



# Corning® Optical Grade Calcium Fluoride (OptG CaF<sub>2</sub>)

## High Quality Calcium Fluoride Optimized for Imaging Applications

Corning Advanced Optics is a trusted, premier supplier of calcium fluoride crystal materials. We have expanded our calcium fluoride portfolio to include Corning® Optical Grade Calcium Fluoride (OptG CaF<sub>2</sub>). Calcium Fluoride ingots are grown using Corning’s proprietary highly purified material process, ensuring a consistent supply of high-quality single crystals. OptG CaF<sub>2</sub> is available in prefinished blanks meeting rigid optical requirements.

### Key Attributes

- High Refractive Index Homogeneity
- Low Stress Birefringence
- Up to 52 mm diameter

Internal Transmittance	> 99.9% @ 193.3 nm
Refractive Index Homogeneity (P-V)	<5 ppm or <2 ppm (max), [111], measured @ 633 nm
Stress Birefringence	<5 nm/cm or <2 nm/cm (max), [111], measured @ 592 nm
Bubbles/Inclusions	ISO 10110 - 1/1 x 0.02
Available Raw Material Diameters	Up to 52 mm diameter, others upon request
Orientation	(111) ±3° typical, others upon request

### Physical and Chemical Properties

Molecular Weight	78.075 g/mol
Crystal Structure	Cubic, fluorite type, space group Fm3m
Lattice Constant	5.462 Angstroms
Cleavage Plane	(111)
Density	3.18 g/cm <sup>3</sup> at 25°C
Melting Point	1420°C
Thermal Conductivity	9.71 W/cmK at 25°C
Dielectric Constant	6.76 at 1 MHz

### Optical Properties

Transmission Range	0.12 μm to beyond 7.5 μm
Energy Gap	10 eV
193 nm Absorption Coefficient (0 Fluence)	< 2E-4 cm <sup>-1</sup>
193 nm 2-Photon Absorption Coefficient	< 2.5E-9 cm/W
Photoelasticity (546.38 nm)	q <sub>11</sub> = -0.38 x 10 <sup>-12</sup> Pa <sup>-1</sup> q <sub>12</sub> = 1.15 x 10 <sup>-12</sup> Pa <sup>-1</sup> q <sub>44</sub> = 0.75 x 10 <sup>-12</sup> Pa <sup>-1</sup> (q <sub>11</sub> - q <sub>12</sub> ) = -1.53 x 10 <sup>-12</sup> Pa <sup>-1</sup>

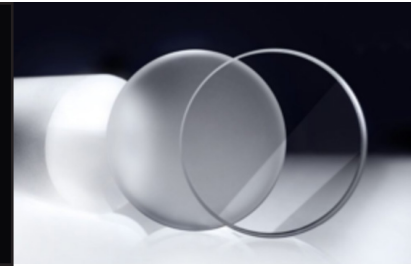
### Mechanical and Elastic Properties

Young’s Modulus (E)	146 GPa <100>, 89.6 GPa <111>
Shear Modulus (G)	60.4 Gpa <100>
Bulk Modulus (K)	84.8 GPa
Poisson Ratio	0.21 <100>
Elastic Compliance	S <sub>11</sub> = 0.6829 S <sub>12</sub> = -0.1448 S <sub>44</sub> = 2.9563
Elastic Stiffness (x 102 GPa)	C <sub>11</sub> = 1.653 C <sub>12</sub> = 0.445 C <sub>44</sub> = 0.338
Knoop Hardness (200 gram load)	156-168 Kg/mm <sup>2</sup> in (111)

### Linear Thermal Expansion Coefficient

Temperature Range	Coefficient [x 10 <sup>-6</sup> K <sup>-1</sup> ]
0 to 25 °C	18.5
25 to 50 °C	19.0
50 to 100 °C	19.6
100 to 150 °C	20.5
150 to 200 °C	21.6

