

Technical characteristics of synthetic sapphire Verneuil crystals

Physical properties	crystalline structure	rhomboedral hexagonal single	
	composition	Al ₂ O ₃	
	purity	99,99 %	
	main impurities	Na ₂ O, Si, Ca, Fe, Ga, Mg, Ti, Mn, Pb, Cu, Zn, Ni	
	cleavage	conchoidal	
	density	3.99 – 9.98	
	dislocation density	10 ⁹ – 10 ⁸ /m ²	
	Thermal properties	melting point	2320 K
		softening point	2070 K
		specific heat	7.5 · 10 ² j/kg · K at 300 K
thermal conductivity		40 W / m · K ⊥ at 300 K	
Thermal expansion		6.2 · 10 ⁻⁶ /K // C-axis	
		5.4 · 10 ⁻⁶ /K // C-axis	
Mechanical properties	hardness	Mohs 9	
		Knoop 2200 face // C-axis	
		Knoop 1800 face ⊥ C-axis	
	young's modulus	4.4 · 10 ¹¹ Pa at 300 K	
	modulus of rupture	4.0 · 10 ⁸ Pa at 300 K	
	compressive strenght	2.1 · 10 ⁹ Pa at 300 K	
	tensile strength	1.9 · 10 ⁸ Pa at 300 K	
	Poisson's constant	0.30	
	Chemical properties	acids and alkalis attack	0 at 570 K
		porosity	0
Electrical properties	dielectric constant	10.6 electric field // C-axis at 300 K	
		8.6 electric field ⊥ C-axis at 300	
	electrical resistivity	10 ⁹ Ω · m at 770 K	
		10 ⁴ Ω · m at 1270 K	
Optical properties	Refractive index N _d at 0.5893 μm	1.760 face // C-axis	
		1.769 face ⊥ C-axis	
	dispersive power (n _f – n _c)	0.011 λ _F = 0.4861 μm	
		λ _C = 0.6563 μm	
	Transmission, disc thickness 1 mm :	- visible light	excellent
		- infrared	85 %
70 %			5.5 μm
50 %			6 μm
80 %			0.4 – 0.3 μm
- ultraviolet		60 %	0.28 μm
		50 %	0.2 μm