Photonics On Crystals

POC-OC-122473-MgF_2 Crystal Datasheet

1 Main Features

- Wide transparency range: 110 nm to 7.5 µm.
- Excellent UV transmittance, ideal for ArF excimer laser applications.
- Superior optical clarity with low absorption and scattering losses.
- Durable and stable under extreme environmental conditions.
- Customizable dimensions and coatings for specific optical requirements.

---

2. Material General Description

Magnesium Fluoride (MgF_2) is a birefringent crystal with exceptional optical properties, making it an essential material in scientific and technological applications. Its broad transparency range (110 nm to 7.5 µm) ensures efficient performance across the ultraviolet (UV), visible, and infrared (IR) regions. MgF_2 is commonly utilized for its high transmittance, particularly at the 193 nm wavelength for ArF excimer laser applications. Additionally, its low refractive index, isotropy, and durability make it a preferred choice for lenses, windows, and prisms in demanding optical systems. With its excellent hardness and resistance to thermal and mechanical shock, MgF_2 is a versatile crystal for both industrial and high-precision scientific equipment.

---

3. General Applications and Examples

MgF_2 Crystals are widely used in the following applications:

- **Excimer Lasers**: Due to their high transmittance at 193 nm, MgF_2 is highly suitable for ArF excimer laser windows in industrial and medical fields.
- **UV and IR Optics**: Commonly employed in lenses, prisms, and windows for UV and IR optical systems.
- **Polarizing Elements**: Effective as polarizing components in high-power UV optical instruments.
- **Vacuum Coating Systems**: As a durable substrate for optical coatings in vacuum systems.
- **Scientific Instruments**: Used in astronomical telescopes, high-energy physics detectors, and spectroscopic tools due to its transparency and mechanical stability.

Examples:

1. Optical components for ArF excimer laser lithography.
2. Precision windows in IR and UV spectroscopic applications.
3. Polarizers and prisms for astronomical observation systems.

---

4. Chemical, Physical, and Structural Properties

Table: Physical and Chemical Properties

Property	Value
Density (g/cm^3)	3.18
Melting Point (°C)	1255
Thermal Conductivity	0.3 W/m·K at 300 K
Thermal Expansion ($°C^{-1}$)	13.7 x 10^{-6} (c-axis), 8.9 x 10^{-6} (⊥ c-axis)
Knoop Hardness	415 (100g indenter)
Refractive Index (n_o, n_e)	n_o = 1.37608; n_e = 1.38771 at 0.7 µm
Crystal Structure	Tetragonal
Cleavage Plane	(110)
Specific Heat Capacity	1003 J/Kg·K
Poisson Ratio	0.276

---

5. Optical Properties

Table: Optical Properties

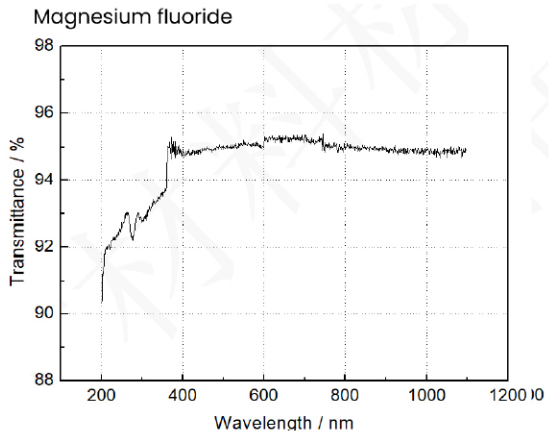
Property	Value
Transparency Range	110 nm to 7.5 µm
Transmittance	>90% @ 0.193 - 6 µm
Reflection Loss	5.2% @ 0.6 µm (both surfaces)
dn/dT ($°C^{-1}$)	2.3 x 10^{-6} (c-axis); 1.7 x 10^{-6} (⊥ c-axis)
Absorption Coefficient	0.04 cm^{-1} @ 2.7 µm

