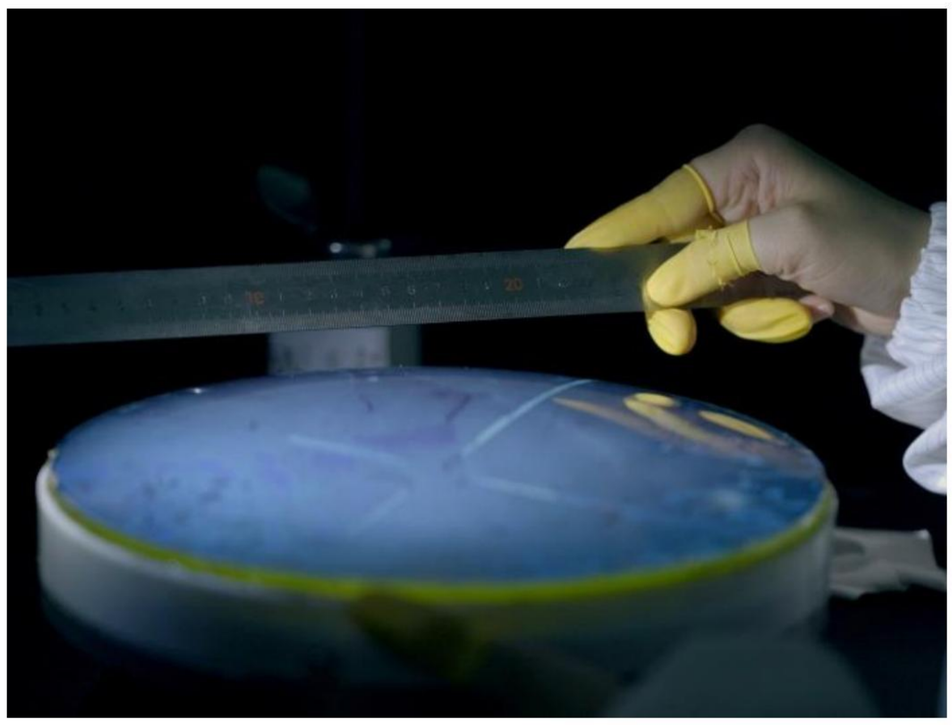
Calcium Fluoride

CaF_2 Datasheet

德硅凯氟
DESIOPTOE



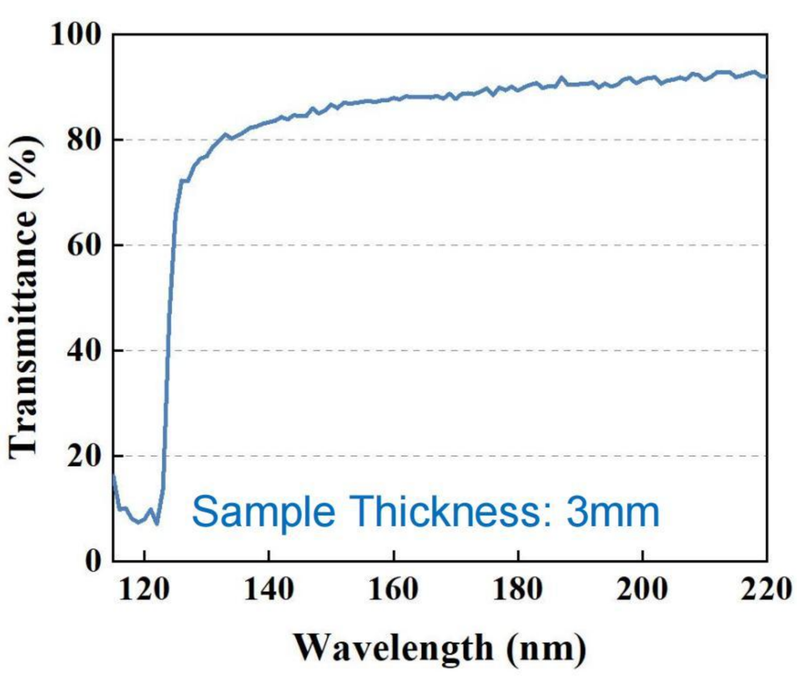
DESIOPTOE is a professional manufacturer of fluoride crystals. With our superior crystal growth technology, **DESIOPTOE** has improved the durability of CaF_2 crystal under long-term exposure to high-power UV lasers, making it an excellent choice for semiconductor lithography, semiconductor inspection, excimer lasers, DUV solid lasers, deep space exploration, microscopy, and other DUV applications.

