

Lithium Tantalate



DESCRIPTION

Lithium Tantalate (LiTaO_3), possess a combination of unique electro-optical, pyroelectric, piezoelectric properties and good mechanical & chemical stability, which as a material finds uses in pyroelectric, electro-optical, piezoelectric, acousto-optical applications. LiTaO_3 well-suited for numerous applications including electro-optical modulators, pyroelectric detectors, optical waveguide, SAW (surface acoustic wave) substrates, IDT (interdigital transducer), bulk acoustic wave devices, piezoelectric transducers etc. With a Curie temperature of 620°C , it can operate at very high ambient temperatures and is an excellent infrared detector material.

FEATURES

- Wide transparency range
- High optical damage threshold
- Stable chemical and physical properties

Applications

- SAW device
- Electro-optical modulators
- Motion detectors



Lithium Tantalate

PARAMETERS

PHYSICAL AND OPTICAL PROPERTIES

Property	Value
Melting Point	1650° C
Crystal structure	Trigonal
Point group	3m
Density	7.465 x 103 kg / m3
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 / (λ ² – 0.04750) – 0.027169λ ² n _e ² = 4.5820 + 0.099169 / (λ ² – 0.04443) – 0.021950λ 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 n _e /d _T = 39.073 x 10 ⁻⁶ / K at 1.4 μm

STANDARD SPECIFICATIONS OF LASER GRADE

Property	Value
Transmitted wavefront distortion	better than λ/4 @ 633nm
Dimension tolerance	(W±0.1mm) x (H±0.1mm) x (L±0.2mm)
Clear aperture	over 90% central diameter
Flatness	λ/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 $c_{ij}/(10^{10}\text{N/m}^2)$	C_{11}	C_{12}	C_{13}	C_{14}	C_{33}	C_{44}
	22.8	3.1	7.4	-1.2	27.1	9.6
Piezoelectric strain constant $d_{ij}/(10^{-11}\text{C/N})$	d_{15}	d_{22}	d_{31}	d_{33}		
	2.6	0.85	-0.3	0.92		
Dielectric constant	$\epsilon_{11}^T/\epsilon_0$	$\epsilon_{11}^T/\epsilon_0$				
	53	44				
Electromechanical coupling coefficient $k_{ij}(\%)$	k_{15}	k_{31}				
	50	50				

Typical Optical Properties Surface Acoustic Wave Properties

Description	Propagation	Design	Surface Wave Velocity (m/s)	Coupling Coefficient k^2 (%)	Group Delay Time Temp Coefficient (ppm/ $^{\circ}\text{C}$)
36° Y - Cut	X - Axis	SSBW	4160	5	28 ~ 32
42° Y - Cut	X - Axis	SSBW	4022	7.6	40
X - Cut	112.2 Y Direction	SAW	3290	0.75	18

SAW = Surface Acoustic Wave L, SAW =Leaky SAW