CaF_2 (Calcium Fluoride)

Calcium Fluoride (CaF_2) is widespread material for UV and IR spectroscopy from 0.15 to 9 transmission range as well as for laser applications. The crystal is optically isotropic, non-hygroscopic and insoluble in most acids and alkali therefore the polished surfaces are practically not degraded in normal atmospheric conditions. A high mechanical strength makes it useful for high pressure applications. At the same time it is very sensitive to thermal shock. Low refraction index of CaF_2 makes it possible to be used without anti-reflection coating for non-laser applications.

Application:

- UV, IR, FTIR spectroscopy
- Laser spectroscopy

Product types:

- Plane-parallel windows and wedges
- Beamsplitter substrates for FTIR spectroscopy
- Lenses
- Prisms

Specifications

Tab.1. Typical specification of CaF_2 optical components:

Specification	Typical	State-of-the-art
Sizes	See table in the article *Plane Windows and Wedged Windows*	Up to 200 mm
Diameter tolerance, mm	+0/-0.25	RFQ
Thickness tolerance, mm	+0/-0.25	RFQ
Thickness matching, mm	-	RFQ
Surface quality, scr/dig	60/40	20/10
Surface flatness, λ @ 633nm per inch*	2	1/8
Parallelism (wedge tolerance)	5 arc min	5 arc sec
Coating	none	protecting

* For "thick" windows: while Diameter/Thickness ratio ≤8

Transmission Spectrum

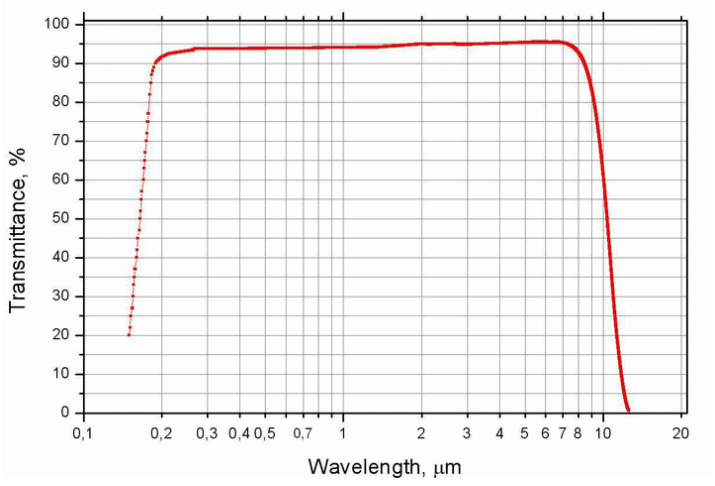

Fig. 1. The measurements were carried out on Perkin Elmer Lambda-35 spectrophotometer and on BrukerVertex-70 Fourier-spectrometer.

Tab.2. Refractive index

λ, μm	n	λ, μm	n
0.19	1.51	2,65	1,42
0.20	1.50	3,90	1,41
0.21	1.49	5,00	1,40
0.22	1.48	5,80	1,39
0.25	1.47	6,20	1,38
0,27	1.46	6,70	1,37
0,33	1.45	7,00	1,36
0,41	1.44	7,50	1,35
0,88	1.43	8,22	1,34

Tab.3. Optical properties

Transmission range, microns	0,15 - 9,0 мкм
Colour	Colourless
Reflection losses @ 5 μm (2 surfaces), %	5,4
Restrahlen peak, μm	35
dN/dT, 10^{-6}/C	-10,6

Tab.4. Physical and mechanical properties

Class / Structure	Cubic FCC, Fm3m, (111) cleavage
Density @300K, g/cm³	3.18
Molecular Weight	78.08
Lattice Constant, Å	5.46
Melting Point, °C	1418
Thermal Conductivity @319K, W/(mxK)	9.71
Thermal Expansion @300K, 10-6/C	18.5
Hardness, Knoop with 200 g indenter	158.3 (100)
Specific Heat Capacity, J/(kg×K)	854
Dielectric Constant for 10^6 Hz @300K	6,76
Young Modulus (E), GPa	75.8
Shear Modulus (G), GPa	33.77
Bulk Modulus (K), GPa	82.71
Elastic Coefficient	C11 = 164 C12 = 53, C44 = 33.7 MPa
Apparent Elastic Limit, MPa	36,54
Poisson Ratio	0,26

Tab.5. Chemical stability / Solubility

in water (at 0°C)		0,0017 r / 100 cm³ non-hygroscopic
in acids		slightly insoluble
in organic solvents	acetone	insoluble
	lower spirits	
	ether	

Please pay your attention that this article is for your information only. We do not supply CaF_2 in ingots as well as semi-finished products. Our standard products are polished parts.

For further information on our CaF_2 optical components please see the following: Windows for IR-spectroscopy, FTIR Beam Splitter, Packaging or fill in request form at www.tydex.com.

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