

BIBO

BIBO (BiB_3O_6) is a newly developed nonlinear optical (NLO) crystal, which has excellent characteristics for nonlinear optical applications. BIBO has a broad transparency range, from 286nm to 2500nm, a high optical homogeneity ($\delta n \approx 10^{-6} \text{cm}$) and is free of inclusions. BIBO's effective SHG coefficient is about 9 times that of KTP. In addition, BIBO has a high damage threshold, wide temperature bandwidth and inertness with respect to moisture.



Structural and Physical Properties

Crystal Structure	Monoclinic, point group 2
Lattice Parameters	$a = 7.116 \text{ \AA}$, $b = 4.993 \text{ \AA}$, $c = 6.508 \text{ \AA}$ $Z = 105.62^\circ$
Melting Point (Congruent)	726 °C
Hardness	5 - 5.5 Mohs
Specific Heat	0.5 J/g K at 330 K
Thermal Expansion	[X] $48 \times 10^{-6}/\text{K}$, [Y] $4.4 \times 10^{-6}/\text{K}$, [Z] $-26.9 \times 10^{-6}/\text{K}$
Density	5.033 g/cm ³
Long Term Stability	Insensitive to moisture

Optical Properties

Transmission range		286 - 2500 nm		
NLO coefficients:		$d_{12} = d_{14} = 2.3$, $d_{25} = d_{36} = 2.4$, $d_{11} = 2.53$, $d_{13} = -1.3$, $d_{35} = -0.9$, $d_{26} = 2.8 \text{ pm/V}$		
Refractive Indices	539.75 nm	$n_1 = 1.9620$	$n_2 = 1.7874$	$n_3 = 1.8190$
	1079.5 nm	$n_1 = 1.9166$	$n_2 = 1.7569$	$n_3 = 1.7835$
Sellmeier coefficients		$n^2(\lambda_i) = A + B / (\lambda_i^2 - C) - D \lambda_i^2$		
	A	B	C	D
n_1	3.6545(4)	0.0511(2)	0.0371(3)	0.0226(1)
n_2	3.0740(3)	0.0323(1)	0.0316(3)	0.01337(6)
n_3	3.1685(3)	0.0373(1)	0.0346(3)	0.01750(8)

Nonlinear Optical Properties Comparisons (SHG at 946nm)

Crystals	Length	D_{eff}	Walk-off	Output Power	Conv. Eff.
BIBO	10.4 mm	3.30 pm/V	40.7 mrad	2.80 W	63%
LBO	10.0 mm	0.81 pm/V	11.3 mrad	1.52 W	33%
BBO	8.0 mm	2.00 pm/V	60.3 mrad	2.10 W	47%

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BIBO Applications

- SHG and THG of middle and high power Nd doped lasers at 1064nm.
- SHG of high power Nd doped lasers at 1342nm and 1319nm for red laser, and THG for blue laser.
- SHG of the Nd doped lasers at 914nm and 946nm for blue laser.
- Non-critical phase matched SHG generation over a broad wavelength range, from 900nm to 1700nm.
- Optical parametric amplifiers (OPA) and oscillators (OPO).

BIBO Specifications

Transmission Wavefront Distortion	$< \lambda/8$ at 633nm
Dimension Tolerance	(W: ± 0.1 mm) x (H: ± 0.1 mm) x (L: $+ 0.2$ mm/- 0.1 mm)
Flatness	$\lambda/8$ at 633 nm
Scratch/Dig code	10/5 to MIL-O-13830A
Parallelism	< 20 arc seconds
Perpendicularity	5 arc minutes
Angle tolerance	$\Delta\theta < \pm 0.3^\circ$, $\Delta\phi < \pm 0.3^\circ$

Standard Products

	Dimensions	Application	Coating	Type
BIBO1305	3 x 3 x 5 mm ³	SHG or THG	AR	I
BIBO1307	3 x 3 x 7 mm ³	SHG or THG	AR	I
BIBO1310	3 x 3 x 10 mm ³	SHG or THG	AR	I
BIBO1410	4 x 4 x 10 mm ³	SHG or THG	AR	I

- Custom high quality BIBO crystals up to 20 x 20 x 40 mm³ are available on request.
- High damage threshold AR-coating is available.
- One-year warranty for all products under proper use.