RAICOL CRYSTALS

SUPER POLISHED!

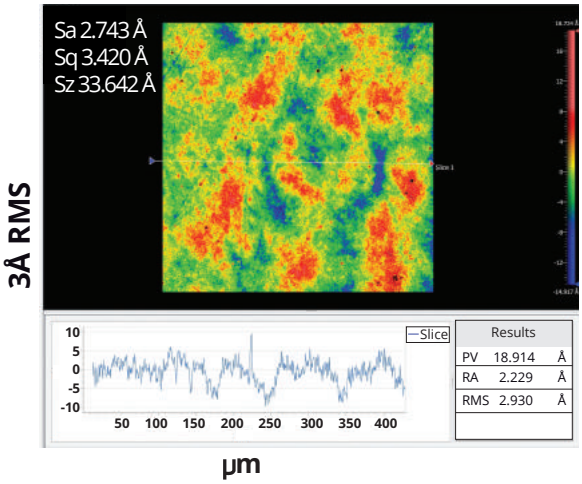
LBO Crystals

LBO (Lithium Triborate LiB_3O_5) is a nonlinear optical crystal ideally suitable for various nonlinear optical applications. LBO crystals combine wide transparency, moderately high nonlinear coupling, high damage threshold and good chemical and mechanical properties.

LBO features

- Wide transparency range (160 nm – 2600 nm)
- Moderately high nonlinear coefficient
- High damage threshold
- Type I and II and non-critical phase matching in a wide wavelength range
- High optical homogeneity
- Wide acceptance angle and small walk-off angle

Roughness measurements by ZYGO Interferometer



Special Advantages of Raicol's Supper Polished LBO

- Super polished elements for excellent surface quality: roughness < 3Å RMS and Scratch/Dig 2/1
- Extremely low bulk absorption: up to 2 ppm/cm at 1064 nm
- Unmatched surface absorption
- Crystal size up to 100x100 mm^2
- Maximum length of 80 mm
- High damage threshold – higher than standard
- Ultra-high optical homogeneity
- Advanced quality control
- Automated work process to ensure high repeatability

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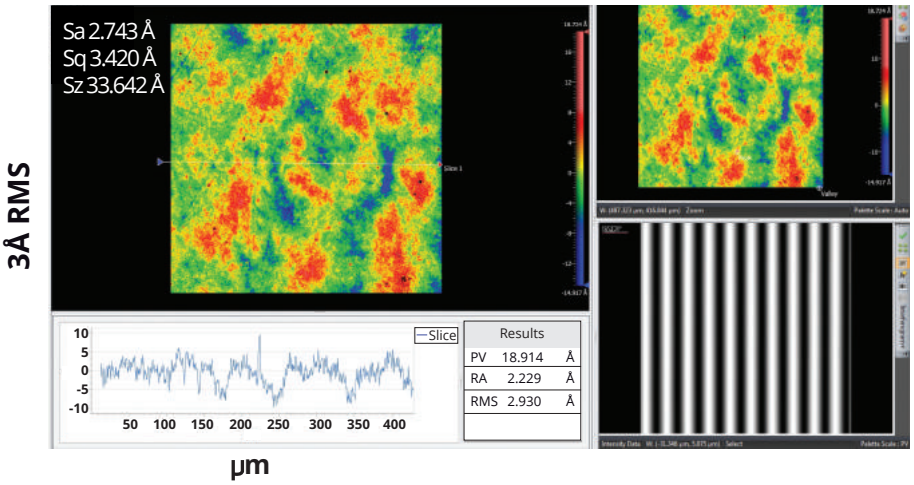
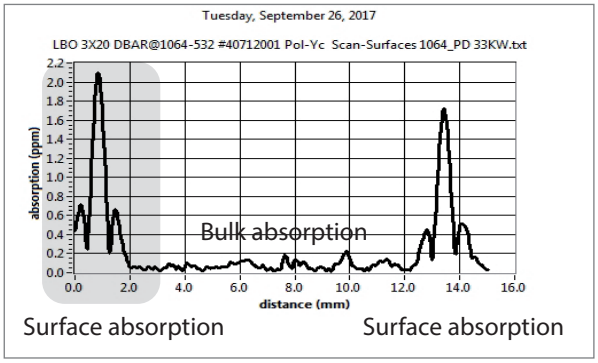


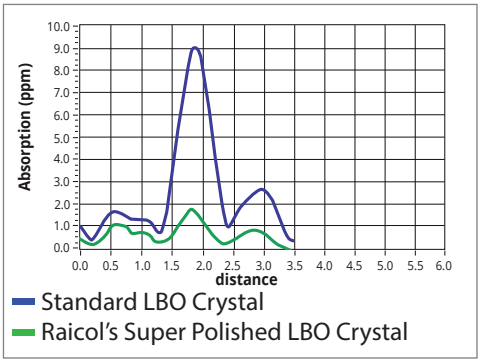
* Roughness measurements by ZYGO Interferometer.
* The standard roughness of Riacol's LBO is **3Å RMS**, compared to the industry's standard 9-10Å RMS LBO roughness.

Unmatched surface absorption

Raicol has developed the Super Polished LBO to minimize roughness which lowers surface absorption.



