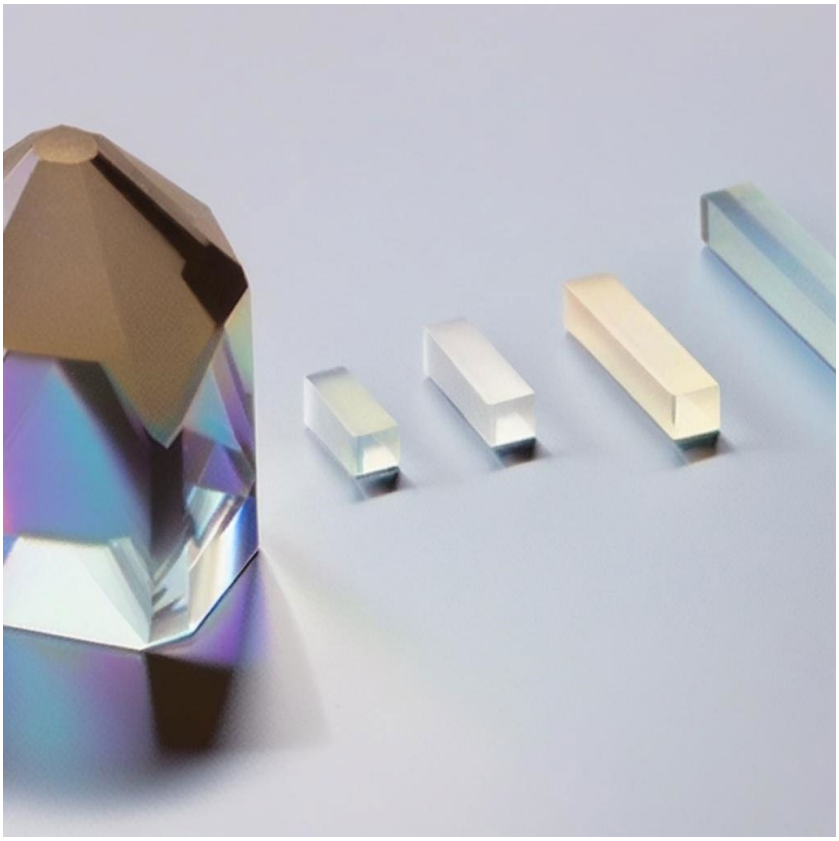
Photonics On Crystals

POC-OC-122515-$LiNbO_3$ Crystal Datasheet

1 Main Features

- Exceptional electro-optical and nonlinear optical properties.
- High-quality material for Q-switching, doubling frequencies, and parametric oscillation.
- Transmission range from 0.4 µm to 5.5 µm.
- Custom doping options, including MgO doping, for enhanced damage thresholds.
- Available in dimensions up to 60 mm × 60 mm.



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2. Material General Description

Lithium Niobate ($LiNbO_3$) is a widely used electro-optic, piezoelectric, and nonlinear optical material. Known for its superior electro-optic and nonlinear optical coefficients, $LiNbO_3$ is utilized in laser technology for Q-switching, frequency doubling, and parametric oscillators. With its broad transparency range and strong piezoelectric response, this material is highly suitable for advanced photonic applications.

POC offers MgO-doped $LiNbO_3$ crystals with up to 5% doping concentration. MgO doping improves optical damage resistance and optimizes the electro-optic properties, enabling the crystal to handle higher laser powers without performance degradation.

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3. General Applications and Examples

$LiNbO_3$ crystals are versatile materials with widespread use in the photonics industry:

1. **Q-Switching:** Essential for controlling high-power laser output in Nd:YAG and Nd:YLF lasers. $LiNbO_3$'s electro-optic properties enable precise modulation of light pulses.
2. **Frequency Doubling:** Used to convert fundamental laser frequencies into harmonics, extending the laser's range into the visible and UV spectrum.
3. **Optical Parametric Oscillators (OPOs):** Generate tunable coherent light by exploiting nonlinear optical phenomena in $LiNbO_3$.
4. **Terahertz Radiation Generation:** Serves as a source for terahertz waves in imaging and sensing applications, including time-domain spectroscopy.
5. **Laser Technology Enhancements:** Utilized in high-precision laser cutting, welding, and marking applications due to its optical efficiency and damage resistance.

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4. Chemical, Physical, and Structural Properties

Property	Value
Crystal Structure	Trigonal System
Mohs Hardness	5.0–5.5
Density	4.628 g/cm³
Transparency Range	0.4 µm–5.5 µm
Refractive Index (at 632.8 nm)	no = 2.286, ne = 2.203
Doping Option	Up to 5% MgO

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5. Optical, Laser, and Nonlinear Optical Properties

Nonlinear Optical Coefficients	Value
d31 (1.06 µm)	2.1 ± 0.21 pm/V
d32 (1.06 µm)	4.35 ± 0.44 pm/V
d33 (1.06 µm)	27.2 ± 2.7 pm/V

Electro-Optic Coefficients	Value
γ13	8.6 pm/V
γ22	3.4 pm/V
γ33	30.8 pm/V

γ51	28.0 pm/V

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6. Spectrum Transmission Curve

(Specific curve not available. Transmission is uniform between 0.4 µm and 5.5 µm. For detailed graphs, contact POC for customized analysis.)

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7. Coating Specification

- POC provides anti-reflection (AR) coatings on request to enhance optical performance.
- Options include standard broadband AR coatings optimized for specific wavelengths.

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8. Standard Fabrication Specifications

Specification	Value
Max Dimension	Up to 60 mm × 60 mm
Surface Flatness	λ/8 @ 632.8 nm
Parallelism Error	< 30 arc seconds
Perpendicularity Error	< 0.2°
Surface Quality	40-20 S-D

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9. POC Strength and Capabilities

POC specializes in providing tailored solutions for advanced photonics materials. With state-of-the-art facilities, POC offers:

- Custom crystal dimensions and doping configurations.
- Precision polishing and coating for enhanced performance.
- Industry-leading expertise in electro-optic and nonlinear optical materials.

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10. Standard Products

Dimension (mm)	Doping	Surface Finish	Price (USD)
10 × 10 × 1.0	MgO: 5%	Uncoated	Request
20 × 20 × 2.0	MgO: 5%	AR Coated	Request
Custom	On Demand	On Demand	Request

Customization is available for various dimensions, surface treatments, and coatings. Contact POC for inquiries.