LiNbO₃

DESCRIPTION

LiNbO$_3$ (Lithium Niobate) crystals are negative uniaxial crystals with a space group of R3c (C9) and a transmission range of 400~5000 nm. They also have the advantages of large effective nonlinear coefficients, easy growth, low price, stable physical and chemical properties, and are not susceptible to deliquescence. They are widely used as dual-frequency lasers with wavelengths greater than 1 mm and 1064 nm optical parametric oscillator (OPOs) pumps as well as quasi-phase-matching (QPM) devices.

APPLICATIONS

- Medical Applications
- Holography
- 532nm laser
- Pulse range finder
- Optical Q-switches
- 1064nm laser
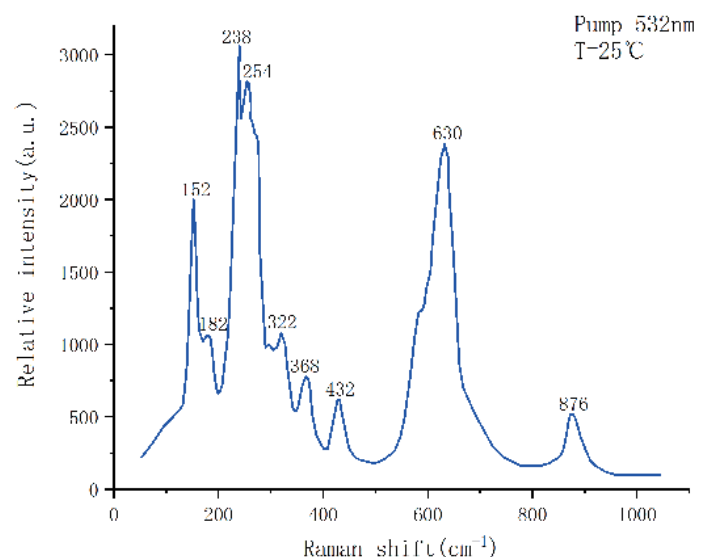- 2940nm Laser
- Laser Target Pointer

FEATURES

- Small volume
- Not susceptible to deliquescence
- High temperature stability
- Large electro-optical coefficient
- Wide range of transparency
- High electro-optical efficiency
- Low absorption loss
- Low damage threshold
- Easy to grow into large crystals
- Stable mechanical and chemical properties

SPECTRA

LiNbO₃

NONLINEAR OPTICAL PROPERTIES

NLO coefficient	$d_{33} = 34.4$ pm/V
	$d_{31} = d_{15} = 5.95$ pm/V
	$d_{22} = 3.07$ pm/V
Efficiency NLO factor	deff =5.7 pm/V or ~14.6 x d_{36} (KDP) for frequency
	deff =5.3 pm/V or ~13.6 x d_{36} (KDP) for OPO
	deff =17.6 pm/V or ~45 x d_{36} (KDP) for quasi-
Electro-optical coefficient	$g^{T}_{33} = 32$ pm/V, $g^{S}_{33} = 31$ pm/V,
	$g^{T}_{31} =10$ pm/V, $g^{S}_{31} =8.6$ pm/V,
	$g^{T}_{22} = 6.8$ pm/V, $g^{S}_{22} = 3.4$ pm/V,
Half wave voltage, DC Electric field|| z, light^ z.	3.03 KV
Electric field|| x or y, light|| z.	4.02 KV
Damage Threshold	100 MW/cm² (10 ns, 1064nm)

PHYSICAL AND OPTICAL PROPERTIES

Chemical formula	LiNbO₃
Crystal Structure	Triangular crystal system
Space group	R3C
Density	4.64 g/cm³
Mohs Hardness	5
Optical uniformity	$\sim 5 \times 10^{-5}$ / cm
Transparent range	420 – 5200 nm
Absorption coefficient	~ 0.1 % / cm @ 1064 nm
Refractive index of 1064 nm	$n_e = 2.146$, $n_o = 2.220$ @ 1300 nm
	$n_e = 2.156$, $n_o = 2.232$ @ 1064 nm
	$n_e = 2.203$, $n_o = 2.286$ @ 632.8 nm
Sellmeier's equation (λ, μm)	$n_o^2 = 4.9048 + 0.11768 / (\lambda^2 - 0.04750) - 0.027169\lambda^2$
	$n_e^2 = 4.5820 + 0.099169 / (\lambda^2 - 0.04443) - 0.021950\lambda^2$
Coefficient of thermal expansion @ 25°C	//a, 2.0×10^{-6} / K
	//c, 2.2×10^{-6} / K
Thermal conductivity	~ 5 W/m/K @ 25 °C
Thermo-optical coefficient	$dn_o/d_T = -0.874 \times 10^{-6}$ / K @ 1.4 μm
	$dn_e/d_T = 39.073 \times 10^{-6}$ / K @ 1.4 μm

LINBO₃ OPTICAL WAVEGUIDE SPECIFICATION

Operating wavelength range	1.525-1.605μm
Extinction ratio	<20dB
Half-wave voltage	<6V
DC Bias Voltage	<8V
Input Characteristic Impedance	50Ω
Light reflection	≤-50dB
Maximum input power	20dBm
Maximum input optical power	10-100mW
Storage temperature	-40-85℃
Operating temperature	-40-70℃