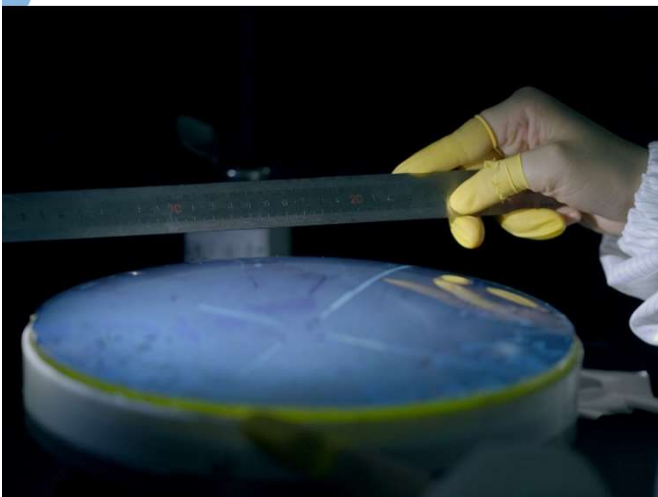


Calcium Fluoride

德硅凯氟
DESIOPTOE

CaF₂ Datasheet



DESIOPTOE is a professional fluoride crystal supplier. With DESIOPTOE's excellent high-purity material process, the durability of CaF₂ crystals under long-term exposure to high-power UV lasers is improved, making it a high-quality choice for microlithography, excimer lasers and other deep UV applications.

Due to the very good transmittance performance of CaF₂ crystals in the DUV-VIS-IR bands, as well as physical stability, chemical inertness, and excellent hardness, calcium fluoride crystals can be widely used in various optical applications such as astronomy, photography, HDTV zoom lenses, microscopes, infrared systems, spectrometers, and medical lasers, etc.

DESIOPTOE provides CaF₂ blanks and components. DESIOPTOE accepts customization of crystals of various specifications within 500mm.

DESIOPTOE can provide products with (111) (001) standard crystal orientations, and can also support customized crystal orientations.

KEY ADVANTAGE

Excellent broadband transmittance

High laser durability

Low stress birefringence

Excellent UV transmittance

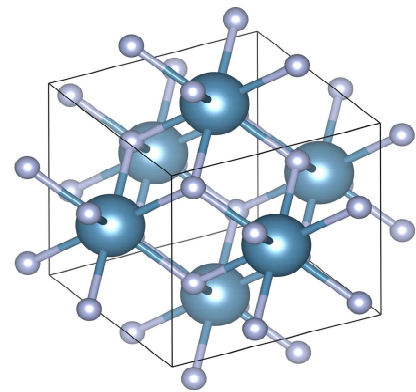
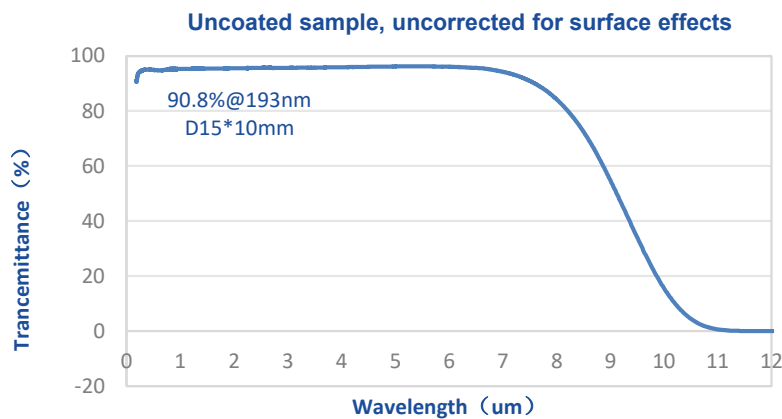
High refractive index homogeneity

General Grades

DESIOPTOE Calcium Fluoride crystals are divided into the following grades:

Material Grade	Internal Transmittance	Laser Durability	Birefringence	Recommended Wavelength
CAF - A	>99.5%@193nm	LD-1	1-10nm/cm on request	ArF excimer laser (193nm)
CAF - B	>99.8%@248nm	LD-2		KrF excimer laser (248nm)
CAF - C-I	>99.8%@365nm	LD-3		i-line 356nm
CAF - C-II	>99.8%@365nm	~		UV region
CAF - D-I	~	~		VIS region, IR region