* A screen shot of actual bulk absorption test.
* Surface Absorption Graph for Uncoated Standard LBO @ 532 nm.
* **Over 70% of total LBO crystal absorption occurs on the surfce of the crystal.**



* Comparison of surface absorption performed @ 532 nm on LBO crystal AR coated @1064/532 nm.
* **Super polished LBO by Raicol (3Å as a standard) reduces surface absorption by 80%!**

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Special Advantages of Raicol's Super Polished LBO

Extremely low bulk absorption

Bulk absorption will affect the long-term deterioration of the crystal - a critical factor in determining the crystal's life expectancy.

Results of 3 photon absorption tests by IPHT (355/1070):

Sample	Absorption coefficient at 1070nm (ppm/cm)
Raicol 1	(14.9 ± 1.5)
Raicol 2	(15.0 ± 1.5)
Ref. 3	(106.5 ± 10)
Ref. 4	(110.4 ± 10)

Sample	Absorption coefficient at 355nm – low intensity (ppm/cm)
Raicol 1	(5.5 ± 1.25)
Raicol 2	(5.0 ± 1)
Ref. 3	(4470 ± 355)
Ref. 4	(4291 ± 355)

* Samples 1+2 are super polished Raicol LBO crystals.
* Samples 3+4 are reference LBO crystals from other suppliers.
* The 3 photon absorption tests by IPHT were conducted by Jenna University.

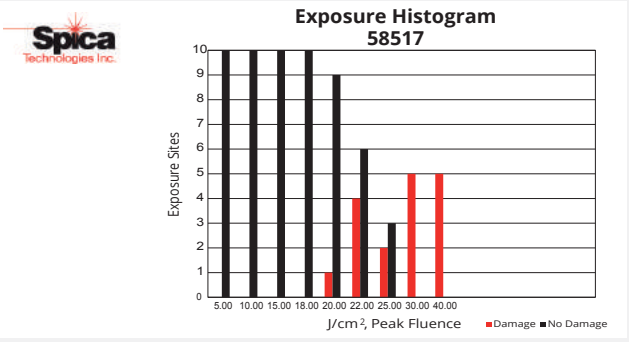
Higher Damage Threshold -

Test Results of independent measurements of SPICA and Lumibird:

"Raicol's Super Polished LBO crystals show extremely high LIDT @ 355 nm and 532 nm."

SPICA test results:

LBO testing results @ 355 nm:
* Laser damage threshold measured as **18.00 J/cm²**, peak fluence.
* Part irradiated at **18.00 J/cm²** with no damage in 10 sites.



Lumibird test results:

LBO Testing Results @ 532 nm:
* Root T scaled: 17 J/cm² @ 8 ns is equivalent to **19 J/cm²** @ 10 ns.
* Root T scaled: 2124.41 MW/cm² @ 8 ns is equivalent to **1900.13 MW/cm²** @ 10 ns.

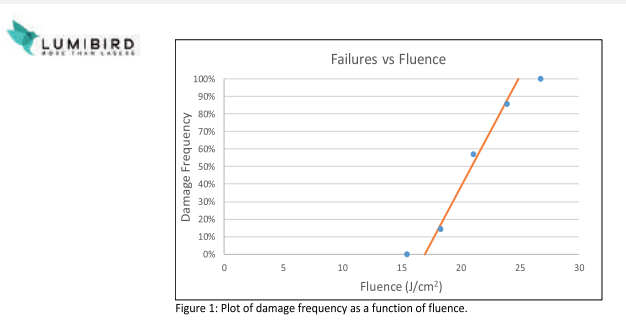


Figure 1: Plot of damage frequency as a function of fluence.

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Typical Specifications

Apertures	up to 100 x 100 mm^2
Length	up to 80 mm along X axis
Flatness	Up to λ/10 @ 633 nm
Roughness	<3Å RMS
Parallelism	Up to 5 arc sec.
Perpendicularity	Up to 5 arc min.
Scratch/Dig	2/1 up to 0/0 per custom demand
AR Coatings	Dual band R < 0.1%
Absorption Coefficient	Bulk (1064 nm) < 2-4 ppm/cm Surface (1064 nm) < 1-2 ppm Bulk (532 nm) < 8 ppm/cm Surface (532 nm) < 1-2 ppm
Wavefront Distortion Control	λ/8 @ 633 nm
Guaranteed Damage Threshold	1800 MW/cm^2 @ 1064 nm 1200 MW/cm^2 @ 532 nm 1000 MW/cm^2 @ 355 nm For 10 ns pulses @ 10 Hz

Raicol Crystals, founded in 1995, is a global leader in nonlinear and EO crystals growth, fabrication and assembly. Raicol offers a unique set of benefits to its customers:

- 50 years of crystal growth experience
- The global pioneers of RTP, HGTR KTP and PPKTP crystals and assembly
- One-stop shop, from crystal growth through coating to EO Cell assembly
- Mass-production capabilities as well as small R&D quantities
- Fast delivery time
- Unmatched crystal quality

Hamelacha 22, Rosh HaAyin, Israel | T:+972-3-7294472 | F:+972-3-9388294 | info@raicol.com
www.raicol.com