



## MAGNESIA STABILIZED ZIRCONIA (MSZ)

---

Transformation toughened zirconias such as Magnesia-Stabilized Zirconia have small precipitates of tetragonal phase which are formed inside of the cubic phase grains. These precipitates transform from the meta-stable tetragonal phase to the stable monoclinic phase when a crack attempts to propagate through the material. The result promotes toughness. Compared to YTZP, MSZ is more stable in high temperature (220C and above), high moisture environments.



## PRIME FEATURES

---

- High mechanical strength
- High temperature resistance
- Very high wear resistance
- Very high impact resistance
- Very low thermal conductivity
- Thermal expansion suitable for ceramic-to-metal assemblies
- High chemical resistance (acids/bases)

## TYPICAL APPLICATIONS

---

- Deep well, down hole components
- Wear parts
- Structural ceramics
- Precision valve seats and seals
- Roller guides for tube forming
- MWD tools
- Bushings
- Wear sleeves
- Pump pistons
- Pump sleeves
- Spray nozzles
- Ceramic bearings
- Solid oxide fuel cell components



## MAGNESIA STABILIZED ZIRCONIA SPECIFICATIONS

|            | Property                               | ASTM Method    | Units                        | MSZ<br>(Magnesia Stabilized) |
|------------|--|----------------|------------------------------|------------------------------|
| General    | Crystal Size (Average)                 | Thin Section   | Microns                      | 30                           |
|            | Color                                  | --             | --                           | Ivory or Yellow              |
|            | Gas Permeability                       | --             | atms-cc/sec                  | gas tight <10 <sup>-10</sup> |
|            | Water Absorption                       | C 20-97        | %                            | 0                            |
| Mechanical | Density                                | C 20-97        | g/cc                         | 5.72                         |
|            | Hardness                               | Vickers 500 gm | GPa (kg/mm <sup>2</sup> )    | 11.7 (1200)                  |
|            | Hardness                               | --             | R45N                         | 78                           |
|            | Fracture Toughness                     | Notched Beam   | MPam <sup>1/2</sup>          | 12                           |
|            | Flexural Strength (MOR) (3 point) @ RT | F417-87        | MPa (psi x 10 <sup>3</sup> ) | 620 (90)                     |
|            | Tensile Strength @ RT                  | --             | MPa (psi x 10 <sup>3</sup> ) | 310 (45)                     |
|            | Compressive Strength @ RT              | --             | MPa (psi x 10 <sup>3</sup> ) | 1862 (270)                   |
|            | Elastic Modulus                        | C848           | GPa (psi x 10 <sup>6</sup> ) | 206 (29.8)                   |
|            | Poisson's Ratio                        | C848           | --                           | 0.28                         |
| Thermal    | C.T.E. 25 - 100° C                     | C 372-96       | x 10 <sup>-6</sup> /C        | 8.9                          |
|            | C.T.E. 25 - 300° C                     | C 372-96       | x 10 <sup>-6</sup> /C        | 9.7                          |
|            | C.T.E. 25 - 600° C                     | C 372-96       | x 10 <sup>-6</sup> /C        | 10.0                         |
|            | Thermal Conductivity @ RT              | C 408          | W/m K                        | 3                            |
|            | Max Use Temp                           | --             | Fahrenheit (°F)              | 2200                         |
|            |  | --             | Celsius (°C)                 | 1200                         |
| Electrical | Dielectric Strength (.125" Thick)      | D 149-97A      | V/mil                        | 300                          |
|            | Dielectric Constant @ 1 MHz            | D 150-98       | --                           | 22.7                         |
|            | Dielectric Constant @ Gigahertz        | D 2520-95      | --                           | 29.2                         |
|            | Dielectric Loss @ 1 MHz                | D 150-98       | --                           | 0.0016                       |
|            | Dielectric Loss @ Gigahertz            | D 2520-95      | --                           | 0.0018                       |
|            | Volume Resistivity, 25°C               | D 257          | ohms-cm                      | > 1 x 10 <sup>13</sup>       |
|            | Volume Resistivity, 300° C             | D 1829         | ohms-cm                      | 5 x 10 <sup>7</sup>          |
|            | Volume Resistivity, 500° C             | D 1829         | ohms-cm                      | 1 x 10 <sup>7</sup>          |
|            | Volume Resistivity, 700° C             | D 1829         | ohms-cm                      | 2 x 10 <sup>6</sup>          |

## CONTACT US

Superior Technical Ceramics | 600 Industrial Park Rd. | St. Albans, VT 05478 | [www.ceramics.net](http://www.ceramics.net)  
Telephone: (802) 527-7726 | Fax: (802) 527-1181 | Email: [sales@ceramics.net](mailto:sales@ceramics.net)

Superior Technical Ceramics products and services are subject to the Company's standard terms and conditions, available on request or at [ceramics.net](http://ceramics.net). For more information contact an authorized Superior Technical Ceramics representative. Unless noted otherwise, trademarks and service marks herein are the property of Superior Technical Ceramics and may be registered in the United States and/or other countries. Superior Technical Ceramics products named herein may be protected by one or more U.S. and/or foreign patents. For more information, contact [sales@ceramics.net](mailto:sales@ceramics.net). Specifications are subject to change without notice. Superior Technical Ceramics sells its products and services in accordance with the terms and conditions set forth in the applicable contract between Superior Technical Ceramics and the client.

