OPTICAL MATERIALS : INFRA-RED

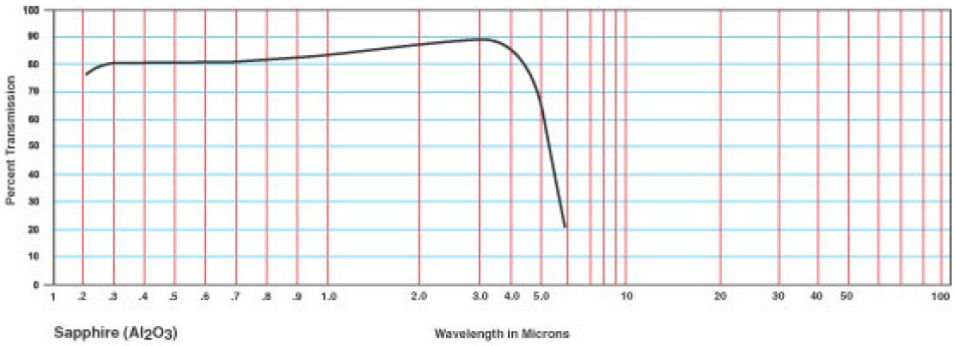
Title: Optical material/ crystals (Infrared)

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	——	——	——	——	—·—	—·—
$\tau_i(\lambda)$	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	—·—	—·—
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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