DESIOPTOE CaF₂ Crystal Transmission



Physical Properties

Crystal Structure	Cubic, Fluoride type
Cleavage Plane	(111)
Lattice Constant	0.546342
Molecular Weight	78.08 g/mol
Density	3.18 g/cm ³
Melting Point	1420 °C
Solubility	0.016 g/l H ₂ O at 20 °C

Thermal Properties

Thermal Conductivity	9.70 W/(m . K)
Specific Heat Capacity	0.893 J/(g . K)
Thermal Diffusivity	35.6 10 ⁻⁷ m ² /sec
Linear Thermal Expansion Coefficient	20.8 10 ⁻⁶ /K at (20 ~ 300 °C) 18.41 10 ⁻⁶ /K at (-30 ~ 70 °C) 18.5 10 ⁻⁶ /K at (0 ~ 25 °C)

Chemical/Electrical Properties

Dielectric Constants	6.81 at 27 °C
Climatic Resistance class	CR 1
Acid Resistance class	SR 4.5
Alkali Resistance class	AR 2.3
Phosphate Resistance class	PR 1.3
Stain Resistance class	FR 0

Mechanical Properties

Bulk Modulus	(GPa)	83.8
Shear Modulus	(GPa)	34.6
Young's Modulus	(GPa)	<100> 146 <110> 101 <111> 91
Poisson Ratio	μ	0.343
Knoop Hardness		82
Mohs Hardness		4

Optical Properties

$n_d = 1.43384$
 $n_e = 1.43492$
 $v_d = 95.23$
 $v_e = 94.96$
 $N_F - N_C = 0.00456$
 $N_F - N_C' = 0.00459$

Refractive Indices

Measured at 22 °C, Nitrogen gas, 1013hPa

	$\lambda_{vac}[nm]$	n	$\Delta n/\Delta T(N_2)[10^{-6}/K]$
n_{2325}	2325.59	1.42212	—
n_{1970}	1970.56	1.42401	—
n_{1530}	1530	1.42612	—
n_{1060}	1060	1.42851	—
n_t	1014.25	1.42879	-9.6
n_s	852.35	1.43002	-9.7
n_r	706.71	1.43166	-9.7
n_c	656.45	1.43245	-9.8
$n_{c'}$	644.03	1.43267	-9.8
n_{He-Ne}	632.98	1.43288	-9.8
n_D	589.46	1.4338	-9.8
n_d	587.73	1.43384	-9.8
n_e	546.23	1.43493	-9.8
n_F	486.27	1.43701	-9.8
$n_{F'}$	480.13	1.43726	-9.8
n_g	435.96	1.43948	-9.7
n_h	404.77	1.44149	-9.6
n_i	365.12	1.44488	-9.4
n_{334}	334.24	1.44848	-9.1
n_{312}	312.66	1.45173	-8.8
n_{296}	296.82	1.45463	-8.5
n_{280}	280.43	1.45824	-8.1
n_{248}	248.35	1.46791	-6.9
n_{194}	194.23	1.5006	-3.2
n_{193}	193.37	1.50143	-3.2
n_{184}	184.95	1.51055	-2.5
$n_{157^{**}}$	157.63	1.55927	—

Relative Partial Dispersion

Deviation of Relative Partial Dispersion

$P_{s,t}$	0.2698		
$P_{C,s}$	0.5333	$\Delta P_{C,t}$	-0.194
$P_{d,C}$	0.3046	$\Delta P_{C,s}$	-0.092
$P_{e,d}$	0.2388	$\Delta P_{F,e}$	0.0183
$P_{g,F}$	0.5389	$\Delta P_{g,F}$	0.0552
$P_{i,h}$	0.7462	$\Delta P_{i,g}$	0.2636

Optical Fabrication Capacity

DESIOPTOE can provide various types of optical fabrication, such as grinding, polishing, and coating.

DESIOPTOE not only provides CaF_2 crystal ingots and blanks but also customized optical components

Internal Transmittance	>99.8%@248nm
Bubbles/Inclusions	ISO 10110 – 1 x 0.02
Scratch/Dig Limit	10-5
Micro-roughness Limit	≤ 0.5 nm
Available blanks diameters	up to 320mm
Wavefront errors Limit	$\lambda/10$
Orientation	(111) (001) (100) orientation are offered
Finish	TSK/rope cut, fine grinded, polished, coated
Components	window, wedge, prism, plano-convex, plan- concave, biconvex, biconcave, convex-concave
Coatings	Anti-reflective, highly reflective

