

LBO Crystal

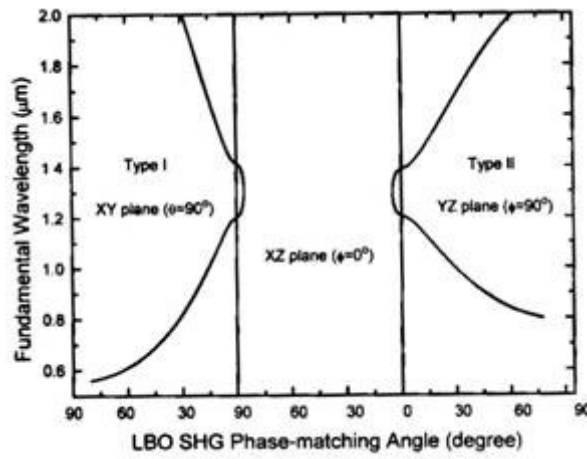
LBO(LiB_3O_5) is another excellent nonlinear crystal of Borate-family following BBO crystal. LBO has a broad transmission range from DUV to mid infrared, higher damage threshold than any other NLO crystals and is capable of noncritical phase matching (NCPM) in the near IR region, making it the material of choice for high power, high efficiency second harmonic generation (SHG) and optical parametric processes (OPO/OPA). LBO crystals are often mounted in temperature controlled ovens either for NCPM SHG or tunable OPO/OPA applications.



LBO Features

- Broad transparency range from 160-2600nm
- High optical homogeneity ($1.0\text{E}-6/\text{cm}$) and being free of inclusion;
- Medium effective SHG coefficient (about three times that of KDP)
- High damage threshold
- Wide acceptance angle and small walk-off
- Type I and type II non-critical phase matching (NCPM)
- Spectral NCPM near 1300nm

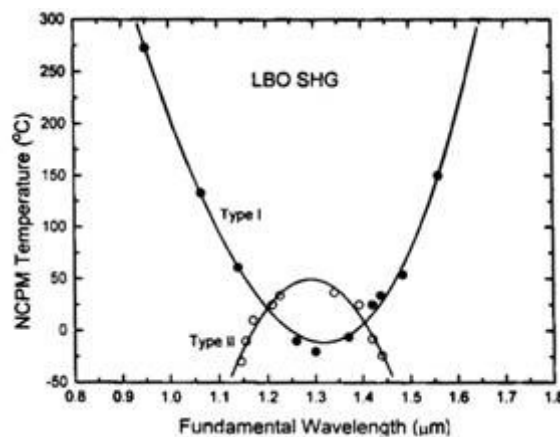
LBO SHG, THG of Nd:Lasers



LBO is phase matchable for the SHG and THG of Nd:YAG and Nd:YLF lasers, using either type I or type II interaction. For the SHG at room temperature, type I phase matching LBO can be reached and has the maximum effective SHG coefficient in the principal XY and XZ planes in a wide wavelength range from 551nm to about 2600nm. LBO optimum type II phase matching falls in principal YZ and XZ planes.

SHG conversion efficiencies of more than 70% for pulse and 30% for cw Nd:YAG lasers, and THG conversion efficiency over 60% for pulse Nd:YAG laser have been observed by using LBO crystal.

LBO's Non-Critical Phase-Matching



Properties of type I NCPM SHG@1064nm:

NCPM Temperature: 148°C

Acceptance Angle: 52 mrad-cm^{1/2}

Walk-off Angle: 0

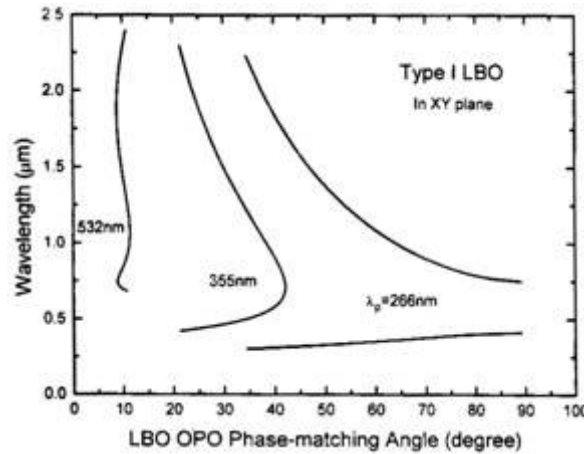
Temperature Bandwidth: 4°C-cm

Efficient SHG Coefficient: 6.1 d/deg (KDP)

As shown above, Non-Critical Phase-Matching (NCPM) of LBO is featured by no walk-off, very wide acceptance angle and maximum effective coefficient. It promotes LBO to work in its optimal condition. LBO SHG conversion efficiencies of more than 70% for pulse and 30% for cw Nd:YAG lasers have been obtained, with good output stability and beam quality.

Oven & Temperature Controller for LBO NCPM, OPO/OPA applications are available from OptoCity.

LBO's OPO and OPA



LBO is an excellent NLO crystal for OPOs and OPAs with a widely tunable wavelength range and high powers. LBO OPO and OPA that are pumped by the SHG and THG of Nd:YAG laser and XeCl excimer laser at 308nm have been reported. The unique properties of type I and type II phase matching as well as the NCPM leave a big room in the research and applications of LBO's OPO and OPA.

