BIBO (BiB3O6) Nonlinear Crystal for Blue and Green SHG, 286–2500 nm

Model WQ-NLC-BIBO · waveqvanta.com/products/bibo-bismuth-triborate-crystal

Bismuth triborate (BiB3O6, BIBO) is a monoclinic nonlinear crystal. Its nonlinear coefficient is about 3.5–4 times that of LBO and 1.5–2 times that of BBO, and it is not affected by moisture. BIBO transmits from 286 nm to 2500 nm and is mainly used for frequency doubling of Nd lasers at 1064 nm, 946 nm and 914 nm, of 780 nm sources to 390 nm, and in OPOs and OPAs.



Key features

- Transparency range 286–2500 nm
- Nonlinear coefficient about 3.5–4 times that of LBO and 1.5–2 times that of BBO
- Effective SHG coefficient about 9 times that of KDP
- deff = 3.0 ± 0.1 pm/V for 1064 nm SHG
- Not hygroscopic (inert to moisture)
- Absorption below 0.1%/cm at 1064 nm
- Damage threshold above 0.3 GW/cm^2 at 1064 nm, 10 ns, 10 Hz

Specifications

Chemical Formula	BiB3O6
Crystal Structure	Monoclinic, point group 2
Lattice Parameters	a = 7.116 Å, b = 4.993 Å, c = 6.508 Å, β = 105.62°, Z = 2
Melting Point	726 °C
Mohs Hardness	5–5.5
Density	5.033 g/cm^3
Thermal Expansion Coefficients	αa = 4.8 × 10^{-5} /K, αb = 4.4 × 10^{-6} /K, αc = −2.69 × 10^{-5} /K
Hygroscopic Susceptibility	None (inert to moisture)
Transparency Range	286–2500 nm
Absorption Coefficient	< 0.1%/cm at 1064 nm
Physical Axes	X ∥ b, (Z, a) = 31.6°, (Y, c) = 47.2°
Phase-Matching Angle (1064 nm SHG)	168.9° from Z axis in the YZ plane
Effective Nonlinear Coefficient (1064 nm SHG)	deff = 3.0 ± 0.1 pm/V
Angular Acceptance (1064 nm SHG)	2.32 mrad·cm
Walk-off Angle (1064 nm SHG)	25.6 mrad
Temperature Acceptance (1064 nm SHG)	2.17 °C·cm
Dimension Tolerance	(W ± 0.1 mm) × (H ± 0.1 mm) × (L +0.5/−0.1 mm) for L ≥ 2.5 mm; (W ± 0.1 mm) × (H ± 0.1 mm) × (L ± 0.1 mm) for L < 2.5 mm
Clear Aperture	Central 90% of the diameter
Flatness	< λ/8 @ 633 nm
Transmitted Wavefront Distortion	< λ/8 @ 633 nm
Scratch/Dig	10/5 per MIL-PRF-13830B
Parallelism	Better than 20 arcsec

Perpendicularity	≤ 5 arcmin
Chamfer / Chip	≤ 0.2 mm × 45° / ≤ 0.1 mm
Angle Tolerance	Δθ ≤ 0.25°, Δφ ≤ 0.25°
Damage Threshold	> 0.3 GW/cm^2 at 1064 nm, TEM00, 10 ns, 10 Hz

Standard sizes

Size	Cut / orientation	Surface / coating	Mount
5 × 5 × 1.5 mm	θ = 149.8°, φ = 90°	Blank	—
5 × 5 × 0.5 mm	θ = 154°, φ = 90°	Polished, uncoated	—
5 × 5 × 0.5 mm	θ = 143.7°, φ = 90°	S1: P-coated @ 1030 + 515 nm; S2: P-coated @ 343 nm	Mounted
5 × 5 × 0.5 mm	θ = 143.7°, φ = 90°	S1: P-coated @ 1030 + 515 nm; S2: P-coated @ 343 nm	—
5 × 5 × 3 mm	θ = 42°, φ = 0°	S1/S2: P-coated, minimum reflection over 750–2700 nm	—
5 × 3 × 2 mm	θ = 42°, φ = 0°	S1/S2: P-coated, minimum reflection over 750–2700 nm	—

Typical applications

- SHG of medium- and high-power Nd lasers at 1064 nm
- SHG of Nd lasers at 914 nm and 946 nm for blue output (e.g. 473 nm)
- Frequency conversion of 1319 nm and 1342 nm Nd lasers for red and blue output
- Frequency doubling of 780 nm lasers to 390 nm
- Optical parametric oscillators (OPO) and amplifiers (OPA)