

Sapphire (Al₂O₃)

Custom sizes and specifications are available

CRYSTALLOGRAPHIC

Syngony	Tetragon
Symmetry Class	3m
Lattice Constants, Angstrom	a=4.758 c=12.991
Cleavability	(1011),(1120), imperfect

OPTICAL

Refractive Index at n_e	1.7771
Refractive Index n_{F'}-n_{C'}	0.0107
Thermal Coefficient of Refractive Index at 3.39 microns for +/-60 deg C	$\beta_o = (0.88...1.28) \times 10^{-5}$ $\beta_e = (0.99...1.39) \times 10^{-5}$
Transmission Range, microns	0.17-5.0

THERMAL

Thermal Linear Expansion, deg ⁻¹ for +/-60 deg C	$(3.24...5.66) \times 10^{-6}$
⊥ to c-axis	
Thermal Conductivity, W/(m•deg C) at 46 deg C	25.2
⊥ to c-axis	
∥ to c-axis	23.1
Specific Heat Capacity, J/(kg•deg C)	0.7610 x 10 ³
Thermal Stability, deg C	162 +/-8
Melting Point, deg C	2030

MECHANICAL

Density, g/cm ³ at 20 deg C	3.98
Mohs Hardness	9
Vickers Microhardness, Pa	2200
⊥ to c-axis	
∥ to c-axis	1940
Constants of Elastic Compliance, Pa ⁻¹	$S_{11} = 2.3 \times 10^{-12}$ $S_{12} = -0.7 \times 10^{-12}$ $S_{13} = -0.4 \times 10^{-12}$ $S_{33} = 2.2 \times 10^{-12}$ $S_{44} = 6.8 \times 10^{-12}$ $S_{14} = 0.5 \times 10^{-12}$

Young Modulus (E), Pa	46.26 x 10 ¹⁰
⊥ to c-axis	
∥ to c-axis	42.64 x 10 ¹⁰
Shear Modulus (G), Pa	14.43 x 10 ¹⁰
⊥ to c-axis	
∥ to c-axis	16.29 x 10 ¹⁰
Poisson Ratio ∥ to c-axis	0.309

CHEMICAL

Molecular Weight	101.96
Solubility in water, gram/100 cm ³	98•10 ⁻⁶

Refr. Index n vs. Wavelength λ

WAVELENGTH, MICRONS	REFRACTIVE INDEX	
	n _o	n _e
1.0	1.7545	1.7460
2.0	1.7374	1.7299
3.0	1.7015	1.6920
4.0	1.6748	1.6679

Internal Transmittance τ_i (λ) vs. Wavelength λ

WAVELENGTH, MICRONS	INTERNAL TRANSMITTANCE
0.2	0.79
0.5	0.97
1.0	0.97
3.0	0.97
5.0	0.45