LBO's Spectral NCPM

Not only the ordinary non-critical phase matching (NCPM) for angular variation but also the noncritical phase matching for spectral variation (SNCPM) can be achieved in the LBO crystal. The phase matching retracing positions are 1.31μm with $\theta=86.4^\circ$, $\phi_i=0^\circ$ for Type I and 1.20μm with $\theta=4.8^\circ$, $\phi_i=0^\circ$ for Type II. The phase

Type I and 1.30 μ m with $n_1 - n_2 = 4.3 \times 10^{-5}$ for Type II. The phase matching at these positions possess very large spectral acceptances. The calculated spectral acceptances at 1.31 μ m and 1.30 μ m are 57nm-cm^{-1/2} and 74nm-cm^{-1/2} respectively, which are much larger than that of other NLO crystals. These spectral characteristics are very suitable for doubling broadband coherent radiations near 1.3 μ m, such as those from some diode lasers, and some OPA/OPO output without linewidth-narrowing components.

LBO Crystal Properties

Crystal Structure: Orthorhombic Space group Pna21, Point group mm2

Lattice Parameter: a=8.4473Å, b=7.3788Å, c=5.1395Å, Z=2

Melting Point : About 834 °C

Mohs Hardness: 6

Density: 2.47 g/cm³

Thermal Conductivity: 3.5W/m/K

Thermal Expansion Coefficient:

$\alpha(x) = 10.8 \times 10^{-5}/K$, $\alpha(y) = -8.8 \times 10^{-5}/K$, $\alpha(z) = 3.4 \times 10^{-5}/K$

Transparency Range: 160-2600nm

SHG Phase Matchable, Type I: 551 ~ 2600nm, Type II: 790-2150nm

Therm-optic Coefficient: $dn_x/dT = -9.3 \times 10^{-6}/^{\circ}C$

$dn_y/dT = -13.6 \times 10^{-6}/^{\circ}C$, $dn_z/dT = (-6.3 - 2.1) \times 10^{-6}/^{\circ}C$

Absorption Coefficient: <0.1%/cm @1064nm, <0.3%/cm @532nm

NLO Coefficients: $d_{31} = 1.05 \text{ pm/V}$, $d_{32} = -0.98 \text{ pm/V}$, $d_{33} = 0.05 \text{ pm/V}$

Sellmeier Equations (λ in μm)

$N_x^2 = 2.454140 + 0.011249/(\lambda^2 - 0.011350) - 0.014591\lambda^2 - 0.000066\lambda^4$

$N_y^2 = 2.539070 + 0.012711/(\lambda^2 - 0.012523) - 0.018540\lambda^2 + 0.00020\lambda^4$

$N_z^2 = 2.586179 + 0.013099/(\lambda^2 - 0.011893) - 0.017968\lambda^2 - 0.000226\lambda^4$

LBO Crystal Specification

Dimension Tolerance: $\pm 0/-0.1 \text{ mm (WxH)}$, $\pm 0.1 \text{ mm thickness}$

Surface Quality: 10-5 Scratch-dig

Flatness: $<\lambda/8$ @633nm

Chamfer: 0.1mm@45deg.

Clear Aperture: Central 90% of Diameter

Parallelism: <20 arc seconds

Perpendicular: <20 arc minutes

Orientation Angle: ± 0.25 deg.

Damage Threshold: $18.9\text{GW}/\text{cm}^2$ @1064nm 1 ns (polished only)

Coating: Dual Band AR coating: $R < 0.2\%$ @ ω & $R < 0.5\%$ @ 2ω

Coating Damage Threshold: $5\text{GW}/\text{cm}^2$ @1064nm 1 ns

Broad Band AR-coating is also available for LBO crystal

i.

1. NCPM LBO Crystal

LBO 3x3x10mm Type I NCPM SHG@1030-1064nm AR/AR

LBO 3x3x15mm Type I NCPM SHG@1030-1064nm AR/AR

LBO 3x3x20mm Type I NCPM SHG@1030-1064nm AR/AR

LBO 4x4x25mm Type I NCPM SHG@1030-1064nm AR/AR

LBO 4x4x20mm Type I NCPM OPO 532nm→700-900nm
AR/AR (Temperature Tuned)

LBO 6x3x25mm Type I NCPM OPO 532nm→700-900nm
Brewster Angle (Temperature Tuned)

Additional message: *qty. other size, holder...*

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ii.

2. CPM LBO Crystal

- LBO 4x4x20mm Type I SHG@946nm AR/AR

- LBO 4x4x20mm Type I SHG@1030-1064nm AR/AR

- LBO 4x4x20mm Type I SHG@1300nm AR/AR

- LBO 4x4x20mm Type I SHG@1550nm AR/AR

- LBO 4x4x20mm Type II THG@1064+532nm AR/AR

Additional message: *qty. other size, holder...*

Add To Cart for Quote

iii.

3. Thin LBO Crystal

- | | |
|--|-----------------|
| <input type="checkbox"/> LBO 10x10x2mm SHG@800nm AR/AR | \$499.00 |
| <input type="checkbox"/> LBO 10x10x1mm SHG@800nm AR/AR | \$499.00 |
| <input type="checkbox"/> LBO 10x10x0.5mm SHG@800nm AR/AR | \$499.00 |
| <input type="checkbox"/> LBO 10x10x0.3mm SHG@800nm AR/AR | Price |
| <input type="checkbox"/> LBO 10x10x0.1mm SHG@800nm AR/AR | Price |

Additional message: *qty. other size, holder...*

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iv.

LBO Crystal Inquiry

Your E-mail:

Subject:

Message with contact information:

Enter webcode: 0 9 3 3

- Thank you! We'll
reply very soon.

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