

Broad phase-matchable SHG range from 409.6 nm to 3500 nm.
 Wide transparency range from 190 nm to 3500 nm
 Large effective second-harmonic-generation (SHG) coefficient
 Damage threshold of 10 GW/cm² for 100 ps pulse at 1064 nm
 Good mechanical and physical properties

Non-Linear Optical Crystal BBO

BBO is a non-linear optical crystal that combines a number of unique features.

These features of nonlinear BBO crystal include wide transparency and phase matching ranges, large non-linear coefficient, high damage threshold and excellent optical homogeneity. Therefore, BBO provides an attractive solution for various non-linear optical applications like OPO, OPA, OPCPA and other. As a result of large thermal acceptance bandwidth, high damage threshold and small absorption BBO well suits for frequency conversion of high peak or average power laser radiation. The large spectral transmission range as well as phase matching, especially in UV range, makes BBO perfectly suitable for frequency doubling of Dye, Arion and Copper vapour laser radiation, effective cascade harmonic generation (Frequency doublers, triplers, parametric amplifiers and wave mixers) of wide spread Nd:YAG as well as of Ti:Sapphire and Alexandrite laser radiation. Both angle tuned Type 1 (oo-e) and Type 2 (eo-e) of phase matching can be obtained increasing a number of advantages for different applications.

Transparency range, nm	189-3500 nm
Length tolerance, mm	+0/-0.1
Aperture tolerances, mm	+0/-0.1
Orientation accuracy of cut angle	<30 arcmin
Surface quality, scratch/dig	10/5
Surface Flatness	L/8 @ 633 nm
Parallelism error	<20 arcsec
Perpendicularity	<5 arcmin
Optical damage threshold	>0.5 GW/cm ² for 10 ns pulses @ 1064 nm

Aperture*, mm	Length*, mm	Orientation θ/ϕ , deg	Protective coatings ** S1/S2, nm/nm	Comments	Price
10x10	0.1	29.2/90	400-800/400-800	SHG@800nm	895 €
	0.5	29.2/90	400-800/400-800	SHG@800nm	850 €
	1	29.2/90	400-800/400-800	SHG@800nm	791 €
6x6	0.1	29.2/90	400-800/400-800	SHG@800nm	616 €
	0.1	44.3/90	400-800/266	THG@800nm	616 €
	0.2	29.2/90	400-800/400-800	SHG@800nm	616 €
	0.2	44.3/90	400-800/266	THG@800nm	616 €
	0.5	29.2/90	400-800/400-800	SHG@800nm	408 €
	0.5	44.3/90	400-800/266	THG@800nm	408 €
	1	29.2/90	400-800/400-800	SHG@800nm	387 €
	1	44.3/90	400-800/266	THG@800nm	387 €
	2	29.2/90	400-800/400-800	SHG@800nm	387 €
7x7	6	47.6/90	532/266	SHG@532nm	1.099 €

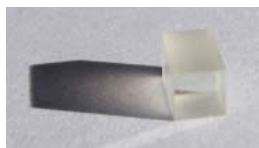
* Crystal aperture up to 22x22 mm and length up to 20 mm available

** Various dielectric coatings are available.

Custom design production is also available.

Crystals with gold electrodes for electro-optical applications available

All BBO crystals have Type I (e-oo) phase matching.



Wide transmission region from 350 nm to 4400 nm
 Wide angular bandwidth and small walk-off angle
 Broad temperature and spectral bandwidth
 Low cost compare with BBO and LBO

Non-Linear Optical Crystal KTP

Single crystal Potassium Titanyl Phosphate is an excellent non-linear crystal. KTP is a standard crystal with the parameters mostly used in extracavity configuration when the single pass through the crystal is required. It exhibits high optical quality, broad transparent range, relatively high effective SHG coefficient (about 3 times higher than that of KDP), rather high optical damage threshold, wide acceptance angle, small walk-off and type I and type II non-critical phase-matching (NCPM) in a wide wavelength range. KTP is the most commonly used material for frequency doubling of Nd:YAG lasers and other Nd-doped lasers, particularly at the low or medium power density.

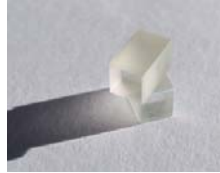
Transparency range, nm	350-4400nm
Length tolerance, mm	+0/-0.1
Aperture tolerances, mm	+0/-0.1
Orientation accuracy of cut angle	<30 arcmin
Surface quality, scratch/dig	10/5
Surface Flatness	L/8 @ 633 nm
Parallelism error	<20 arcsec
Perpendicularity	<5 arcmin
Optical damage threshold	>500MW/cm ² for 10 ns pulses @ 1064 nm

Aperture*, mm	Length*, mm	Orientation θ/ϕ, deg	AR coatings** S1/S2, nm/nm	Application	Price
3x3	5	90/23.5	1064+532/1064+532	SHG@1064	149 €
3x3	10	90/23.5	1064+532/1064+532	SHG@1064	192 €
4x4	6	90/23.5	1064+532/1064+532	SHG@1064	203 €
7x7	9	90/23.5	1064+532/1064+532	SHG@1064	738 €

*Other sizes are available on request.

