and Surgical Materials and Devices; F34 Rolling Element Bearings; G02 Wear and Erosion
Collaborating International Organizations: ISO TC206 Fine/Technical/Adv Ceramics; CEN TC184 Technical Ceramics

Standardization: Tangible Benefits

F 1773: Standard Specification for High Purity Dense Yttria Tetragonal Zirconium Oxide Polycrystal (Y-TZP) for Surgical Implant Applications

ASTM Committee F04, Surgical and Medical Devices and the U.S. Food and Drug Administration used generic standards from Committee C28 Advanced Ceramics for their new standard specification.

"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"



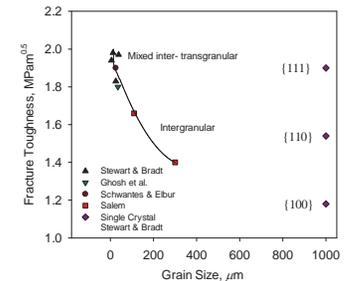
Standardization:

Tangible Benefits

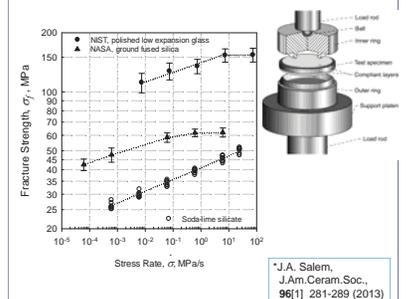
Comparisons Among Authors and Helping to Interpret Data

The Problem: Transparent Armor Ceramics as Spacecraft Windows*

Standardized fracture toughness tests using Test Method C1421 ensure correct comparisons of different authors' results --



Standard-sized circular disks could be used to determine Poisson's ratio and Young's modulus via Test Method C1259 and biaxial strength via Test Method C1499 as well as the slow crack growth parameters, n and A, via Test Method C1368. This allowed efficient understanding of the behavior of the material.



*J.A. Salem, J. Am. Ceram. Soc., 96[1] 281-289 (2013)