

# OPTICAL MATERIALS : INFRA-RED

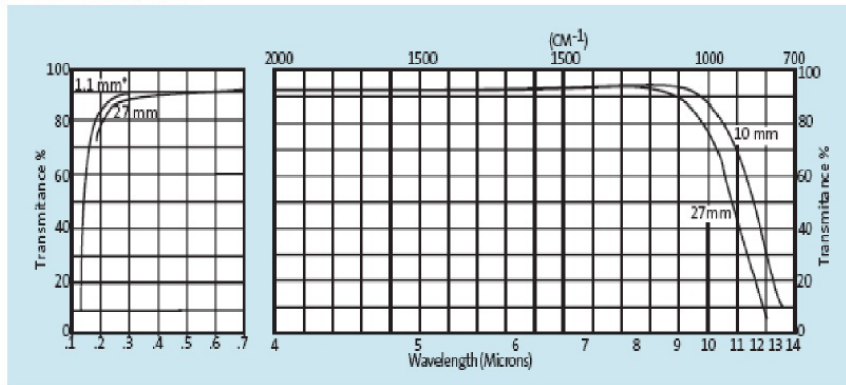
**Title:** Optical material/ crystals (Infrared)

**Material/Specification:** Barium Fluoride for 0.15µm to 15µm transmission

**Range/Description:** OPMI-BARIUM FLUORIDE

Barium Fluoride is transparent from the ultraviolet to the infrared, from 150-200 nm to 11-11.5 µm, and can be used as a material to make optical components such as lenses. It is used in windows for infrared spectroscopy, in particular in the field of fuel oil analysis. Its transmittance at 200 nm is relatively low (0.60), but at 500 nm it goes up to 0.96-0.97 and stays at that level until 9 µm, then it starts falling off (0.85 for 10 µm and 0.42 for 12 µm)

## Internal Transmittance



Internal Transmittance $t_i(l)$ vs. wavelength $l$											
$\lambda, \text{MKM}$	0.2	0.5	1.0	3.0	5.0	6.0	7.0	8.0	9.0	10.0	12.0
$\tau_i(\lambda)$	0.60	0.96	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.85	0.42

Refractive Index $n$ vs. Wavelength $\lambda$																
$l, \text{MKM}$	0.2	0.5	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10	11	12	12.5	15
$n(l)$	1.55	1.47	1.46	1.46	1.46	1.45	1.45	1.44	1.43	1.42	1.41	1.40	1.38	1.36	1.35	1.30

Optical Properties	
Transmission Range	0.15 to 12 micron
Refractive Index	1.45 at 5 micron
Refractive Loss	6.5% at 5 micron
Crystal/Class Structure	Cubic CaF <sub>2</sub>
Cleavage Plane	(111), Perfect

Thermal Properties	
Thermal Expansion	$18.1 \times 10^{-6}/^{\circ}\text{C}$ @ 273 K
Thermal Conductivity	$11.72 \text{ W m}^{-1} \text{ K}^{-1}$ @ 286 K
Melting Point	1386°C
Specific Heat Capacity	$410 \text{ J Kg}^{-1} \text{ K}^{-1}$

Mechanical Properties	
Density	4.89 g/cc
Hardness (Knoop)	Knoop 82 with 500g indenter
Youngs Modulus	53.07 Gpa
Shear Modulus	25.4 Gpa
Bulk Modulus	56.4 Gpa
Poisson Ratio	0.343
Elastic Limit	26.9 Mpa (300psi)
Molecular Weight	175.36

Chemical Properties	
Solubility	0.17g/100g water at 23°C

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