

CeraLumina™ High Strength Transparent Alumina

CERANOVA TRANSPARENT CERAMICS

Our CeraLumina™ ceramic is 14X stronger and 4X harder than glass.

CeraLumina is an extremely strong, incredibly hard material with excellent transmission at MW-IR wavelengths.

The IR transparent ceramic for the most demanding applications.

When polished to thin forms, CeraLumina becomes transparent in the visible spectrum

CeraLumina clarity at 1mm thick:



Polished 6" Tall Dome

Strength

CeraNova offers high strength and high hardness CeraLumina.

Temp (°C)	Biaxial Flexure Strength (MPa)	Weibull Modulus
20	729	12.5
500	647	7.2
750	603	12.6
1000	551	10.9

CeraLumina™ retains 75% of strength up to 1000 °C! This higher strength material enables thinner product designs for improved optical performance and reduced weight.

Products

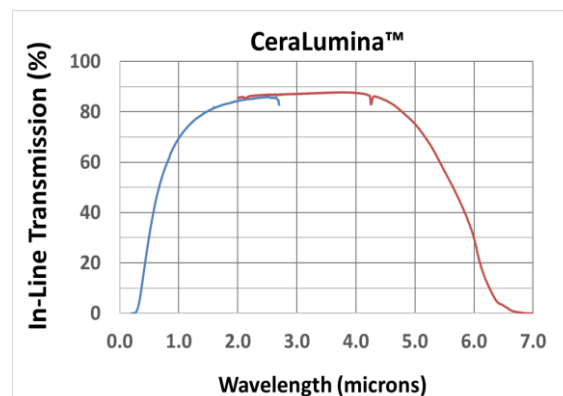
- ❖ Highest strength and toughness of all transparent ceramic types
- ❖ High strength high temperature
- ❖ Missile and armor windows - flat and conformal, low emittance
- ❖ Complex and flat near-net shapes, minimizing machining



CeraLumina Blank Examples

Optical

CeraLumina™ has effectively isotropic optical properties with no birefringence. Transmission Data shown below for 2mm thickness.



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CeraLumina™ Microstructure = Performance

Micron-size grains, impurity-free grain boundaries, intra-granular fracture

CeraNova's Material and Advanced Manufacturing Advantage:

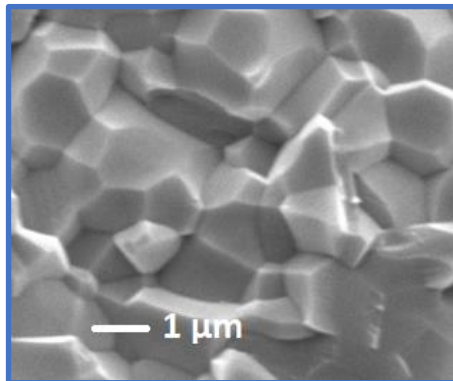
- Custom design flexibility:
 - Flats / Planos
 - Hemispheres
 - Cones / Ogives
 - Arbitrary conformal shapes
- High strength expands design space to enable thinner, lighter products
- Proprietary raw material processing to remove impurities, improve performance & quality
- Flexible, scalable tooling / processes for quick-start low volume production
- As-fired near net shapes significantly reduce machining requirements
- Polish to commercial and optical grade finishes with no "orange peel" surface effects typical of other spinels

Delivery

- Rapid response team
- Quick turn prototypes
- We love to be challenged!

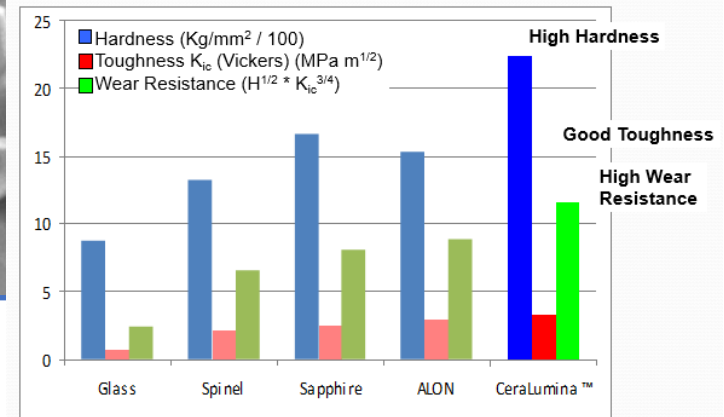
Quality

- ISO Certified: 9001:2015



Enhanced Mechanical Properties

Durability



CeraLumina beats all other transparent materials for mechanical properties. With IR transmission equal to sapphire and spinel, and effectively isotropic behavior with no birefringence. CeraLumina is extremely hard and scratch resistant with high temperature performance and thermal shock resistance.

CeraLumina Properties

	Property	Units	Test	CeraLumina
Physical	Composition		GDMS	Al ₂ O ₃
	Density	g/cm ³	ASTM C373	3.986
	Purity	% Al ₂ O ₃	GDMS	99.9
	Crystal Size (average)	microns	ASTM E112-96	0.4
	Water Absorption	%	ASTM C373	<0.004
	Gas Permeability	Torr-L/sec	He Leak detection	<1 x 10 ⁻¹⁰
	Color			Ivory or Grey
	Flexural Strength (20° C)	MPa	ASTM C1499 Biaxial Flexure	978
	Weibull Modulus		ASTM C1161, C1239	6.56
	Modulus of Elasticity	GPa	ASTM C1259	403
	Poisson's Ratio		ASTM C1259	0.24
	Hardness	Kgf/mm ²	Vicker's Indentation	2284
	Fracture Toughness	MPa/m	Indentation Crack Length Notched Beam SEVNB	3.30 ±0.12 3.5
	Inclusions	>0.8mm dia	3x visual	0
Electrical	Impurities (as SiO ₂)		GDMS	*
	Dielectric Strength	KV/mm	ASTM D149	30.4
	Dielectric Constant		ASTM D2520 (1.0 MHz)	*
	Dielectric Loss		ASTM D150 (1 MHz)	*
Thermal	Volume Resistivity	ohm-cm	ASTM D257 (RT)	*
	Thermal Diffusivity	cm ² /s	ASTM E1461 (100° C)	0.06
	Thermal Conductivity	W/m-K	ASTM C408 (100° C)	27.910
	Specific Heat	J/g-K	ASTM E1461 (100° C)	0.7700
	Thermal Expansion Coefficient	x 10 ⁻⁶ / °C	ASTM C372 (20° C)	6.08
	Thermal Expansion Coefficient	x 10 ⁻⁶ / °C	ASTM C372 (600° C)	7.67
	Thermal Shock Resistance	(ΔT) °C	ASTM C1525	>550

Values are typical ceramic materials properties and may vary according to product configuration and manufacturing process.
*To be determined. Please contact CeraNova for further details.

Applications

- Missile domes and windows
- Transparent armor strike face
- IR device protection
- Harsh environment windows:
 - High temperature
 - High pressure
 - Abrasive materials
 - Corrosive substances



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