

FELIX OPTICAL GLASS

OPTICAL-GRADE SAPPHIRE MATERIAL DATA SHEET

Single-Crystal Sapphire (Al₂O₃) | Engineering Reference for Custom Sapphire Optical Windows

1. Optical Properties

Optical Property	Typical / Reference Value
Material	Optical-grade single-crystal sapphire (Al ₂ O ₃)
Useful transmission range	330–5500 nm typical for commercial uncoated sapphire windows
Refractive index (n _D)	~1.77
Refractive index vs. wavelength	1.83 @ 0.26 μm; 1.76 @ 0.63 μm; 1.58 @ 5.57 μm
Abbe number (V _D)	~72.24
Birefringence	~0.008 visible; published value 0.0087 @ 0.55 μm
Near / mid-wave IR transmission	~85% nominal for polished uncoated sapphire (reference value)
Crystal orientation	C-plane, A-plane, R-plane or project-specific
AR coating capability	VIS / NIR / SWIR / MWIR / custom BBAR, project-specific

2. Mechanical & Physical Properties

Mechanical / Physical Property	Typical / Reference Value
Density	3.97 g/cm ³
Mohs hardness	9
Knoop hardness	~1,900 kg/mm ²
Vickers hardness	~1,940–2,200 depending on orientation
Young's modulus	~435 GPa
Poisson's ratio	~0.27–0.28
Tensile strength	~60,000 psi
Compressive strength	~300,000 psi

3. Thermal & Electrical Properties

Thermal / Electrical Property	Typical / Reference Value
Melting point	~2050 °C
Thermal conductivity	~32 W/m·K @ 258 °C (published reference)
Coefficient of thermal expansion	5.4 ×10 ⁻⁶ /°C parallel to C-axis; 4.3 ×10 ⁻⁶ /°C perpendicular
Electrical resistivity	>10 ¹¹ Ω·cm @ 25 °C; >10 ¹² Ω·cm @ 500 °C
Dielectric constant	~9.3 perpendicular / ~11.5 parallel to C-axis (25 °C, published reference)
Dielectric strength	~480,000 V/cm

4. FELIX Custom Sapphire Window Manufacturing Options

Custom Sapphire Window Capability	Available Options
Shape	Round, square, rectangular, stepped and drawing-based custom geometry
Thickness / size	Custom according to drawing and application
Surface quality	80-50 / 60-40 / 40-20 / 20-10 available by project
Surface flatness	Commercial to precision; up to $\lambda/10$ subject to size/thickness review
Clear aperture	Typically $\geq 90\%$, customizable
Edge treatment	Fine ground, polished, chamfered or beveled
Coating	Uncoated, AR, BBAR and wavelength-specific optical coatings
Applications	Camera windows, sensors, lasers, protective windows, aerospace and industrial optics

Important: Values shown are typical/published material reference values, not guaranteed lot-specific acceptance values. Final specifications depend on crystal orientation, thickness, geometry, surface finish and coating. For production orders, FELIX GLASS can provide drawing-based specifications and applicable inspection data.

Reference basis: Published sapphire property data from established optical-material suppliers, including Meller Optics and Edmund Optics. This sheet is prepared by FELIX OPTICAL GLASS as an engineering reference and is not a Certificate of Analysis.

Custom Sapphire Optical Window Manufacturer

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