Lithium Niobate

DESCRIPTION

Lithium Niobate Crystal (LiNbO3), is one of the few man-made crystals. Lithium niobate is an important ferroelectric material. It possesses a series of special proper-ties such as excellent piezoelectric, electro-optic, acousto-optic, thermoelectric, photorefractive and nonlinear optical properties. It is widely used in optical waveguides, optical modulators, O-switches, nonvolatile memories, SAW and second harmonic generators.

The low acoustic loss and high surface-wave velocity make LiNbO3 a good candidate for surface acoustic devices, such as SAW resonators, SAW filters a, SAW delay lines and SAW signal-compressors/expanders. As a piezo-electric transducer it is widely used in mirco-positioning, sensing and modulation applications.

FEATURES

Wide transparency range

High homogeneity

Stable mechanical and chemical properties

Low absorption loss

Applications

SAW wafers

Laser frequency conversion optical device

Optical waveguide

Optical isolator

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PARAMETERS

PHYSICAL AND OPTICAL PROPERTIES

Property	Value
Chemical formula	$LiNbO_3$
Crystal structure	trigonal
Space group	R_3C
Density	5
Optical homogeneity	~ 5 x 10^{-5} / cm
Transparency range	420 – 5200 nm
Absorption coefficient	~ 0.1 % / cm @ 1064 nm
Refractive indices at 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 equations (λ, μm)	$n_o^2 = 4.9048 + 0.11768 / (\lambda^2 – 0.04750)$ $– 0.027169\lambda^2$ $n_e^2 = 4.5820 + 0.099169 / (\lambda^2 – 0.04443)$ $– 0.021950\lambda^2$
Thermal expansion coefficient @ 25 °C	//a, 2.0 x 10^{-6} / K //c, 2.2 x 10^{-6} / K
Thermal conductivity	~ 5 W/m/K @ 25 °C
Thermal optical coefficient	d_{no}/d_T = -0.874×10^{-6} / K at 1.4μm $_{ne}/d_T$ = 39.073 x 10^{-6} / K at 1.4 μm

STANDARD SPECIFICATIONS OF LASER GRADE $LINBO_3$ CRYSTALS

Property	Value
Transmitted wavefront distortion	better than l/4 @ 633nm
Dimension tolerance	(W±0.1mm) x (H±0.1mm) x (L±0.2mm)
Clear aperture	over 90% central diameter
Flatness	1/8 @ 633nm
Surface quality	20 /10 Scratch/Dig
Parallelism	better than 20 arc sec
Perpendicularity	5 arc min
Coating	Au/Cr per surface

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PIEZOELECTRIC PROPERTY

Elastic stiffness coefficient $c_{ij}/(10^{10}N/m^2)$	C_{11}	C_{12}	C_{13}	C_{14}	C_{33}	C_{44}
	20.3	5.3	7.5	0.9	24.5	6.0
Elastic compliance coefficient $s_{ij}/(10^{-12}m^2/N)$	S_{11}	S_{12}	S_{13}	S_{14}	S_{33}	S_{44}
	5.78	-1.01	-1.47	-1.02	5.02	17.0
Piezoelectric strain constant dij/$(10^{-11}C/N)$	d_{11}	d_{15}	d_{22}	d_{31}	d_{33}	
	8	7.4	2.04	-0.086	1.62	
Dielectric constant	$\varepsilon^T_{11}/\varepsilon 0$					
	78					
Electromechanical coupling coefficient $k_{ij}(\%)$	k_{15}	k_{31}				
	68	50				