

Sapphire (Al_2O_3)

Second only to diamond in hardness — the survivability window.

PHYSICAL PROPERTIES	
Crystal structure	Hexagonal (single crystal)
Density	3.97 g/cm ³
Bulk resistivity	> 10 ¹⁴ Ω·cm
OPTICAL PROPERTIES	
Useful transmission range	0.17 – 5.5 μm
Refractive index	1.768 (n _d)
dn/dT	+13.1 × 10 ⁻⁶ /K
Birefringence	Yes — orientation-dependent
THERMAL PROPERTIES	
Thermal conductivity	27 W/m·K
Specific heat	0.76 J/g·K
Thermal expansion (CTE)	5.3 × 10 ⁻⁶ /K
MECHANICAL PROPERTIES	
Young's modulus	~345 GPa
Knoop hardness	2200 kgf/mm ²
Poisson's ratio	~0.27

Typical Applications

Sensor windows for abrasive and high-pressure environments; MWIR domes; sight glasses; substrates where scratch resistance is mandatory.

Fabrication & Specification Notes

Birefringent — specify c-axis (0001) orientation for polarization-sensitive systems.

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