

Barium Fluoride (BaF₂)

MATERIALS DATA

Barium Fluoride is grown by vacuum Stockbarger technique. Unlike CaF₂, BaF₂ is not found in the native state and all material must be synthesised chemically making BaF₂ relatively expensive to produce. Barium Fluoride cleaves easily and is highly susceptible to thermal shock. It polishes well and can be etched (5). The highest purity VUV material can be qualified as fast scintillator grade.

APPLICATIONS: Barium Fluoride is used in spectroscopic components. It is often suitable for applications in the passive IR band (8 to 14 μ m) and is often used as a view-port window for thermography. For an equivalent thickness the transmission extends approximately 1 μ m further into the IR than CaF₂. The highest quality BaF₂ also has application as the fastest known scintillator material and is used in High Energy Physics Experiments.

Transmission Range	0.15 to 12 μ m
Refractive Index	1.45 at 5 μ m (1)
Reflection Loss	6.5% at 5 μ m (2 surfaces)
Absorption Coefficient	$3.2 \times 10^{-4} \text{ cm}^{-1}$ @ 6 μ m
Reststrahlen Peak	47 μ m
dn/dT	$-15.2 \times 10^{-6}/^{\circ}\text{C}$ (2)
dn/d μ = 0	1.95 μ m
Density	4.89 g/cc
Melting Point	1386 $^{\circ}\text{C}$
Thermal Conductivity	11.72 W m ⁻¹ K ⁻¹ @ 286 K
Thermal Expansion	$18.1 \times 10^{-6} \text{ K}^{-1}$ @ 273 K
Hardness	Knoop 82 with 500g indenter (4)
Specific Heat Capacity	410 J Kg ⁻¹ K ⁻¹ (3)
Dielectric Constant	7.33 at 1 MHz
Youngs Modulus (E)	53.07 GPa (3)
Shear Modulus (G)	25.4 GPa (3)
Bulk Modulus (K)	56.4 GPa
Elastic Coefficients	C ₁₁ = 89.2 C ₁₂ = 40.0 C ₄₄ = 25.4 (2)
Apparent Elastic Limit	26.9 MPa (300psi) (4)
Poisson Ratio	0.343
Solubility	0.17g/100g water at 23 $^{\circ}\text{C}$
Molecular Weight	175.36
Class/Structure	Cubic Fm3m (#225) Fluorite structure Cleaves on (111)

(1) Handbook Optical Constants, ed Palik, V3, ISBN 0-12-544423-0

(2) I.H.Malitson; J.Opt.Soc.Am. Vol52, p1377, 1962

(3) D.Girlich; Elastic Constants of BaF₂; Phys.Rev. Vol135, p1826, 1964

(4) S.Ballard et al; J.Opt.Soc.Am. Vol42, p684, 1952

(5) US patent. Chemical polish. 4,040,896 1977

(6) M.Laval et al; Nu. Insts.Meth, V206 p169, 1983



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μm	No	μm	No	μm	No
0.1408	1.815	0.1452	1.7820	0.1477	1.7670
0.1500	1.6780	0.2000	1.557	0.2652	1.5122
0.2803	1.5066	0.2893	1.5039	0.2967	1.5019
0.3021	1.5004	0.3130	1.4978	0.3254	1.4952
0.3403	1.4925	0.3466	1.4915	0.3610	1.4894
0.3663	1.4887	0.4046	1.4844	0.5461	1.4759
0.5893	1.4744	0.6438	1.4730	0.6563	1.4727
0.7065	1.4718	0.8521	1.4699	0.8944	1.4694
1.0140	1.4685	1.1287	1.4678	1.3673	1.4667
1.5295	1.4661	1.6810	1.4656	1.7012	1.4655
1.9701	1.4647	2.3254	1.4636	2.6738	1.4623
3.2434	1.4602	3.4220	1.4594	5.1380	1.4501
5.5490	1.44732	6.2380	1.4422	6.6331	1.4390
7.0442	1.4353	7.2680	1.4331	9.7240	1.4051
10.346	1.3936				