# Corning® Optical Grade Calcium Fluoride (OptG CaF<sub>2</sub>) for imaging applications



## CaF<sub>2</sub> Refractive Index

Refractive Index of CaF<sub>2</sub> measured in 1 atm of N<sub>2</sub>

λ (nm)	Spectral Line	Measured 20°C	Measured 25°C	dn/dT x 10 <sup>-6</sup> K <sup>-1</sup>
2326.05		1.422132	1.422084	-9.6
1530.00		1.426143	1.426091	-10.5
852.344	[s]	1.430042	1.429990	-10.3
656.454	[C]	1.432471	1.432420	-10.2
546.227	[e]	1.434945	1.434897	-9.7
435.957	[g]	1.439480	1.439433	-9.5
365.119	[i]	1.444900	1.444852	-9.6
334.244		1.448498	1.448454	-8.9
289.444		1.456183	1.456141	-8.4
253.728		1.465997	1.465959	-7.6
228.872		1.476372	1.476339	-6.6
214.506		1.484572	1.484544	-5.7
206.266		1.490325	1.490300	-5.2
194.227		1.500606	1.500587	-3.9
184.950		1.510562	1.510546	-3.2

## Polynomial Dispersion Formula

(relative, N<sub>2</sub>, 20-25 °C, 2326 nm - 185 nm)

$$dn/dT = (C_0 + C_1\lambda^2 + C_2\lambda^{-2} + C_3\lambda^{-4} + C_4\lambda^{-6}) \times 10^{-6}, \text{ with } \lambda \text{ in } \mu\text{m}$$

Polynomial Dispersion Coefficients (20-25 °C)

C <sub>0</sub>	-1.059200E+01
C <sub>1</sub>	1.543519E-01
C <sub>2</sub>	1.515306E-01
C <sub>3</sub>	2.230264E-03
C <sub>4</sub>	4.820581E-05

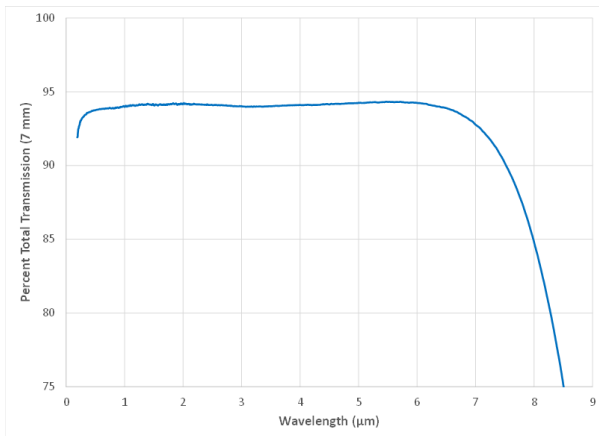
## Sellmeier Dispersion Formula

(relative, N<sub>2</sub>, 2326 nm - 185 nm)

$$n^2 - 1 = A_1\lambda^2/(\lambda^2 - B_1) + A_2\lambda^2/(\lambda^2 - B_2) + A_3\lambda^2/(\lambda^2 - B_3) + A_4\lambda^2/(\lambda^2 - B_4), \text{ with } \lambda \text{ in } \mu\text{m}$$

	Sellmeier Dispersion Coefficients (20 °C)	Sellmeier Dispersion Coefficients (25 °C)
A <sub>1</sub>	4.430595147E-01	4.463112200E-01
A <sub>2</sub>	4.454624348E-01	4.408035972E-01
A <sub>3</sub>	1.502595301E-01	1.515166998E-01
A <sub>4</sub>	8.859807728E+00	8.853841319E+00
B <sub>1</sub>	1.733873966E-03	1.752260093E-03
B <sub>2</sub>	7.938987382E-03	7.970736905E-03
B <sub>3</sub>	1.234337898E-02	1.231282897E-02
B <sub>4</sub>	2.751117861E+03	2.751117881E+03

## Total Transmission



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For more information about Corning's fluoride crystals and our worldwide sales office locations please visit our website:

Corning Advanced Optics

[www.Corning.com/worldwide/en/products/advanced-optics](http://www.Corning.com/worldwide/en/products/advanced-optics)

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