

Sapphire (Al₂O₃) Crystals Windows

- **Extreme surface hardness and chemical resistance**
- **Transmits wavelength ranging from 0.2 to 5.5μm**

Chemically, **sapphire** is single crystal aluminum oxide (Al₂O₃) and is useful in a transmission range from 0.2 - 5.5μm, it is suitable for MWIR 3-5μm **thermal imaging** applications.

Sapphire Windows are made from single crystal sapphire, they are ideal for demanding applications because of their extreme surface hardness, high thermal conductivity, high dielectric constant and resistance to common chemical acids and alkalis.

Sapphire is the second hardest crystal next to diamonds and, because of their structural strength, sapphire windows can be made much thinner than other common dielectric windows with improved transmittance.



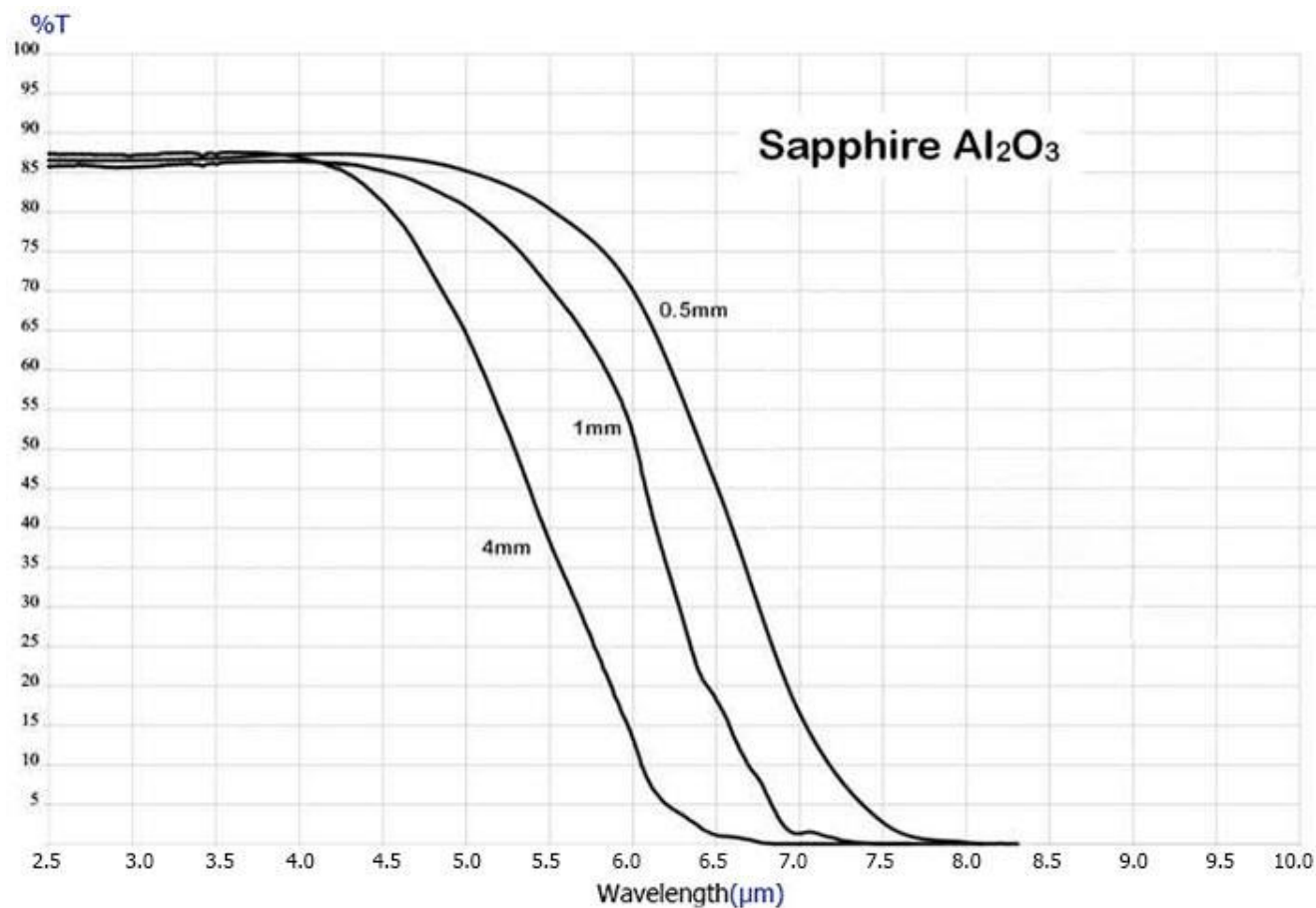
Features

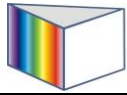
- Features Extreme Surface Hardness Chemical Resistance
- Transmits Wavelengths Ranging From UV to Mid-Infrared
- Thinner and Stronger than Standard Glass Windows

Specifications

Specifications	
Materials	Sapphire crystals
Diameter Range	~ 250mm
Aperture	>90%
Dimension tolerance	+0.0/-0.2mm
Thickness tolerance	+/-0.2mm
Surface Quality	60/40 S/D
Parallelism	1 arc minute
Chamfer	0.3-0.5mmx45degree
Coating	No coating or single layer MgF2

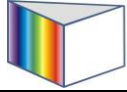
Transmission curve of the Sapphire windows (no coating)





Basic Properties

Physical and optical properties	
Transmission Range	0.17 to 5.5 μm
Refractive Index	No 1.75449; Ne 1.74663 at 1.06 μm (1)
Reflection Loss	14% at 1.06 μm
Absorption Coefficient	$0.3 \times 10^{-3} \text{ cm}^{-1}$ at 2.4 μm (2)
Reststrahlen Peak	13.5 μm
dn/dT	13.1×10^{-6} at 0.546 μm (3)
$dn/d\mu = 0$	1.5 μm
Density	3.97 g/cc
Melting Point	2040°C
Thermal Conductivity	27.21 W m ⁻¹ K ⁻¹ at 300K
Thermal Expansion	5.6 (para) & 5.0 (perp) $\times 10^{-6}/\text{K}$ *
Hardness	Knoop 2000 with 2000g indenter
Specific Heat Capacity	763 J Kg ⁻¹ K ⁻¹ at 293K (4)
Dielectric Constant	11.5 (para) 9.4 (perp) at 1MHz
Youngs Modulus (E)	335 GPa
Shear Modulus (G)	148.1 GPa
Bulk Modulus (K)	240 GPa
Elastic Coefficients	C11=496 C12=164 C13=115 C33=498 C44=148
Apparent Elastic Limit	300 MPa (45,000 psi)
Poisson Ratio	0.25
Solubility	98×10^{-6} g/100g water
Molecular Weight	101.96
Class/Structure	Trigonal (hex), R3c



Shalom EO
Crystals, optics and components

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