Calcium Fluoride (CaF_2)

Calcium fluoride is grown by vacuum Stockbarger technique in diameters of up to about 250mm. Material for IR use is grown using naturally mined fluorite, in large quantities at a relatively low cost. For UV applications chemically prepared raw material is generally used. For Excimer applications, we use only the highest grade of specially selected material and crystal.

APPLICATIONS: Calcium Fluoride has widespread IR application as spectroscopic windows, prisms and lenses. Especially pure grades of Calcium Fluoride find useful application in the UV and as UV Excimer laser windows. Specially selected material is used for Raman work as it has no interfering fluorescence peaks. Use the links on page 30 for more data on Raman Grade and Crystal Quality.

Transmission Range	0.13 to 10µm
Refractive Index	1.39908 at 5µm (1) (2)
Reflection Loss	5.4% at 5µm
Absorption Coefficient	7.8×10^{-4} cm^{-1} @ 2.7µm
Reststrahlen Peak	35µm
dn/dT	-10.6×10^{-6} K^{-1} (3)
$dn/d\mu = 0$	1.7µm
Density	3.18 g/cc
Melting Point	1360°C
Thermal Conductivity	9.71 W m^{-1} K^{-1} (4)
Thermal Expansion	18.85×10^{-6} K^{-1} (5)(6)
Hardness	Knoop 158.3 (100) with 500g indenter
Specific Heat Capacity	854 J Kg^{-1} K^{-1}
Dielectric Constant	6.76 at 1MHz (7)
Youngs Modulus (E)	75.8 GPa (7)
Shear Modulus (G)	33.77 GPa (7)
Bulk Modulus (K)	82.71 GPa (7)
Elastic Coefficients	$C_{11} = 164$ $C_{12} = 53$ $C_{44} = 33.7$ (7)
Apparent Elastic Limit	36.54 MPa
Poisson Ratio	0.26
Solubility	0.0017g/100g water at 20°C
Molecular Weight	78.08
Class/Structure	Cubic $Fm\bar{3}m$ (#225) Fluorite structure Cleaves on (111)

(1) Handbook Optical Constants, ed Palik, V2, ISBN 0-12-544422-2
(2) Dressler et al., Cryst.Res.Technol. V27, p413, 1992
(3) I.H.Malitson; J.Opt.Soc.Am. Vol52, p1377, 1962
(4) Ballard et al; Rev. Sci. Instr., V21, p905, 1950
(5) Batchelder & Simmons, J.Chem. Phys. V41, p2324 N8 1964
(6) Schumann & Neumann, Crys. Res. Tech V19, 1984
(7) Dickinson, IR laser windows, AFCRL-TR-0318, Air Force, Cambridge 1975

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µm	No	µm	No	µm	No
0.149	1.5800	0.161	1.5490	0.195	1.5000
0.200	1.4950	0.222	1.4800	0.248	1.4680
0.266	1.4621	0.280	1.4584	0.300	1.454
0.337	1.4481	0.400	1.4419	0.486	1.4370
0.588	1.4339	0.656	1.4325	0.687	1.4320
0.728	1.4314	0.884	1.4298	1.014	1.4288
1.100	1.4283	1.250	1.4275	1.650	1.4256
1.900	1.4244	2.058	1.4236	2.450	1.4214
2.700	1.4199	2.800	1.4192	3.050	1.4175
3.400	1.4149	4.000	1.4096	4.400	1.4057
4.800	1.4014	5.000	1.3991	5.304	1.3952
5.893	1.3871	6.483	1.3782	7.072	1.3681
7.661	1.357	8.251	1.3444	8.840	1.3308
9.429	1.3161