Due to the excellent transmittance performance of CaF_2 crystal in the DUV-VIS-IR spectrum, as well as its physical stability, chemical inertness and good processability, CaF_2 crystal can be widely used in various optical applications, such as astronomy, photography, HDTV zoom lenses, microscopes, infrared systems, spectrometers, and medical lasers, etc.

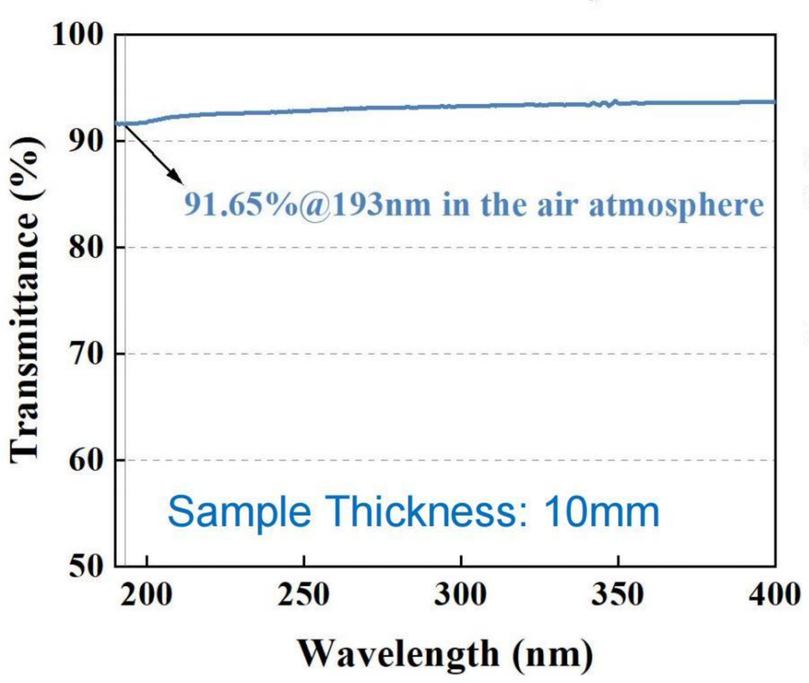
DESIOPTOE provides CaF_2 crystal blanks and optical components in various specifications within 600mm, offering products with standard crystal orientations and supporting customized crystal orientations.

KEY ADVANTAGES

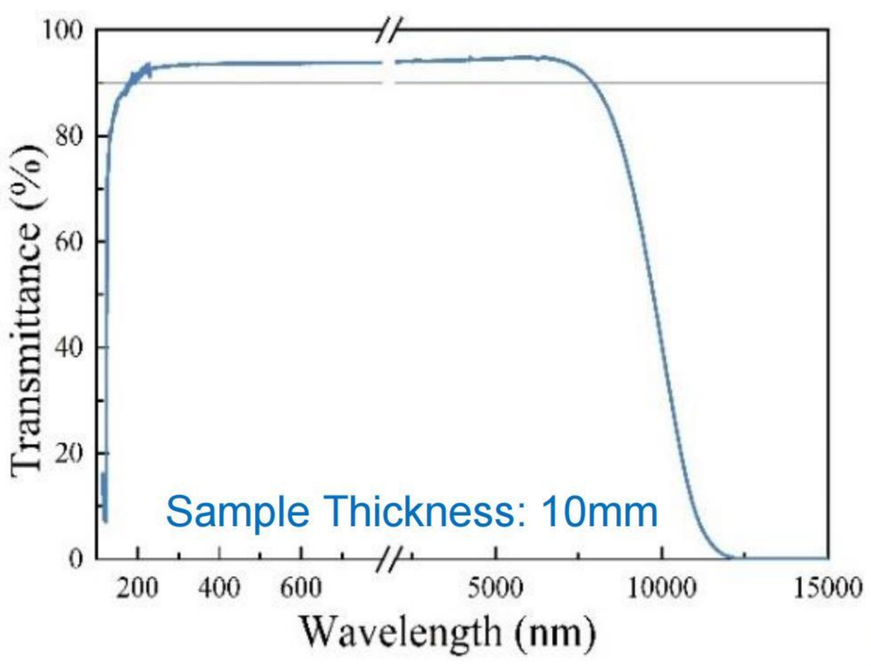
- **Broad Spectrum High Transmittance**
- **High Laser-Induced Damage Threshold**
- **Low Stress Birefringence**
- **High Optical Homogeneity**



