

MATERIAL PROPERTIES & SPECIFICATIONS



Barium Fluoride (BaF₂)

Fairfield Crystal uses a unique source material purification with a vertical-Bridgman method to grow synthetic high purity BaF₂ single crystals. Barium Fluoride is transparent from the ultraviolet (UV) to the infrared (IR) from 0.200 to 14.0 μm, and is used to make optical components, such as windows for infrared spectroscopy. Barium fluoride is also a very fast scintillator used for the detection of X-rays, gamma rays or other high energy particles. One of its applications is the detection of 511 keV gamma photons in Positron Emission Tomography (PET). It responds also to alpha and beta particles, but, unlike most scintillators, it glows in ultraviolet light. It can be also used for detection of high energy neutrons, and use pulse shape discrimination techniques to separate them from simultaneously occurring gamma photons. In a dry environment BaF₂ can be used up to 800 °C, however prolonged exposure to moisture degrades transmission in the vacuum UV range. It is less resistant to water than calcium fluoride, but is the most resistant of all the optical fluorides to high-energy radiation, though its far ultraviolet transmittance is lower than theirs. It is quite hard, and very sensitive to thermal shock. Fairfield Crystal provides this excellent material to give our customers a quality product at a reasonable cost.

	Barium Fluoride	BaF ₂
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Optical Properties	
Transmission Range	0.20 to 14 μm
Internal Transmission	>99% @ 0.4 to 9.0 μm
Refractive Index Homogeneity	1.4759 @ ne
Cleavage Plane	<111>
Reflection Loss	% @ 3.0 μm (2 surfaces)

Refractive Indices	
Wavelength [μm]	n
1.0	1.46861
2.0	1.46464
3.0	1.46119
4.0	1.45671
5.0	1.45103
6.0	1.44398
7.0	1.43561
8.0	1.42579
9.0	1.41435
10.0	1.40131

Physical properties

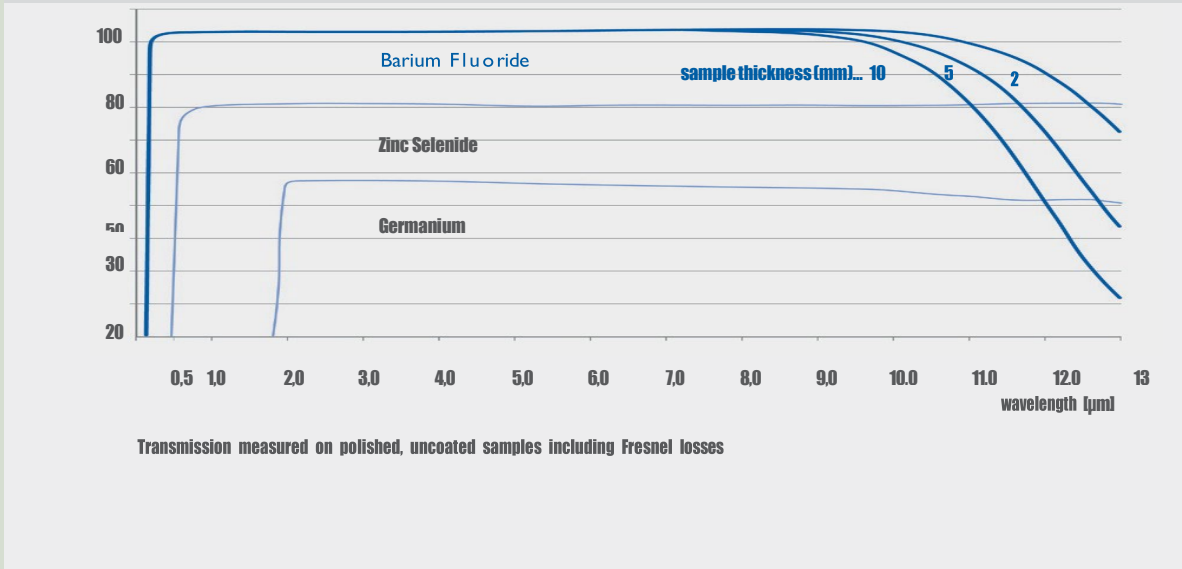
Density	4.89gm/cc
Melting Point	1368 deg C
Solubility	1.7 gm/kg water @ 25 deg C
Hygroscopic	Slightly
Knoop Hardness	82.0 Knoop
Crystal Structure	Cubic <111> cleavage plane
Absorption Coefficient	3.2 x 10 ⁻⁴ @ 6μm
Thermal Expansion Coefficient	18.1 x 10 ⁻⁶

Thermal properties

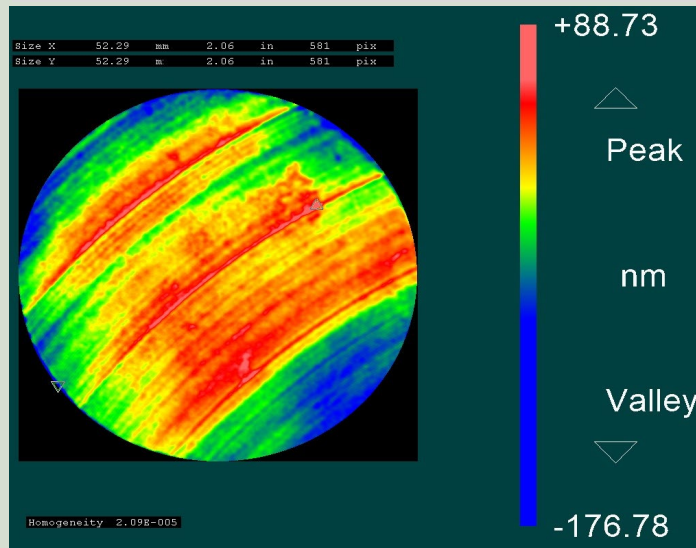
Melting point [°C]	1386
Specific heat capacity [J/(kg K)] (2)	410
Thermal conductivity @13°C [W / (m K)]	11.72
Linear thermal expansion coefficient @ 0°C [10 ⁻⁶ / K]	18.1

Barium Fluoride is transparent from the ultraviolet (UV) to the infrared (IR) from 0.200 to 14.0 μm , and it is often used to make optical components, such as windows for infrared spectroscopy. Our standard sizes range from 5.0mm to 150mm diameter, however larger sizes and cuts are available upon request. The maximum size of polycrystalline BaF₂ can reach up to 320mm.

Spectral Transmission BaF₂



Homogeneity of unpolished BaF₂ blank



Substance	Form	Diameter Range	Thickness Range	Transmission Range (μm)	Finish
Barium Fluoride	Single Crystal or Polycrystal	5 to 150mm	1 to 50mm*	0.15 to 14.00	Fine Ground**

* Special orders available **
Standard finish – other finish available upon