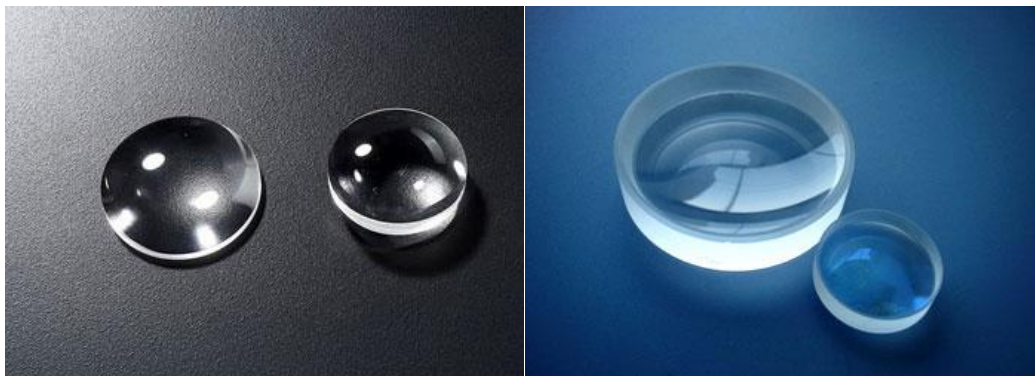


Sapphire Lenses

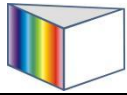
Single crystal sapphire lenses are ideal for demanding applications (such as laser systems) and harsh environments because of their extreme surface hardness, high thermal conductivity, high dielectric constant and resistance to common chemical acids and alkalis. Sapphire is the second hardest crystal next to diamond and, because of their structural strength, sapphire crystal lenses can be made much thinner than other common materials. Chemically, sapphire is single crystal aluminum oxide (Al₂O₃) and is useful in a transmission range from 0.15 to 5.5μm.

Hangzhou Shalom EO offers the custom lenses upon customer's request, and the lenses with anti-reflection and other thin film coatings are available.



SPECIFICATIONS

Specifications	
Lens Type	Plano-convex, Plano-concave, Double convex, Meniscus lenses
Materials	Optical grade single crystal sapphire
Aperture	>90%
Diameter tolerance	+0.0/-0.2mm
Thickness tolerance	+/-0.2mm
Centering error	3 arc minutes
Surface Quality	Option: 60/40, 40/20 or 20/10 S/D
Parallelism	1 arc minute
Coating	According to customer's requirement



Basic Properties

Physical and optical properties	
Transmission Range	0.17 to 5.5 μm
Refractive Index	No 1.75449; Ne 1.74663 at 1.06 μm (1)
Reflection Loss	14% at 1.06 μm
Absorption Coefficient	$0.3 \times 10^{-3} \text{ cm}^{-1}$ at 2.4 μm (2)
Reststrahlen Peak	13.5 μm
dn/dT	13.1×10^{-6} at 0.546 μm (3)
$dn/d\mu = 0$	1.5 μm
Density	3.97 g/cc
Melting Point	2040°C
Thermal Conductivity	27.21 W m ⁻¹ K ⁻¹ at 300K
Thermal Expansion	5.6 (para) & 5.0 (perp) $\times 10^{-6}/\text{K}$ *
Hardness	Knoop 2000 with 2000g indenter
Specific Heat Capacity	763 J Kg ⁻¹ K ⁻¹ at 293K (4)
Dielectric Constant	11.5 (para) 9.4 (perp) at 1MHz
Youngs Modulus (E)	335 GPa
Shear Modulus (G)	148.1 GPa
Bulk Modulus (K)	240 GPa
Elastic Coefficients	C11=496 C12=164 C13=115 C33=498 C44=148
Apparent Elastic Limit	300 MPa (45,000 psi)
Poisson Ratio	0.25
Solubility	98×10^{-6} g/100g water
Molecular Weight	101.96
Class/Structure	Trigonal (hex), R3c

Features

- Large wavelength range: 0.15~5 μm
- Extreme hardness for harsh environment
- Chemical and erosion resistant front surface
- Large strength for thin lenses