

Pamphlet on Crystal Fluorite CaF_2

Characteristic

- ◆ The transmitted wavelength region ranges widely from vacuum ultraviolet to infrared.
- ◆ The crystalline material shows a low dispersion and also anomalous dispersion. This material can be used to produce an apochromatic lens in combination with other optical materials.
- ◆ The crystalline material is physically and chemically stable, and is resistant to water and chemicals.



Applied Example



Telephoto lens for digital single-lens reflex camera



Astronomical telescope



Television camera

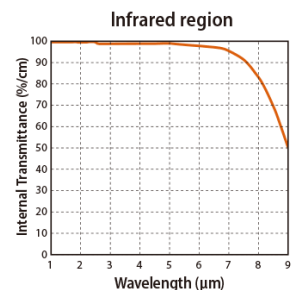
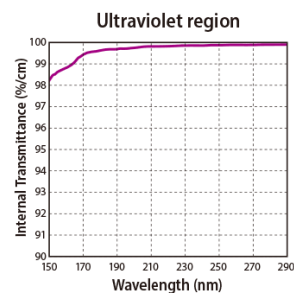


Ultraviolet microscope

Features

Refractive Indices			Constants of Dispersion Formula	
n _C	656.3 nm	1.43246	$n^2 - 1 = A_1 \lambda^2 / (\lambda^2 - B_1^2) + A_2 \lambda^2 / (\lambda^2 - B_2^2) + A_3 \lambda^2 / (\lambda^2 - B_3^2)$	
n _d	587.6 nm	1.43385		
n _F	486.1 nm	1.43702	A ₁	5.675888×10^{-1}
n _g	435.8 nm	1.43948	A ₂	4.710914×10^{-1}
■ Measurement accuracy : $\pm 3 \times 10^{-5}$			A ₃	3.8484723
			B ₁	5.0263605×10^{-2}
Abnormal Dispersion			B ₂	1.003909×10^{-1}
			B ₃	3.464904×10^{-1}
V _d	95.1	(Reference) Malitson, I. H., <i>Appl. Opt.</i> , 2, 1103, 1963.		
θ _{g,F}	0.5394			

Internal Transmittance



Temperature Coefficients of Refractive Index

$-d n / d T (\times 10^{-6} \text{ } ^\circ\text{C}^{-1})$

	0.767858 μm	r	0.6678149 μm	C	D	e	F	g	h
15~35 °C	10.80	10.50	10.70	10.50	10.50	10.50	10.60	10.05	9.75
35~55 °C	11.10	11.10	10.85	11.05	10.90	11.00	10.70	10.55	10.12

(Reference) Stockbarger, D. C., *J. Opt. Soc. Am.*, 39, 731, 1949.

Physical Properties

Basic Physical Properties	
Name of crystal material	CaF ₂
Transmittance wavelength range (μm)	0.13~10
Color	Colorless
Density(g/cc)	3.18
Melting point (°C)	1418
Solubility(g/100gH ₂ O) (20°C)	0.00151
Molecular weight	78.08
Crystal system	Cubic
Crystal structure	Fluorite type
Cleavage plane	{1 1 1}

Thermal Properties	
Thermal Expansion α (/°C) (20°C~60°C)	24×10 ⁻⁶
Thermal Conductivity λ (cal/cm·sec·°C)	2.41×10 ⁻²
Specific Heat Cp (cal/g·°C)	0.211

Mechanical Properties	
Knoop Hardness Hk	158.3
Young's Modulus E (GPa)	75.8
Modulus of Rigidity G (GPa)	33.77
Poisson Ratio	0.26

Processing specifications

	High accuracy	General accuracy
Size	10-200 mm in diameter	
Curvature	< ±1Fr	< ±5Fr
Profile irregularity	< λ/6.66	< λ/2
Surface roughness	< RMS 0.3 nm	< RMS 3 nm
Diameter tolerance	±0.005 mm	±0.015 mm
Wall thickness	±0.01 mm	±0.1 mm
Eccentricity	< 20seconds	< 1minutes
Appearance accuracy(S/D)	Compliant with MIL-0-13830 Canon Optron's standards usually recommended	
Machined shape	Various lenses (biconvex lens, meniscus lens, etc.) Plane glass, prism, etc.	



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