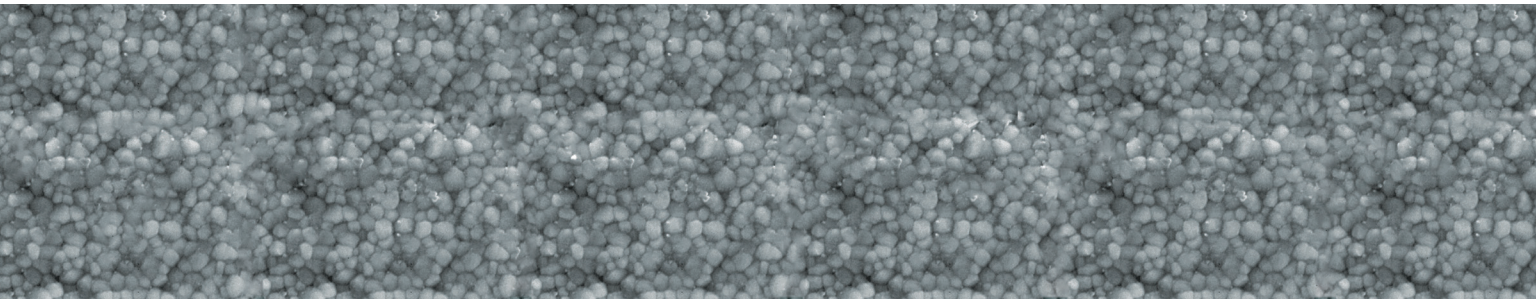
Superior Technical Ceramics

PROVIDING ADVANCED CERAMIC SOLUTIONS WORLDWIDE SINCE 1898

YTTRIA STABILIZED TETRAGONAL ZIRCONIA POLYCRYSTALS (YTZP)

A purely tetragonal phase, fine grain material. This material offers the highest flexural strength of all Zirconia based materials. YTZP exhibits a trait called transformation toughening which allows it to resist crack propagation. Applied stress, magnified by the stress concentration at a crack tip, can cause the tetragonal phase to convert to monoclinic, with the associated volume expansion. This phase transformation can then put the crack into compression, retarding its growth, and enhancing the fracture toughness. This mechanism significantly extends the reliability and lifetime of products made with stabilized zirconia. YTZP is well suited to replacing metals due to its extremely high strength and toughness, it also offers far higher resistance to chemicals and superior erosion resistance.



PRIME FEATURES

- Very high mechanical strength
- High impact resistance
- Very high wear resistance
- Very high erosion resistance
- Very low thermal conductivity
- High chemical resistance (acids/bases)
- High corrosion resistance

TYPICAL APPLICATIONS

- Structural ceramics
- Wear parts
- Cutting tools (knives, blades, shears)
- Deep well, down hole components
- Thread and wire guides
- Thermal barrier coatings
- Fiber optic ferrules and sleeves
- Oxygen sensors
- Precision ball valve, balls and seats
- Rollers and guide for metal tube forming
- Hot metal extrusion dies
- Solid oxide fuel cell components

APPLICATION LIMITATIONS

- YTZP Properties degrade rapidly when exposed to water vapor at 200 - 300º C.
- Strength & toughness degrade with increasing temperature, generally limiting structural use to below 500º C.

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YTZP SPECIFICATIONS

	Composition			YTZP 2000	YTZP 4000
	Property	**ASTM Method**	**Units**		
General	Crystal Size (average)	Thin Section	Microns	1	1
	Color	-	-	Ivory	Ivory
	Gas Permeability	-	atms-cc/sec	gas tight $<10^{-10}$	gas tight $<10^{-10}$
	Density	C 20-97	g/cc	6.02	6.07
	Hardness	Vickers 500 gm	GPa (kg/mm^2)	12.5 (1250)	12.5 (1250)
	Hardness		R45N	80	80
	Fracture Toughness	Notched Beam	$MPam^{1/2}$	12.50	12.50
	Flexural Strength (MOR) (3 point) @ RTº	F417-87	MPa (psi x 10^3)	951 (138)	1380 (200)
	Tensile Strength @ RTº	-	MPa (psi x 10^3)	550 (80)	690 (100)
	Compressive Strength @ RTº	-	MPa (psi x 10^3)	2000 (290)	2485 (360)
	Elastic Modulus	C848	GPa (psi x 10^6)	30 (210)	30 (210)
	Poisson's Ratio	C848	none	0.23	0.23
Thermal	C.T.E., 25 - 100°C	C372-96	$x10^{-6}/C$	6.9	6.9
	C.T.E., 25 - 300°C	-	-	8.1	8.1
	C.T.E., 25 - 600°C	-	-	8.7	8.7
	Thermal Conductivity, 25° C	C 408	W/m-K	2.2	2.2
	Max Use Temp (Non-loading) (at High Strength)	-	Farhenheit (°F)	932	932
			Celcius (°C)	500	500
Electrical	Dielectric Strength (.25 thick)	D 149-97A	V/mil	240	240
	Dielectric Constant, 1 MHz	D 150-98	-	30	30
	Dielectric Loss @ 1 MHz	D 150-98	-	0.001	0.001
	Volume Resistivity, 25° C	D 257	ohms-cm	$1x10^{13}$	$1x10^{13}$
	Volume Resistivity, 300° C	D1829	ohms-cm	$1x10^{10}$	$1x10^{10}$
	Volume Resistivity, 500° C	D1829	ohms-cm	$1x10^{6}$	$1x10^{6}$
	Volume Resistivity, 700° C	D1829	ohms-cm	$5x10^{3}$	$5x10^{3}$
	Volume Resistivity, 1000° C	D1829	ohms-cm	$1x10^{3}$	$1x10^{3}$

Form Revised: 2/13/2014

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