

# Iron Doped Lithium Niobate

## Product Description

Deltronic Crystal's Iron-Doped Lithium Niobate is one of the most preferred photorefractive materials due to its superior photorefractive properties.

Iron-Doped Lithium Niobate is a ferroelectric crystal with the paraelectric to ferroelectric phase transition around 1143 C°. Boules are electrically poled along the Z-axis to align antiparallel domains of the spontaneous polarization.

Deltronic Crystal regularly grows large diameter boules of iron-doped lithium niobate for photorefractive applications. Lithium niobate is chemically stable at room temperature and is generally non-reactive to most solvents.

## Applications

- Astronomical Filters
- Spectroscopic Filters
- Holographic Applications
- Holographic Data Storage
- Wavelength Division Multiplexing

## Features

- Strong Photovoltaic Effects
- High Electro-optic Coefficients
- High Photorefractive Sensitivity
- High Diffraction Efficiency
- Grown by Czochralski Method

Figure 1. Holographic Optical Filter

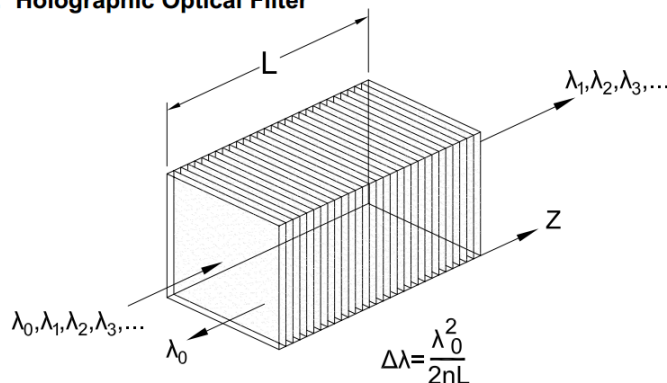
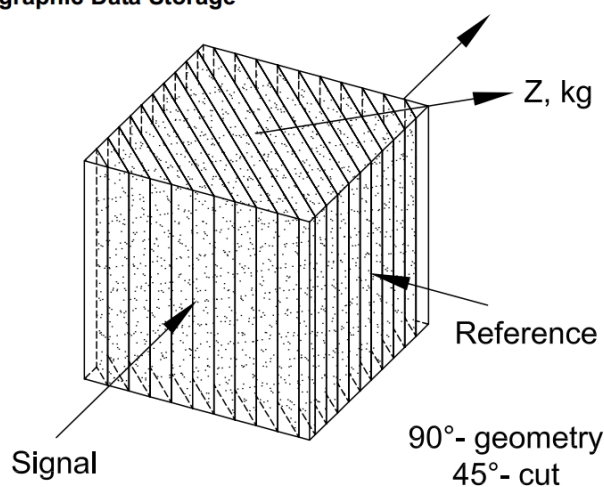


Figure 2. Holographic Data Storage



Property at 25°C	Value
Empirical Formula	LiNbO <sub>3</sub> :Fe
Congruent Melt Composition	48.6 mole % Li <sub>2</sub> O
Congruent Melting Point (°C)	1253
Crystal Structure	trigonal
Space Group	R3c
Bandgap (eV)	3.7
Point Group	3m
Curie Temperature (°C)	1143
Density (g-cm <sup>-3</sup> )	4.612
Hardness (moh)	5
Thermal Expansion Coefficient (°C <sup>-1</sup> )	a = 16.7x10 <sup>-6</sup> c = 2.0 x 10 <sup>-6</sup>
Resistivity (ohm-cm)	> 1014 at 200°C
Lattice Constant (Å)	a = 5.1508 (hex) c = 13.864 (hex)
Spontaneous Polarization (Coul/m <sup>2</sup> )	0.71
Dielectric Constants	ǫ <sub>33</sub> <sup>s</sup> = 29 ǫ <sub>11</sub> <sup>s</sup> = 44 ǫ <sub>33</sub> <sup>s</sup> = 30 ǫ <sub>11</sub> <sup>T</sup> = 84
Refractive index, 514.5nm	n <sub>o</sub> = 2.2029, n <sub>e</sub> = 2.1476
Refractive Index, 633nm	n <sub>o</sub> = 2.2884, n <sub>e</sub> = 2.2019

Refractive Index, 1064nm	$n_o = 2.2340, n_e = 2.1554$
Electro-optic Coefficients at 633nm [pm/V] (constant tension)	$r_{13} = 9.6 \ r_{22} = 6.8 \ r_{33} = 30.9$ $r_{51} = 32.6 \ r_c = 21.1$

### Crystallographic Orientations, Dimensions, and Tolerances

Standard Sizes	10x10x10mm <sup>3</sup> , 0° cut and 45° cut 10x10x20mm <sup>3</sup> , 0° cut and 45° cut
Dimension Tolerances	±0.1mm on polished faces ±0.1mm on lapped faces
Orientations	X-ray oriented within ±10 arc-minutes
Flatness	<λ/10 at 633nm
Surface Quality	<10/5 (scratch/dig)
Edges	0.1 to 0.15mm chamfer at 45°
Parallelism	<10 arc-minutes
Anti-reflective Coatings	Specify
Other Dopants	Specify
Fe Standard Dopants	0.015, 0.03, 0.05, 0.10 mole%