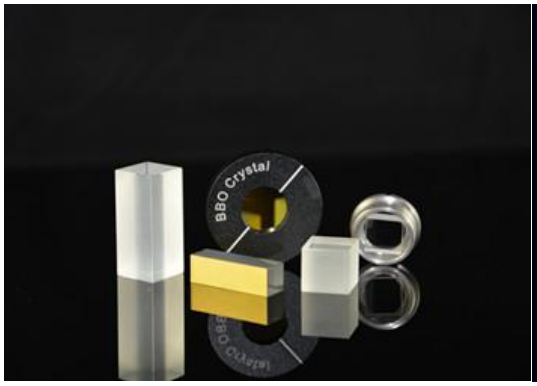
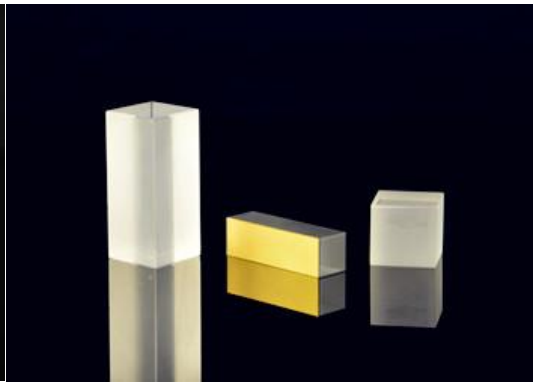
BBO Crystals - Beta Barium Borate Crystal

- **Size up to 15x15x15mm^3**
- **Smallest thickness only 0.05mm**
- **P coating, AR coating, mounts and repolished service**

Beta-Barium Borate (β -BaB2O4,BBO) or BBO crystal is an excellent non-linear crystal for frequency-conversion (SHG,THG, 4HG and 5HG) of Visible and Near IR laser light, OPO/OPG/OPA pumped by ultrafast pulses of wavelengths in the Near IR to UV, and sum-frequency mixing (SFM) into the Visible to the deep UV. **BBO crystals** is also used in the EO Q-switches for its high electro-optical coefficients. BBO is one of the few practical crystal for use below 500 nm in SHG and SFM.





Fertures

- Broad phase matchable range from 409.6 nm to 3500 nm
- Wide transmission region from 190 nm to 3500 nm
- Large effective second-harmonic-generation (SHG) coefficient about 6 times greater than that of KDP crystal
- High damage threshold
- High optical homogeneity with dn » 10-6/cm
- Wide temperature-bandwidth of about 55°C

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SPECIFICATIONS

Specifications	
Dimension tolerance	(W±0.1mm)x(H±0.1mm)x(L+0.5/-0.1mm) (L≥2.5mm) (W±0.1mm)x(H±0.1mm)x(L+0.1/-0.1mm) (L<2.5mm)
Clear aperture	central 90% or the diameter
Scattering of crystals	No visible scattering paths or centers when inspected by a 50mW green Laser
Flatness	less than λ/8 @ 633nm
Transmitting wavefront distortion	less than λ/8 @ 633nm
Chamfer	≤0.2mmx45°
Chip	≤0.1mm
Surface Quality	better than 10/5 S/D (MIL-PRF-13830B)
Parallelism	≤20 arc seconds
Perpendicularity	≤5 arc minutes
Angle tolerance	≤0.25°
Quality Warranty Period	one year under proper use

Notes:

- BBO has a low susceptibility to the moisture. The user is advised to provide dry conditions for both the use and preservation of BBO.
- BBO is relatively soft and therefore requires precautions to protect its polished surfaces.
- When angle adjusting is necessary, keep in mind that the acceptance angle of BBO is small.
- Our engineers can select and design the best BBO crystal, if the main parameters of your laser are provided, such as energy per pulse, pulse width and repetition rate for a pulsed laser, power for a cw laser, laser beam diameter, mode condition, divergence, wavelength tuning range, etc.

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Chemical and Structural properties	
Crystal Structure	Trigonal, space group R3c
Lattics Parameters	a=b=12.532Å, c=12.717Å, Z=6
Melting point	About 1095℃
Mohs Hardness	4
Density	3.85g/cm3
Thermal Conductivity	1.2W/m/K(⊥c): 1.6W/m/K(//c)
Thermal Expansion Coefficients	$a11=4x10^{-6}/K$; $a33=36x10^{-6}/K$

Optical and Nontinear Optical Properties	
Transparency Range	190-3500nm
SHG Phase Matchable Range	409.6-3500nm(Type I) 525-3500nm(Type II)
Therm-optic Coefficients(/°C)	$dno/dT=-16.6X10^{-6}$ $dne/dT=-9.3X10^{-6}$
Absorption Coefficients	<0.1%/cm at 1064nm <1%/cm at 532nm
Angle Acceptance	0.8mrad-cm (θ, Type I,1064 SHG) 1.27mrad-cm (θ, Type II,1064 SHG)
Temperature Acceptance	55℃-cm
Spectral Acceptance	1.1nm-cm
Walk-off Angle	2.7° (Type I 1064 SHG) 3.2° (Type II 1064 SHG)
NLO Coefficients	deff(I)=d31sinθ+(d11cosΦ-d22sin3Φ)cosθ deff(II)=(d11sin3Φ+d22cos3Φ)cos2θ
Non-vanished NLO susceptibilities	d11=5.8xd36(KDP) d31=0.05xd11 d22<0.05xd11
sellmeier Equations(λ in μm)	no2=2.7359+0.01878 / (λ2-0.01822) -0.01354 λ2 ne2=2.3753+0.01224 / (λ2-0.01667) -0.01516 λ2
Electro-optic coefficients	r22=2.7pm/V
Half-wave voltage	7KV (at 1064nm,3*3*20mm3)
Resistivity	$>10^{11}$ ohm-cm
Relative Dielectric Constant	εs11/εo:6.7 εs33/εo:8.1 Tan δ<0.001

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BBO crystal has broad tunability, high damage threshold, and high efficiency. BBO's small acceptance angle requires a very good beam quality and its large walkoff results in output beams that are very elliptical or slit-like. Type I is usually much more efficient than type II operation. BBO can not be used for NCPM (temperature tuned) application.

Typical applications:

- SHG ,3HG, 4HG and autocorrelation of femtosecond and picosecond Ti:Sapphire lasers;
- SHG, 3HG, 4HG, 5HG of YAG lasers at 1064 nm and 1320 nm to yield output of 212-660nm;
- SHG of tunable dye or solid-state laser sources from 410-750 nm to yield output of 205-375 nm;
- SFM of dye laser and YAG harmonics to yield output of 189-400 nm;
- DFM (difference-frequency mixing) from the Visible to the IR range up to over 3000 nm;
- OPO pumped with SHG or 3HG of YAG or Ti:Sapphire with an output range of 400-3000;
- Intracavity SHG of Argon ion lasers (488, 514 nm) or Copper vapor lasers (510 nm, 578 nm);
- Used as E-O crystals in pockels cells

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