

LiNbO₃

LiNbO₃ crystal is widely applied as an excellent acousto-optic material for surface acoustic wave (SAW) devices (such as filters, oscillators and resonators) and ultrasonic transducer due to its high electro-mechanical coupling factor, low acoustic transmission loss, stable physical and chemical properties.

AOTK supplies large quantities of LiNbO₃ boules, as-cut or finished $\phi 3''$ and $\phi 4''$ wafers available up to 20,000 pieces per month with good quality and very low price.

Typical Applications of Piezoelectronic LiNbO₃

- Surface Acoustic Wave (SAW) Device
- Bulk Acoustic Wave (BAW) Device
- Leaky Surface Acoustic Wave (LBAW) Device
- Piezoelectric Transducer (PET)
- Piezoelectric Sensor (PES)



Basic Properties

Structural and Physical Properties

Crystal Structure	Trigonal, point group 3m
Lattice Parameters	a = 5.148Å, c = 13.863Å
Density	4.64 g/cm ³
Mohs Hardness	5
Melting Point	1250°C
Curie Point	1160°C
Thermal Expansion Coefficient	$\alpha_1 = \alpha_2 = 2 \times 10^{-6}/^{\circ}\text{C}$, $\alpha_3 = 2.2 \times 10^{-6}/^{\circ}\text{C}$ at 25°C
Thermal Conductivity	38 W/m/K at 25°C
Elastic Stiffness Constant	$C_{11}^E = 2.04 \times 10^{11}$ N/m ² , $C_{33}^E = 2.46 \times 10^{11}$ N/m ²
Piezoelectric Strain Constant	$d_{22} = 2.04 \times 10^{-11}$ C/N, $d_{33} = 19.22 \times 10^{-11}$ C/N
Dielectric Constant	$\epsilon_{11}/\epsilon_0 = 85$, $\epsilon_{33}/\epsilon_0 = 29.5$

Typical Properties of Piezoelectric LiNbO₃

Orientation	127.86° Y-cut	Y-cut
SAW Velocity	3970 m/s	3485 m/s
Electromechanical Coupling Factor	$K_s^2 = 5.5\%$	$K_s^2 = 4.3\%$
Temperature Coefficients of Delay (TCD)	$78 \times 10^{-6}/^{\circ}\text{C}$	$95 \times 10^{-6}/^{\circ}\text{C}$
Temperature Coefficients of Velocity (TCV)	$-60 \times 10^{-6}/^{\circ}\text{C}$	$-80 \times 10^{-6}/^{\circ}\text{C}$

Specifications of LiNbO₃ SAW Wafer

Type Specifications	Boule		Wafer	
Diameter	$\phi 3''$	$\phi 4''$	$\phi 3''$	$\phi 4''$
Length or Thickness (mm)	≤ 100	≤ 50	0.35-1.0	
Orientation	127.86° Y, 64° Y, 135° Y, X, Y, Z, and other cut			
Ref. Flat Orientation	X, Y			
Ref. Flat Length	22±2mm	32±2mm	22±2mm	32±2mm
Front Side Polishing	Mirror polished 5-15 Å			
Back Side Lapping	0.3-1.0 μm			
Flatness (μm)	< 15			
Bow (μm)	< 25			

Note:

- I. Other dimension is also available upon request.
- II. Wafers are packaged in plastic containers (25 pieces wafers each).

All statements, technical information and recommendations related to the products herein are based upon information believed to be reliable or accuracy or completeness thereof is not guaranteed, and no responsibility is assumed for any inaccuracies. The user assumes all risks and liability whatsoever in connection with the use of a product or its application, AOTK reserves the right to change at any time of a product offered for sale herein. AOTK makes no representations that the products herein are free from any intellectual property claims of others. Please contact AOTK for more information.



LiTaO₃

LiTaO₃ crystal is widely applied as an excellent acousto-optic material for surface acoustic wave (SAW) devices (such as filters, oscillators and resonators) and ultrasonic transducer due to its high electro-mechanical coupling factor, low acoustic transmission loss, stable physical and chemical properties.

AOTK supplies large quantities of LiTaO₃ boules, as-cut or finished $\phi 3''$ and $\phi 4''$ wafers available up to 15,000 pieces per month with good quality and very low price.



