

Corning[®] Magnesium Fluoride (MgF₂)

Fluoride Crystal Materials

Corning is a premier provider of fluoride crystal materials, one with the expertise and resources required to provide complete end-to-end optical solutions. Our crystal growth operation regularly produces Magnesium Fluoride crystals of exceptional quality for use at a variety of wavelengths and in a multitude of applications. In addition to growing crystal materials, Corning also offers designing, fabrication, polishing, and coating capabilities. With the ability to do it all under one roof, let Corning be the supplier of choice for your most complex optical requirements.

Magnesium Fluoride is a durable crystal with low absorption, suitable for high-powered laser, space, and other UV applications. MgF₂ is also naturally birefringent, making it an ideal material for use where this property can be exploited, such as retardation plates and polarizing elements, particularly in the wavelength range from 0.13-0.30 μm. Single crystal ingots are grown exclusively in the USA from highly purified materials using Corning's proprietary process, ensuring consistent supply. A full range of geometries and finishes, from ingots and blanks to complex multi-faceted, highly polished parts are available. Standard (001) orientation as well as specifically oriented parts and materials are offered. A variety of finishes and coatings can be customized and combined to meet individual customer specifications.

Physical and Chemical Properties

General Properties

CAS#	7780-40-6
Molecular Weight	62.302 g/mol
Structure	Tetragonal, TiO ₂ Rutile type, space group P4 ₂ /mm, a ₀ = 4.623Å, C ₀ = 3.52Å
Density	3.177 g/cm ³ at 20 °C
Melting Point	1255 °C
Boiling Point	2260 °C

Mechanical and Electrical Properties

Bulk Modulus	101.3 GPa
Shear Modulus	54.7 GPa
Young Modulus	139.0 GPa
Poisson's Ratio	0.271
Elastic Constants Elastic Stiffness (GPa)	C ₁₁ = 123.7 C ₁₂ = 73.2 C ₃₃ = 177.0 C ₁₃ = 53.6 C ₄₄ = 55.2 C ₆₆ = 95.1
Dielectric Constant	4.87 along C axis, 5.45 perpendicular between 95KHz and 42MHz
Hardness	415 Knoop

Thermal Properties

Heat Capacity

T[K]	Cp [J/g · K]
80.00	0.238
95.00	0.319
114.00	0.428
135.00	0.538
155.00	0.627
176.00	0.706
196.00	0.771
216.00	0.830
236.00	0.877
256.00	0.922
276.00	0.955

Thermal Conductivity

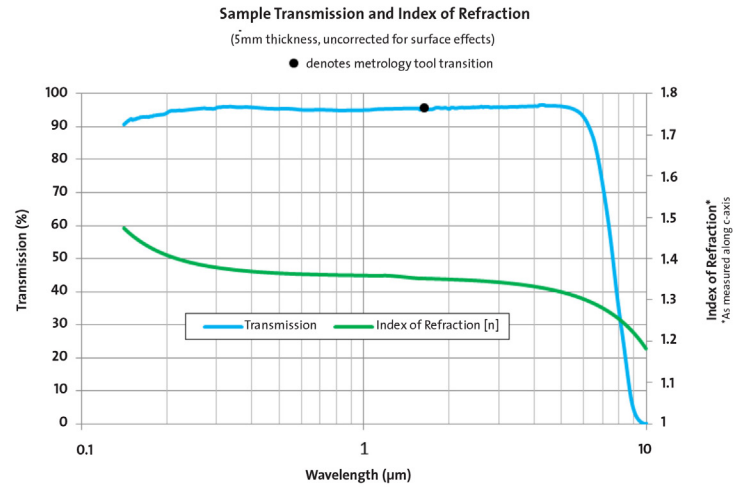
T [°C]	[W/(m·K)]
18	11.6

Linear Thermal Expansion Coefficient

T [°C]	T [K]	Coefficient [x10 ⁻⁶ /K]	
		Perp c axis	Parallel c Axis
-180	93	0.72	2.90
-160	113	1.63	4.45
-140	133	2.65	5.95
-120	153	3.64	7.39
-100	173	4.58	8.86
-80	193	5.45	9.82
-60	213	6.23	10.86
-40	233	6.93	11.74
-20	253	7.52	12.47
0	273	8.04	13.07
20	293	8.48	13.70
40	313	8.88	14.09
60	333	9.25	14.54
80	353	9.60	14.94
100	373	9.93	15.32
120	393	10.22	15.67
140	413	10.49	16.00
160	433	10.71	16.33
180	453	10.91	16.67
200	473	11.10	17.00

Optical Properties

Transmission Range	Useful range of 0.11 μm to ~7.50 μm, depending on thickness
Energy Gap	11eV
Restrahl Frequency	17.5, 20.8, 24.7, 34.5, and 37.0 μm
Reciprocal Dispersive Power	100



Available Grade and Additional Information

Corning® Magnesium Fluoride material is classified as Excimer ArF grade. For the most demanding high-fluence applications, Corning® Calcium Fluoride 193 nm Laser Durability Grade is also available.

Corning's crystal experts work actively with every prospective customer to determine the most appropriate and cost-effective solution for each application. Depending on the application of interest, some or all of the following attributes may be considered in the selection process:

Internal transmittance	>99.0% @ 193.3nm
Stress Birefringence	Naturally birefringent
Bubbles/Inclusions	ISO 10110 - 1/1 x 0.02
Scratch dig	To 10/5 available
Micro-roughness	To 2 Å available
Available raw material diameters	1.7", 2.4", 3.5" and 5" (typical), others upon request
Orientation	Typically at least one face parallel to (001), which is perpendicular to the optical "C" axis [001], others upon request
Finish	Saw cut, fine ground, polished, super-polished, enhanced super-polished
Coatings	Anti-reflective, highly reflective, partially reflective, low absorption, custom solutions upon request

Depending on customer requirements, Corning can provide solutions ranging from crystal blanks to complete turnkey optical packages. We can precisely manufacture a wide variety of laser optic components including windows, prisms, and mirrors, as well as plano convex, plano concave, and hemispherical optics. With world-class coating engineering expertise, we can customize final optical performance to enhance transmission, reflectivity, and/or laser durability to your specification in order to provide a comprehensive optical path solution.

CORNING

For more information about fluoride crystals please contact us at:

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