



Sapphire Properties

Chemical properties

Chemical composition:	Single-crystalline Al ₂ O ₃
Chemical resistance:	inert for most acids, bases, metal vapours, and gases

Physical properties

Specific weight:	3.98 g cm ⁻³
Hardness	Mohs: 9
	Knoop: 1,800 daN mm ⁻² parallel C-axis 2,200 daN mm ⁻² perp. C-axis
Young's modulus:	360 - 450 GPa (25°C)
Tensile strength:	190 N mm ⁻² (25°C)
Compressive strength:	2,000 N mm ⁻² (25°C)
Flexural strength:	400 - 900 N mm ⁻² (25°C)

Thermal properties

Melting temperature:	2040°C
Thermal expansion:	6.7*10 ⁻⁶ K ⁻¹ (25°C) parallel C-axis 5.0*10 ⁻⁶ K ⁻¹ (25°C) perp. C-axis
Thermal conductivity:	40 W m ⁻¹ K ⁻¹ (25°C) 12 W m ⁻¹ K ⁻¹ (400°C) 4 W m ⁻¹ K ⁻¹ (1,200°C)
Heat capacity:	764 J kg ⁻¹ K ⁻¹ (25°C)

Optical properties

Index of refraction:	n _o = 1.766 (590 nm) n _e = 1.760 (590 nm)
Transparency:	200 nm – 5.5 μm
Reflection loss:	approx. 15 % at two surfaces (590 nm)

Electrical properties

Resistivity:	10 ¹⁶ Ohm cm (25°C) 10 ¹¹ Ohm cm (500°C) 10 ⁶ Ohm cm (1,000°C)
Dielectric constant:	11.5 parallel C-axis (10 ³ - 10 ⁹ Hz at 25°C) 9.3 perp. C-axis (10 ³ - 10 ⁹ Hz at 25°C)
Dielectric strength:	48 kV mm ⁻¹ (50 Hz)