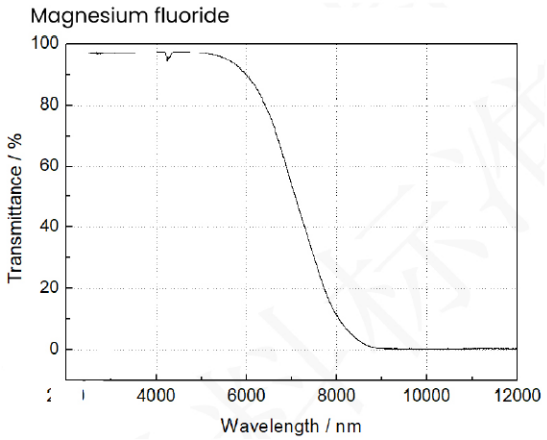
---

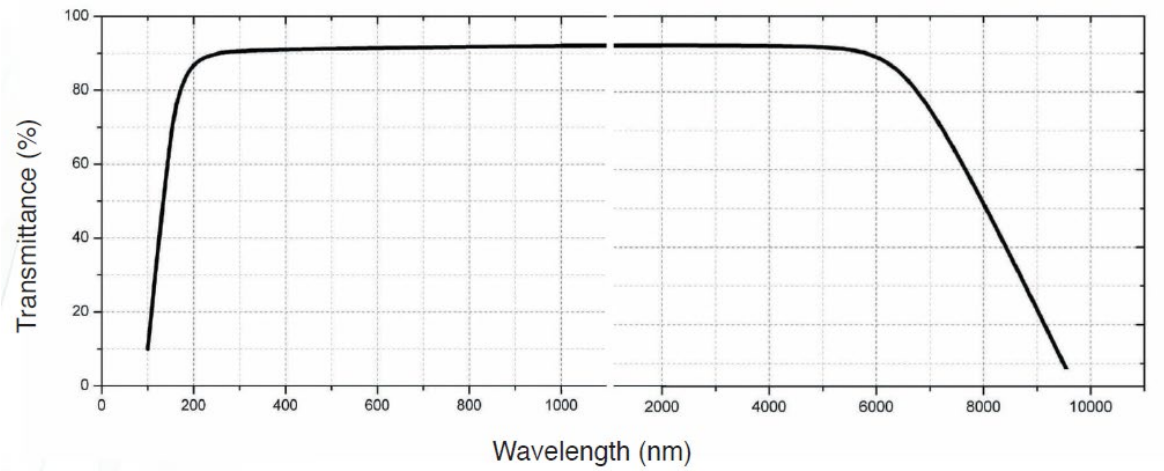
6. Spectrum Transmission Curves

The transmittance of MgF_2 exceeds 90% across a wide spectrum from UV (110 nm) to IR (7.5 µm). Below are the transmission curves for MgF_2 (3 mm thickness):

- **UV Region**: High transmittance above 90% from 193 nm to 6 µm.
- **IR Region**: Steady transmittance up to 7.5 µm.







The Transmittance Curve of MgF_2 Crystal (under 3mm thickness)

---

7. Coating Specification

MgF_2 crystals can be coated with anti-reflective coatings for enhanced transmittance and reflection reduction. Available coatings include:

- **AR Coating**: Optimized for wavelengths from 0.193 µm to 6 µm.
- **Custom Coatings**: Specific to application requirements.

---

8. Standard Fabrication Specifications

Table: Fabrication Specifications

Specification	Value
Maximum Diameter	170 mm
Clear Aperture	>85%
Surface Flatness	λ/4 @ 633 nm
Surface Quality	20/10
Wavefront Distortion	<λ/4 @ 633 nm
Chamfer	<0.25 mm x 45°
Length Tolerance	± 0.1 mm

---

9. POC Strength and Capabilities

Photonics On Crystals (POC) offers high-quality MgF_2 crystals tailored to demanding optical applications. Our expertise lies in:

- Customizing crystal dimensions and coatings for specific needs.
- Strict quality control for high durability and precision in optical performance.
- Timely delivery and competitive pricing to meet industry standards.
- Full OEM services, ensuring solutions for unique project requirements.

---

10. Standard Products

Table: Standard Products (in USD)

Dimensions	Length	Coating	Price (USD)
10 mm x 10 mm	5 mm	AR@193-6 µm	$120

Photonics On Crystals

20 mm x 20 mm	10 mm	AR@193-6 µm	$220
50 mm x 50 mm	15 mm	AR@193-6 µm	$550
Customization	**As required**	**Custom Coating**	**Quote**