

PROPERTIES of Sapphire (Al_2O_3)

MECHANICAL PROPERTIES

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| Young Modulus | : 345 GPa |
| Shear Modulus | : 145 GPa |
| Bulk Modulus | : 240 GPa |
| Knoop Hardness | : 22 GPa |
| Mohs Hardness | : 9 |
| Vickers Hardness | : 1570...1750 |
| Modulus of Rupture | : 420 MPa at 20°C : 280 Mpa at 500°C |
| Apparent Elastic Limit | : 275 MPa |
| Poisson constant | : 0.30 |
| Density | : 3.98 g/cm ³ at 20°C |

THERMAL PROPERTIES

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| Melting Point | : 2030°C |
| Specific Heat | : 105 J/kg.°C at - 182.15°C : 761 J/kg.°C at 17.85°C |
| Coefficient of thermal expansion | : $6.66 \times 10^{-6} K^{-1}$ // c axis at 50°C : $5 \times 10^{-6} K^{-1}$ ⊥ c axis at 50°C |
| Thermal conductivity | : 10000 (W/m.°C) at -243°C : 40 (W/m.°C) at 27°C : 4 (W/m.°C) at 1227°C |

ELECTRICAL PROPERTIES

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| Resistivity | : $10^{16} \Omega$ -cm at 27°C : $10^{11} \Omega$ -cm at 300°C |
| Dielectric resistance at 60Hz | : 48×10^6 V/m |
| Dielectric Strength | : 17kV/mm |
| Dielectric Costant | : 10.6 // c axis at 27°C ; 106Hz : 8.6 ⊥ c axis at 27°C ; 106Hz |
| Loss coefficient | : $< 10^3$ at 27°C |

OPTICAL PROPERTIES

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| Transmittance | : Excellent in the visible : >85% from 0.75μm...4.5μm : >60% from 0.25μm...0.4μm |
| Refractive Index | : $n_0 = 1.7717$; $n_e = 1.76355$ at 50.532μm |
| Puissance dispersivity ($n_f - n_c$) | : 0.011; $\lambda_f = 0.4861\mu m$; $\lambda_c = 0.6563\mu m$ |
| Emissivity | : < 0.02 @ 880°C; $\lambda = 2.6$ at 3.7μm |
| dn/dt | : $13 \times 10^{-6} K^{-1}$ |

TRASMISSION CURVE