**Various dielectric coatings are available.

Custom design production is also available.



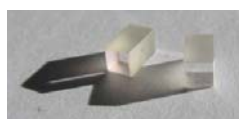
Wide transparency range
 Unique electro-optical, photoelastic,
 piezoelectric and nonlinear properties
 Good mechanical and chemical stability
 Absorption loss < 0,1 %/cm @ 1064 nm

Non-Linear Optical Crystal LiNbO₃

Lithium Niobate is widely used as frequency doublers for wavelength over 1 micron and optical parametric oscillators (OPOs) pumped at 1064 nm as well as quasi-phase-matched (QPM) devices. LiNbO₃ is also one of the most attractive materials for optoelectronics. A great variety of devices has been developed based upon this material. Typically, Czochralsky grown and poled along Z-axis boules are used with sizes up to 80 mm in dia. and 100 mm in length. Other boules orientations can be applied for some purposes (SAW substrates, piezotransducers).

Transparency range, nm	350-5500nm
Length tolerance, mm	+0/-0.1
Aperture tolerances, mm	+0/-0.1
Orientation accuracy of cut angle	<30 arcmin
Surface quality, scratch/dig	10/5
Surface Flatness	L/8 @ 633 nm
Parallelism error	<20 arcsec
Perpendicularity	<5 arcmin
Optical damage threshold	>250MW/cm ² for 10 ns pulses @ 1064 nm

*LiNbO₃ crystals with gold electrodes for electro-optic modulators available
 Fe, Zn, Gd, Cu, Y, B, Er doped LiNbO₃ crystals available
 Various dielectric coatings are available.*



Good UV transmission
High optical damage threshold
High birefringence
High nonlinear coefficients

Non-Linear Optical Crystals KDP, DKDP

Nonlinear single crystals KDP and DKDP are widely used as the second, third and fourth harmonic generators for Nd:YAG and Nd:YLF lasers.

Crystals are also widely used for electro-optical applications as Q-switches for Nd:YAG, Nd:YLF, Ti:Sapphire and Alexandrite lasers, as well as for Pockels cells. The most commonly used electro-optical crystal is DKDP with a deuteration more than 98%. These crystals are grown by a water-solution method and can be grown up to very large sizes. Therefore, they are as low-cost and large-size finished non-linear components available.

For frequency-doubling (SHG) and -tripling (THG) of Nd:YAG laser at 1064 nm, both type I and type II phase-matchings can be employed for Nonlinear single crystals KDP and DKDP. For frequency - quadrupling (4HG, output at 266 nm) of Nd:YAG laser KDP crystal is normally recommended.

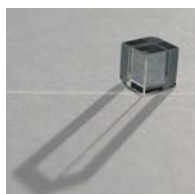
Transparency range, nm	160-2800nm
Length tolerance, mm	+0/-0.1
Aperture tolerances, mm	+0/-0.1
Orientation accuracy of cut angle	<30 arcmin
Surface quality, scratch/dig	40/20
Surface Flatness	L/4 @ 633 nm
Parallelism error	<20 arcsec
Perpendicularity	<5 arcmin
Optical damage threshold	>10 GW/cm ² (for KDP) and >0.5 GW/cm ² (for DKDP) for 10 ns pulses @ 1064 nm

Crystal	Aperture x length, mm *	Orientation θ/ϕ , deg	AR coatings S1/S2, nm/nm**	Comments	Price
KDP	12x12x5	76.5/45	532+266/ 532+266	SHG@532nm, Type I	315 €
KDP	15x15x7	76.5/45	532+266/ 532+266	SHG@532nm, Type I	393 €
DKDP	12x12x20	53.5/0	1064/1064+532	SHG@1064 nm, Type II	440 €
DKDP	12x12x20	59.3/0	1064+532/355	THG@1064 nm, Type II	440 €
DKDP	15x15x13	53.5/0	1064+532/1064+532	SHG@1064 nm, Type II	450 €
DKDP	15x15x13	36.5/45	1064+532/1064+532	SHG@1064 nm, Type I	450 €
DKDP	15x15x20	53.5/0	1064/1064+532	SHG@1064 nm, Type II	548 €
DKDP	15x15x20	59.3/0	1064+532/355	THG@1064 nm, Type II	548 €

*Other sizes are available on request.

