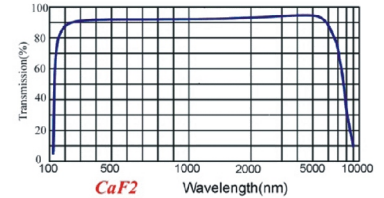


OPTICAL CRYSTAL

CaF2

CaF2 is a crystal, which has good transmission from 170 nm to 7800 nm. It's slightly soluble in water and susceptible to thermal shock. CaF2 is commonly used in IR components such as windows, Lenses and prisms.

- Transmission Range: 170 nm~7800 nm
- Thermal Expansion Coefficient: $18.85 \times 10^{-6}/K$
- Density: 3.18 g/cm³

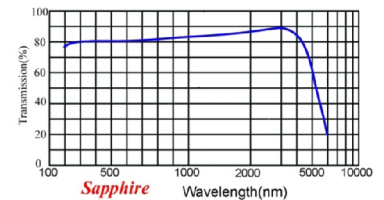


Sapphire

Sapphire is a single crystal aluminum oxide (Al₂O₃). It is one of the hardest materials. Sapphire has good transmission characteristics over the visible, and near IR spectrum. It exhibits high mechanical strength, chemical resistance, thermal conductivity and thermal stability. It is often used as window materials in specific field such as space technology where scratch or high temperature resistance is required.

Physical Properties

Crystal Symmetry	Hexagonal System
Lattice Constant	a = 4.75 ; c = 12.97
Transparence Range	0.18~4.5 μ m
Density	3.98 g/cm ³
Mohs Hardness	9
Melting Point	2030 °C
Thermal Conductivity	0.04 W/m/K
Expansion Coefficient	$8.4 \times 10^{-6}/K$
Refractive Index	1.755



Silicon(Si) Crystals

Silicon(Si) is commonly used as a substrate material for infrared reflectors and windows in the 1.5 μ m-8 μ m region. The strong absorption band at 9 μ m makes it unsuitable for Co₂ laser transmission applications but it is frequently used for laser mirrors because of its high thermal conductivity and low density. Silicon is also a useful transmitter in 20 μ m range.

Physical Properties

Material Type	CZ FZ; N or P
Crystal Direction	{100} {111}
Resistivity(Ohm/cm)	0.003-50
Thermal conductivity(J/K . M . S)	163.3@273K
Density(g/cm ³)	2.33g/cm ³ at 20 °C
Melting point	1410 °C
Boiling point	3265 °C
Knoop Hardness(kg/mm ²)	1150
Transparency Range	1000nm-10000nm 30000nm-300000nm