VUV Transmittance



UV Transmittance: 91.65%@193nm



Full-SpectrumTransmittance

General Grades

Material Grade	Internal Transmittance	Laser Durability	Stress Birefringence	Recommended Wavelength
CAF - A	>99.8%@193nm	LD-1	0-10nm/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 365nm
CAF - C-II	>99.8%@365nm	~		UV region
CAF - D-I	~	~		VIS region, IR region, Monocrystal
CAF - D-II	~	~		Polycrystal

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Tel: +86-21-31081290 **E-mail:** ib@desioptoe.com

Website: http://www.desioptoe.com/ **Facebook:** Desioptoe Shanghai

Add: Workshop 4, No. 485 Xiangjiang Road, Jiading, Shanghai, China

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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

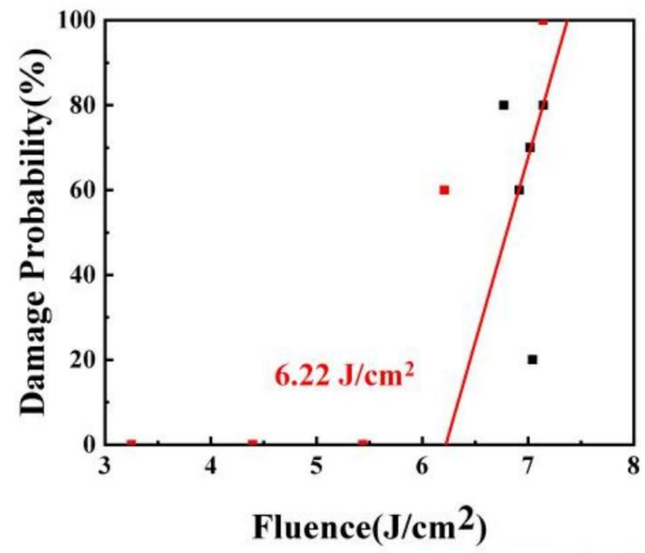
Refractive index

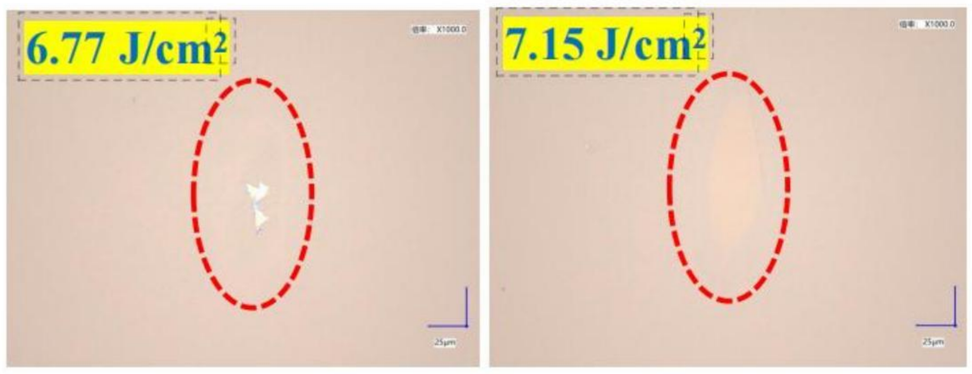
Measured at 22 ℃, Nitrogen gas 1013hPa

	λ_{vac}[nm]	n	$\triangle n/\triangle T(N_2)[10^{-6}/K]$
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	△PC,t	-0.194
$P_{C,s}$	0.5333	△PC,s	-0.092
$P_{d,C}$	0.3046	△PF,e	0.0183
$P_{e,d}$	0.2388	△Pg,F	0.0552
$P_{g,F}$	0.5389	△Pi,g	0.2636
$P_{i,h}$	0.7462	△PC,t	-0.194

