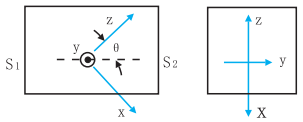
BBO

BBO is an outstanding crystal for many applications in nonlinear optics and electro-optics. BBO is a colorless trigonal uniaxial crystal with low hygroscopic susceptibility. Its transparency range is from 0.19μm to 3.5μm.

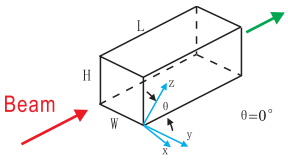
BBO is an efficient nonlinear crystal for second, third, fourth and fifth harmonic generators of Nd: Laser, dye lasers and ultrafast Ti:Sapphire lasers. It has also excellent performance in optical parametric amplifier, oscillators, etc.

BBO typical orientations:

θ≠0°, ϕ=0°, For Type I phase matching application.
θ≠0°, ϕ=30°, For Type II phase matching application.
Brewster cut, θ≠0°, ϕ=0°, or 30°, no coating on S1&S2.
Z-cut, gold coated on X-faces, for Q-switch application.



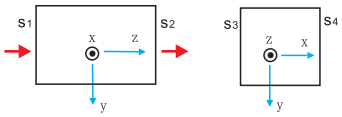
Phase matching angle: θ and ϕ
θ and ϕ are depended on different applications of frequency conversion.
If you are not sure to calculate the phase matching angles, please contact us for assistance.



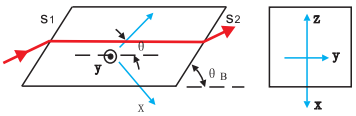
General Specifications

Dimensional tolerance	±0.1mm
Thickness tolerance	±0.02mm
Angle tolerance	<0.5°
Surface flatness	λ/8@632.8nm
Wavefront distortion	λ/8@632.8nm
Surface quality	10-5S/D
Parallelism	<20 arcsec
Perpendicularity	<5 arcmin
Clear aperture	>85%

z-cut



Brewster angle cut



Typical Sizes
Aperture: 5x5mm, 6x6mm, 7x7mm, 10x10mm
Thickness: 0.1mm, 0.2m, 0.5mm, 1.0mm, 2.0mm, 3.0mm, 5.0mm

Coating
Protective coating is required to prevent polished surfaces from fogging.
Anti-reflective coating should be considered if low reflectivity is required.

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Ultra Thin BBO Plate

The minimum thickness of BBO we can polish is 0.005mm, the ultra thin BBO is used for frequency conversion of ultra fast laser with femtosecond pulse width.

For frequency conversion of ultrafast lasers such as Ti:sapphire and Dye laser with femtosecond pulse width. The main concern is fs pulse broadening induced by group velocity mismatching(GVM) or group velocity dispersion. The suggested thickness of BBO crystals is less than pulse width divides.

BBO Optical properties

Transparence range	189--3500nm
Second harmonic generation range	410--2400nm
Type I phase matching plane	X-Z plane, ϕ=0°
Type II phase matching plane	ϕ=30°
Refractive indices	n_e=1.5425, n_o=1.6551@1064nm
	n_e=1.5555, n_o=1.6749@532nm
	n_e=1.6146, n_o=1.7571@266nm
Therm-optic coefficients	$dn_o/dT=-9.3x10^{-6}$/°C
	$dn_e/dT=-16.6x10^{-6}$/°C
NLO coefficients	$d_{11}=5.8xd_{36}$(KDP)
	$d_{31}=0.05xd_{11}$
	$d_{22}<0.05xd_{11}$
Half wave voltage	48Kv@1064nm
Damage threshold	5GW/cm^2, 10ns, 1064nm
Sellmeier equations	$n_o^2(\lambda)=2.7359+0.01878/(\lambda^2-0.01822)-0.01354\lambda^2$
	$n_e^2(\lambda)=2.3757+0.01224/(\lambda^2-0.01667)-0.01516\lambda^2$

BBO Physical properties:

Crystal structure	Trigonal, space group R_{3C}
Cell parameters	A=B=12.532Å , C=12.717Å , Z=6
Melting point	1095°C
Transition temperature	925°C
Mohs hardness	4.5
Optical coefficient	<0.1%/cm @1064nm
Density	3.85g/cm^3
Hygroscopic susceptibility	Low
Resistivity	>10^{11} ohm-cm
Thermal expansion coefficients	⊥C, $4x10^{-6}$/K; //C, $36x10^{-6}$/k
Thermal conductivity	⊥C, 1.2w/m/k; //C, 1.6w/m/k

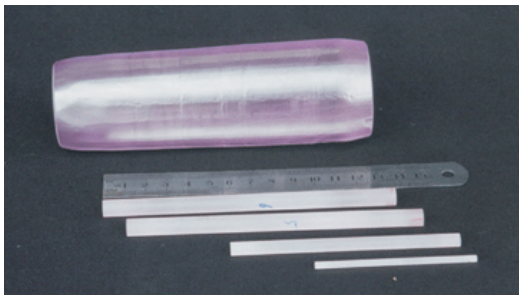
Nd:YAG

Nd:YAG (neodymium-doped yttrium aluminium garnet; Nd:$Y_3Al_5O_{12}$) is a crystal that is used as a lasing medium for solid-state lasers. The dopant, triply ionized neodymium, typically replaces yttrium in the crystal structure of the yttrium aluminium garnet, since they are of similar size. Generally the crystalline host is doped with around 1% neodymium

Nd:YAG rod is an excellent laser crystal for high energy application, it has a high thermal conductivity, and good optical quality.

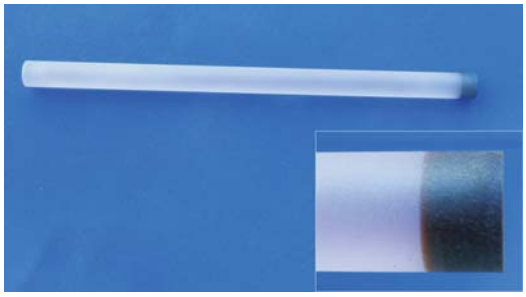
General Specifications

Nd dopant	1.1%
Dimension tolerance	±0.1mm
Angle tolerance	<0.5°
Surface flatness	λ/8@632.8nm
Wavefront distortion	λ/8@632.8nm
Surface quality	10-5 S/D
Parallelism	<20 arcsec
Perpendicularity	<5 arcmin
Clear aperture	>85%



Nd:YAG optical and physical properties.

Crystal structure	Cubic
Lattice parameters	A=B=C=12.01
Density	4.56g/cm^3
Melting point	1970°C
Mohs hardness	8.5
Density	4.64g/cm^3
Thermal expansion coefficient	7.8 x10^{-6}/°C [111]
Thermal conductivity	14w/m/k @20°C
Refractive index	1.82
Lasing wavelength	1064nm
Stimulated emission cross-section	2.8x$10^{-19}$$cm^{-2}$ @1064nm
Relaxation time of terminal	30ns
Spontaneous fluorescent	230μs 1 atomic %Nd
Radiative lifetime	550μs
Loss coefficient	0.003 cm^{-1} @1064nm
Absorption band at pump wavelength	1nm
Pump wavelength	807.5nm
Polarized emission	unpolarized



Compound of Nd:YAG+Cr^{4+}:YAG

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