Synthetic Sapphire is a single crystal form of corundum, Al₂O₃, also known as alpha-alumina, alumina, and single crystal Al₂O₃. Sapphire is aluminium oxide in its purest form with no porosity or grain boundaries, making it theoretically dense. The combination of favourable chemical, electrical, mechanical, optical, surface, thermal, and durability properties make sapphire a preferred material for high performance systems and component designs.

Unique properties to be mentioned (among others):
- excellent transmission in a wide range from UV to IR
- chemical inertness and outstanding durability against aggressive media
- extremely good thermal conductivity
- very good resistance against high temperatures and thermal shocks
- unexcelled scratch resistance
- preeminent corrosion- and abrasion resistance
- unique hardness (just beaten by diamond)
- best electrical features (high electric resistance, large dielectric constant)

Those features have made synthetic sapphire the material of choice for demanding applications in semiconductor, aerospace, analytics, medical, optics and watch industries.

### Chemical formula
Al₂O₃

### Crystal class
Hexagonal system, rhombohedral class 3m

### Lattice constants, A
a = 4.785, c = 12.991

### Density, g/cm³
3.98

### Melting point, °K
2303

### Hardness
Knoop (daN/mm²): 1800 parallel to C-axis, 2200 perpendicular to C-axis, Mohs: 9

### Optical transmission range, µm
0.17 – 5.5

### Refractive index at 0.532 µm
n₀ = 1.7717, nₑ = 1.76355

### Water absorption
nil

### Young Modulus, GPa
345

### Shear Modulus, GPa
145

### Bulk Modulus, Gpa
240

### Bending Modulus (Modulus of Rupture), Mpa
420 at 20°C, 280 at 500°C

### Elastic Coefficient
C₁₁ = 496, C₁₂ = 164, C₁₃ = 115, C₃₃ = 498, C₄₄ = 148

### Poisson ratio
0.25 – 0.30

### Friction Coefficient
0.15 on steel, 0.10 on sapphire

### Tensile strength, MPa
400 at 25°, 275 at 500°, 345 at 1000°

### Compressive strength, GPa
2.0

### Young's modulus E, daN/mm²
3.6 x 10⁴ to 4.4 x 10⁴

### Specific heat, J/(kg x K)
105 at 91°K, 761 at 291°K

### Thermal expansion, K⁻¹
6.66 x 10⁻⁶ parallel to optical axis, 5 x 10⁻⁶ perpendicular to optical axis

### Thermal conductivity, W/(m x K) at 300K
23.1 parallel to optical axis, 25.2 perpendicular to optical axis

### Resistivity, Ohm x cm
10¹⁰ (25°), 10¹³ (500°), 10¹³ (1000°)

### Dielectric constant
11.5 (10³ – 10⁹ Hz, 25°) parallel to C-axis, 9.3 (10³ – 10⁹ Hz, 25°) perpendicular to C-axis

### Dielectric strength, V/cm
4 x 10⁶

### Loss tangent
1 x 10⁻⁴

### Solubility
- in water: insoluble
- in HNO₃, H₂SO₄, HCl, HF: insoluble to 300°C
- in alcalis: insoluble to 800°C
- in melts of metals Mg, Al, Cr, Co, Ni, Na, K, Bi, Zn, Cs: insoluble to 800 – 1000°C

### g-radiation stability
No change in transmission above 2.5 mm after exposure to 10⁷ Rads.

### Proton radiation stability
No change in transmission below 0.3 µm after exposure to 10⁷ proton/cm² total dose

### Chemical resistance
Sapphire is highly inert and resistant to attack in most process environments including hydrofluoric acid and the fluorine plasma applications commonly found in semiconductor wafer processing (NF3, CF4)
Why us?

- We do not offer "catalogue" parts.
- Instead we focus on customer specifications and requirements only.
- "Special features" such as coatings, engravings, etchings etc. are standard for us.
- We deliver smallest batch sizes (≥1) up to >100k pieces at most economic conditions and with reasonable leadtimes.
- We support customers with cost effective designs (if required).
- We do not have to be the cheapest, but the price worthiest.
- We believe in high level customer service, short response times and long term reliability.
- We measure our success solely in customers' satisfaction.