Laser-Induced Damage Threshold (LIDT) of Calcium Fluoride (CaF_2)



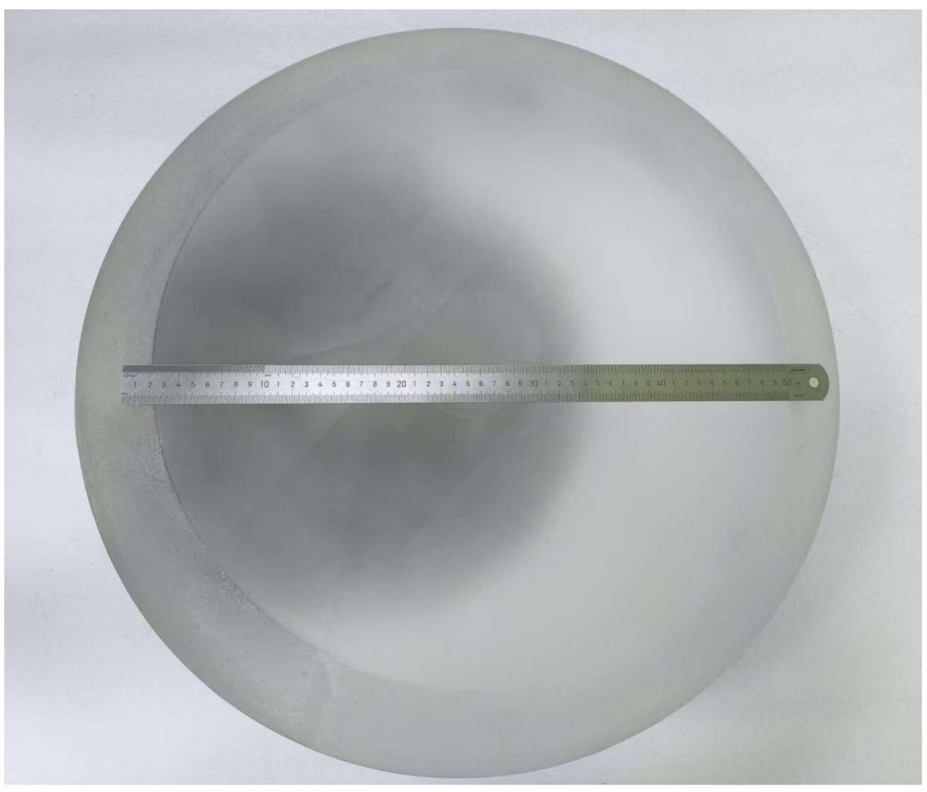


Laser-Induced Damage Threshold:

@193nm: ~ 6.22J/cm² (6.7ns @193 nm)

~7.5J/cm² (10ns @ 193nm)

Calcium Fluoride Crystal Diameter: 620mm



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Physical Properties

Crystal Structure	Cubic, Fluorite Type
Cleavage Plane	(111)
Lattice Constant	a=0.546
Molecular Mass	78.08 g/mol
Density	3.18 g/cm³
Melting Point	1420 ℃
Solubility	1.6 g/L H_2O at 20 ℃

Chemical/Electrical Properties

Dielectric Constant		6.81 at 27 ℃
Weathering 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

Thermal Properties

Specific Heat Capacity	0.893 J/(g · K)
Thermal Conductivity	9.70 W/(m · K)
Thermal Diffusivity	35.6 × 10^{-7} m²/sec
Linear Thermal Expansion Coefficient	20.8 × 10^{-6}/K at (20 ~ 300 ℃) 18.41 × 10^{-6}/K at (-30 ~ 70 ℃) 18.5 × 10^{-6}/K at (0 ~ 25 ℃)

Mechanical Properties

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

Optical Fabrication Capacity

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

Scratch/Dig Limit	10-5
Micro-roughness Limit	≤ 0.2nm
Wavefront errors Limit	λ/10
Crystal Orientations	Custom crystal orientations are available upon request
Surface Finishing	TSK/ Wire Cutting, Fine Grinding, Precision Polishing, Coating
Optical Components	Windows, Wedges, Prisms, Various Types of Lenses, etc.