

Osaka-CLBO™

CsLiB₆O₁₀ (CLBO)

Discovered by Osaka University in 1993

A nonlinear optical crystal Cesium Lithium Borate Crystal CsLiB₆O₁₀ (CLBO) has a wide transparent wavelength region (2.7μm to 180nm) and birefringence suitable for the generation of deep-ultraviolet radiations such as 266nm, 213nm, and 193nm. CLBO has already been put to practical use in several coherent DUV sources for semiconductor inspection applications. Precise processing, such as drilling in printed circuit boards, requires high-average DUV sources operated at a kilohertz repetition rate. Osaka University and SOSHO CHOKO have newly developed high-quality CLBO (Osaka-CLBO™) for high-power DUV users.

Material	CsLiB ₆ O ₁₀
Main Application	266nm DUV light generation
Crystal Angle (deg)	$\theta=61.9\pm 0.25$, $\phi=45\pm 0.5$
Size (mm)	5×5×10, 5×5×15
Size Tolerance	W±0.1 × H±0.1 × L±0.2
Clear Aperture (mm)	Central 80% of the diameter
Transmitted Wavefront, PV (λ)	≤1/8 @λ=633nm
Flatness, PV (λ)	≤1/4 @λ=633nm
Surface Quality	S/D=10/5
Chamfer (mm)	≤0.2mm
Chipping (mm)	≤0.1mm
Other Applications	355nm, 213nm, 193nm UV light generations

SOSHO CHOKO
Osaka-CLBO™

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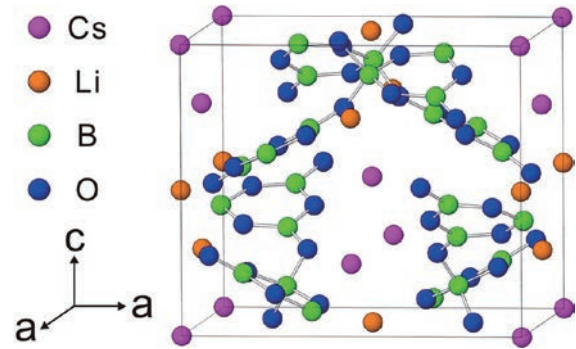
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High-quality CLBO (115 x 71 x 54 mm)



Tetragonal, Point group -42m

$d_{36}(532\text{nm})=0.92\text{pm/V}$, $d_{36}(1064\text{nm})=0.74\text{pm/V}$

J. Opt. Soc. Am. B, Vol.18, p.302 (2001)

Shortest SHG wavelengths: 236.5nm(type1), 318nm(type2)

OSA TOPS ASSL, Vol.26 p.715-719 (1999)

Advantages

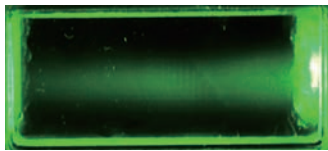
- Large Nonlinearity
- Small Walk-off Angle
- Broad Angular, Spectral and Temperature Acceptance Bandwidths

Suitable for high-power DUV light generation (266nm, 213nm and 193nm DUV light generations have been already achieved)

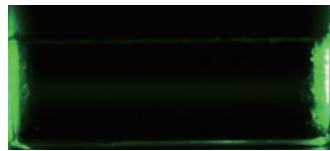
Chen and Sasaki et al., Nonlinear Optical Borate Crystals, Wiley (2012)

New application of 355nm high-power UV light generation
Opt. Express Vol.24, p.30465 (2016)

Observation of light scattering in CLBO



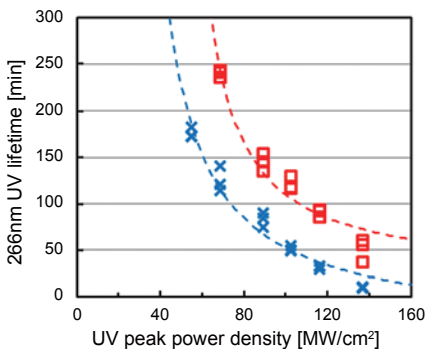
Conventional CLBO



Osaka-CLBO™

Newly developed CLBO by Osaka University

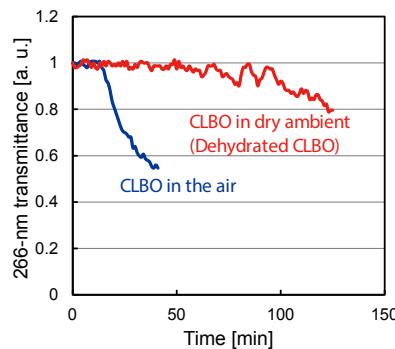
Long lifetime and high laser-induced damage tolerance than conventional CLBO



Opt. Mater. Express Vol.4, p.559 (2014)

- High-quality CLBO
- × Conventional CLBO

Dehydrated CLBO at 150°C has higher laser-induced damage tolerance



Dehydration process of CLBO

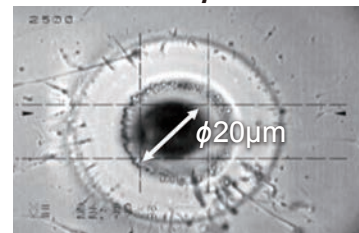
Appl. Opt. Vol.48, p.1658 (2009)

Patents Licensed from Osaka Univ. & Mitsubishi Electric Co.

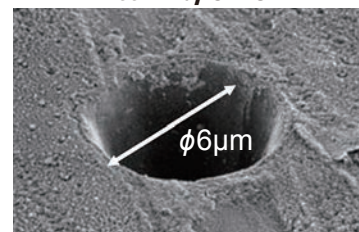
JP : 4911494 US : 7,948,673
CN : ZL200780006027.X TW : I408482

Micro-hole drilling on borosilicate glass substrates by Mitsubishi Electric Co.

355nm by LBO



266nm by CLBO



SOSHO CHOKO

Osaka-CLBO™

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Yusuke MORI Representative Director
Masashi YOSHIMURA Director
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