**Various dielectric coatings are available.

Custom design production is also available.



Broad transparency range from 160 nm to 2600 nm
 Relatively large effective SHG coefficient
 (about three times that of KDP)
 High damage threshold
 (18.9 GW/cm² for a 1.3 ns laser at 1053nm)
 Wide acceptance angle and small walk-off
 Type I and Type II non-critical phase matching in a
 wide wavelength range

Non-Linear Optical Crystal LBO

LBO's high damage threshold, wide acceptance angle, good thermal stability and wide transmission range make it ideal for frequency doubling of high power lasers.

It is unique in many aspects, especially its wide transparency range, moderately high non-linear coupling, high damage threshold and good chemical and mechanical properties. Its transmission range is from 0.16µm to 2.6µm. LBO allows temperature-controllable non-critical phase-matching (NCPM) for 1.0-1.3µm, Type I SHG, and also provides room temperature NCPM for Type II SHG at 0.8-1.1µm. It possesses a relatively large angular acceptance bandwidth, reducing the beam quality requirements for source lasers.

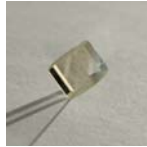
Transparency range, nm	160-2800nm
Length tolerance, mm	+0/-0.1
Aperture tolerances, mm	+0/-0.1
Orientation accuracy of cut angle	<30 arcmin
Surface quality, scratch/dig	10/5
Surface Flatness	L/8 @ 633 nm
Parallelism error	<20 arcsec
Perpendicularity	<5 arcmin
Optical damage threshold	>10GW/cm ² for 10 ns pulses @ 1064 nm

Aperture, mm*	Length, mm*	Orientation θ/φ, deg	AR coatings S1/S2, nm/nm**	Application	Price
3x3	10	42.2/90	1064+532/355	THG@1064, Type II (e-oe)	305 €
	10	90/11.6	1064+532/1064+532	SHG@1064 Type I (e-oo)	305 €
	15	42.2/90	1064+532/355	THG@1064 Type II (e-oe)	388 €
	15	90/11.6	1064+532/1064+532	SHG@1064 Type I (e-oo)	388 €
	15	90/0	1064+532/1064+532	SHG@1064 NCPM I Type	388 €
	20	90/0	1064+532/1064+532	SHG@1064 NCPM I Type	471 €
5x5	15	42.2/90	1064+532/355	THG@1064 Type II (e-oe)	846 €
	15	90/11.6	1064+532/1064+532	SHG@1064 Type I (e-oo)	846 €

*Other sizes are available on request.

**Various dielectric coatings are available.

Custom design production is also available



Low absorption and scattering
 Low wavefront distortion
 High Figure of merit for non-linear interactions
 Excellent crystal for three-wave interactions
 Ultrashort pulse generation in mid IR range

Non-Linear Optical Crystals AgGaS₂, AgGaSe₂

AgGaS₂ crystal is transparent from 0.53 to 12 μm. Although its nonlinear optical coefficient is the lowest among the above mentioned infrared crystals, high short wavelength transparency edging at 550 nm is made use of in OPOs pumped by Nd:YAG laser; in numerous difference frequency mixing experiments with diode, Ti:Sapphire, Nd:YAG and IR dye lasers covering 3–12 μm range; in direct infrared countermeasure systems, and for SHG of CO₂ laser. Thin AgGaS₂ (AGS) crystal plates are popular for ultrashort pulse generation in mid IR range by difference frequency generation employing NIR wavelength pulses.

AgGaSe₂ crystal has band edges at 0.73 and 18 μm. Its useful transmission range within 0.9–16 μm and wide phase matching capability provide excellent potential for OPO applications when pumped by a variety of currently available lasers. Tuning within 2.5–12 μm has been obtained when pumping by Ho:YLF laser at 2.05 μm; as well as non-critical phase matching (NCPM) operation within 1.9–5.5 μm when pumping at 1.4–1.55 μm. AgGaSe₂ has been demonstrated to be an efficient frequency doubling crystal for infrared CO₂ lasers radiation.

Crystal	AgGaS ₂	AgGaSe ₂
Transparency range, μm	0.53-12	0.9-16
Length tolerance, mm	+0/-0.1	
Aperture tolerance, mm	+0/-0.1	
Orientation accuracy of cut angle	<30 arcmin	
Surface quality, scratch/dig	20/10	
Surface Flatness	λ/4 @ 633 nm	
Parallelism error	<30 arcsec	
Perpendicularity	<5 arcmin	
Optical damage threshold	>350 MW/cm ² for 10 ns pulses @ 1064 nm	

Custom design and various dielectric coatings are available.