

Property	Measurement	Benefit
<b>Physical:</b>		
Material	>99.99% 3mol% YSZ	Common ceramic oxide, common electrolyte
Surface Finish	20-25 nm	Good for thin and thick film coatings
Thickness	20 or 40 microns	50% that of other available ceramic or glass materials
Density	6.04 g/cm <sup>3</sup>	Near theoretical density, no premature passage of reactants
Crystal Structure	Tetragonal	Stable crystal structure over wide range of environments
<b>Mechanical:</b>		
Hardness	6.5 Mohs, 1600 Knoop (Kg/mm <sup>2</sup> )	Will not wear, erode
Poisson Ratio	0.32	
Bend Strength	1.2 Gpa, measured on 2 cm strip, 20 microns	Gives flexibility, 3x other ceramics at these thicknesses
Flexural Strength	900 Mpa @RT	Permits rapid absorption of environment temperature shifts
Compressive Strength	2500 MPa @ RT	Can be put under high loads, once fully backside supported
Fracture Toughness	7.0 MPa x m <sup>1/2</sup>	Great structural ceramic, robust in ultrathin format
Tensile Strength	248 MPa @RT	
Modulus of Elasticity	207 GPa	High for ceramic and glass materials, resists loads
Wear, Abrasion Resistance	Hard Material, near Diamond, TBD	High reliability in harsh environments
<b>Thermal:</b>		
Processing Temperature	Up to 1200°C	Gains in faster processing
Operating Temperature	Up to 1000°C	Higher temperature operations
Bulk Thermal Conductivity	2.7 W/mK	10x better than glass, 10% of alumina
Z-Axis Thermal Mass	Ultra-low	Phonons rapidly pass through, high heat dissipation
Coefficient of Thermal Expansion	8.2ppm @ RT, 10.7 ppm @ 1000°C	Suitable for metal deposition, thin or thick films
Thermal Shock Resistance	>280-380 C/sec	Repeated rapid temperature transitions in applications
Specific Heat	0.10 cal/gC @RT	Good for rapid flexible heaters
<b>Electrical:</b>		
Dielectric Constant	26 @ 100kHz	Suitable for low speed electronics
Dielectric Breakdown	3200 VDC @ 40 microns, 2500 VDC @ 20 microns, 80 kV/mm @ 40 microns	High breakdown for ceramics, useful in power electronics
Ionic Conductivity	0.03 S/cm @ 800°C	Great for fuel cells and oxygen sensor applications
Resistivity	>10 <sup>14</sup>	Useful in power electronics
<b>Optical:</b>		
Light Dispersion	15% @ 40 microns	Substrate is translucent, enables backlighting, mixes and diffuses light from multi-color LEDs
IR Transparent	80% between 2-7 nm	Used in military systems
<b>Chemical:</b>		
Water Adsorption	0% @ RT	Near theoretical density, no moisture affects
Outgassing	0%, all temperatures	High purity, no long term degradation
Chemical Interactions	Not suitable with HF	Can be used in semiconductor processing, FDA approved for in body applications