Optical Glasses

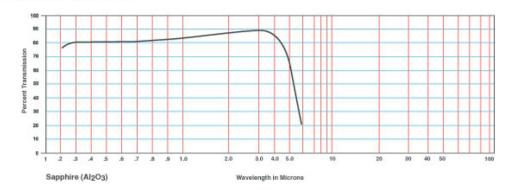


Optical material / crystals (Infrared)

Material / Specification: Sapphire for 0.17µm to 5.5µm transmission (UV-C cut) **Range / Description:** OPMI-SAPPHIRE C

Glass-like. Sapphire (Al $_2O_3$) is an extremely hard material which is useful for UV, NIR and IR applications through 5 microns.

Internal Transmittance



| Internal Transmittance $t_i(\lambda)$ vs. wavelength λ | | | | | | | | | | | |
|--|------|------|------|------|------|---|--|---|--|---|---|
| λ,мкм | 0.2 | 0.5 | 1.0 | 3.0 | 5.0 | - | | _ | | - | |
| τ _i (λ) | 0.79 | 0.97 | 0.97 | 0.97 | 0.45 | | | | | | — |

| Refractive Index n vs. Wavelength λ no = ordinary ne = extraordinary | | | | | | | | | | | | | | | | |
|--|------|------|------|------|------|------|------|------|------|------|------|------|------|------|---|---|
| μm | 0.22 | 0.24 | 0.28 | 0.33 | 0.44 | 0.51 | 0.63 | 0.75 | 0.82 | 1.32 | 2.24 | 3.33 | 4.34 | 5.26 | | |
| no | 1.87 | 1.84 | 1.82 | 1.80 | 1.78 | 1.77 | 1.76 | 1.76 | 1.75 | 1.75 | 1.73 | 1.70 | 1.65 | 1.60 | I | - |
| ne | 1.86 | 1.83 | 1.81 | 1.79 | 1.77 | 1.76 | 1.75 | 1.75 | 1.75 | 1.74 | 1.72 | 1.69 | 1.65 | 1.59 | | |

| Optical Properties | |
|---------------------------|--------------------------------------|
| Transmission Range | 0.17 to 5.5 µm |
| Refractive Index | No 1.75449; Ne 1.74663 at 1.06 μm |
| Refractive Loss | 14% at 1.06 µm |
| Crystal/Class Structure | Trigonal (hex), R3c |
| Cleavage Plane | (1011),(1012), imperfect |

| Thermal Properties | | | | | |
|------------------------|--|--|--|--|--|
| Thermal Expansion | 5.6 (para) & 5.0 (perp) x 10 ⁻⁶ /K * | | | | |
| Thermal Conductivity | 27.21 W m ⁻¹ K ⁻¹ at 300K | | | | |
| Melting Point | 2040°C | | | | |
| Specific Heat Capacity | 419 J Kg ⁻¹ K ⁻¹ | | | | |

Mechanical Properties

| Density | 3.97 g/cc | | | | |
|------------------|--------------------------|--|--|--|--|
| Hardness (Knoop) | 2000 with 2000g indenter | | | | |
| Youngs Modulus | 335 GPa | | | | |
| Shear Modulus | 148.1 GPa | | | | |
| Bulk Modulus | 240 GPa | | | | |
| Poisson Ratio | 0.25 | | | | |
| Elastic Limit | 300 MPa (45,000 psi) | | | | |
| Molecular Weight | 101.96 | | | | |

| Chemical Properties | |
|----------------------------|------------------------------------|
| Solubility | 98 x 10 ⁻⁶ g/100g water |

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