Typical Applications of Piezoelectric LiTaO₃

- Surface Acoustic Wave (SAW) Device
- Bulk Acoustic Wave (BAW) Device
- Leaky Surface Acoustic Wave (LBAW) Device
- Piezoelectric Transducer (PET)
- Piezoelectric Sensor (PES)

Basic Properties

Structural and Physical Properties

Crystal Structure	Trigonal, point group 3m
Lattice Parameters	a = 5.154Å, c = 13.781Å
Density	7.46 g/cm ³
Mohs Hardness	5.5
Melting Point	1650°C
Curie Point	607°C
Elastic Stiffness Constant	C ^E ₁₁ = 2.33 x 10 ¹¹ N/m ² , C ^E ₃₃ = 2.77 x 10 ¹¹ N/m ²
Piezoelectric Strain Constant	D ₁₅ = 2.4 x 10 ⁻¹¹ C/N, d ₃₃ = 0.8 x 10 ⁻¹¹ C/N
Dielectric Constant	ε ₁₁ /ε ₀ = 51.7, ε ₃₃ /ε ₀ = 44.5

Typical properties of Piezoelectric LiTaO₃

Orientation	112° Y-cut	Y-Z cut
SAW Velocity	3295 m/s	3230 m/s
Electromechanical Coupling Factor	K _s ² = 0.75%	K _s ² = 0.66%
Temperature Coefficients of Delay (TCD)	22.3 x 10 ⁻⁶ /°C	35 x 10 ⁻⁶ /°C
Temperature Coefficients of Velocity (TCV)	-16.5 x 10 ⁻⁶ /°C	—

Basic Specifications of LiTaO₃ SAW Wafer

Type Specifications	Boule		Wafer	
Diameter	φ3"	φ4"	φ3"	φ4"
Length or Thickness (mm)	≤100	≤50	0.35-1.0	
Orientation	Y, Z, 36°Y, 42°Y, 127.86°Y, and other cut			
Ref. Flat Orientation	X, 112.2°Y			
Ref. Flat Length	22±2mm	32±2mm	22±2mm	32±2mm
Front Side Polishing	Mirror polished 5-15 Å			
Back Side Lapping	0.3-1.0 μm			
Flatness (μm)	< 15			
Bow (μm)	< 25			

Note

- Other dimension is also available upon request.
- Wafers are packaged in plastic containers (25 pieces wafers each).

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TeO₂

TeO₂ is an excellent acousto-optic (A-O) crystal with high AO figure of merit, larger birefringence, good optical rotation and slow propagation velocity along [110] direction. The solution of A-O devices made of TeO₂ crystals will promote performance several levels than others. It is an ideal single crystal material for preparation of Acousto-Optic Rotators, Modulators, Resonators, Tuning Filters and other A-O devices.

AOTK provides TeO₂ single crystal with size as large as 120x85x50 mm on all direction, as well as cylinder or cuboid shape single crystal.

Typical Applications of TeO₂ Crystal

- Acousto-optic Device

Basic Properties

Transparency Range	350~ 5000nm
Crystal Structure	Tetragonal
Point Group	422
Lattice Parameters	a = 4.810Å, c = 7.613Å
Space Group	P4 ₁ 2 ₁ 2
Mohs Hardness	4.5
Melting Point	733°C
Density	5.99 g/cm ³
Refractive Index	n _o = 2.260, n _e = 2.142
Optical Homogeneity	Δn < 10 ⁻⁵ /cm
A-O Figure of Merit (M ²)	793 x 10 ⁻¹⁸ S ³ /g
Acoustic Velocity	616 m/s (Transverse wave [110] propagation)
Transmittivity	>70% @ 632.8nm

Speciflcations

Orientation	[001], [110]
Size	Φ35x50 mm, Φ50x50 mm, >30x30x50 mm
Polish	0.25~0.016 μm

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PbMoO₄

PbMoO₄ crystal is widely used as Acousto-Optic (A-O) Modulators, Deflectors, Q-Switches, Mode-Lockers, Frequency-Shifters, Tunable Filters, Scanners and other A-O devices because of its high acousto-optic figure of merit and good chemical and physical properties. AOTK provides PbMoO₄ single crystal raw boule with large size up to Diameter 50mm x 90mm. The crystal has good quality - no scattering, colorless, high transmission and optical homogeneity.

Typical Applications of PbMoO₄ Crystal

- Acousto-optic Device

Basic Properties

Transparency Range	420~ 55000nm
Crystal Structure	Tetragonal,
Point Group	4/m
Space Group	I4 ₁ /a
Lattice Parameters	a = 5.435Å, c = 1.211Å
Mohs Hardness	6.95
Melting Point	1065°C
Density	5.99 g/cm ³
Refractive Index	n _o = 2.386, n _e = 2.262
Optical Homogeneity	Δ n < 10 ⁻⁵ /cm
A-O Figure of Merit (M ₂)	36.1 x 10 ⁻¹⁸ S ³ /g
Acoustic Velocity	3600 m/s (Transverse wave [110] propagation)
Transmittivity	>70% @ 632.8nm

Specifcations

Orientation	[100]
Size	Φ35x50 mm, Φ50x50 mm, >30x30x50 mm
Polish	0.25~0.016 μm

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Quartz single crystal is grown by hydrothermal synthesis method in autoclaves, It has trigonal crystal structure with right-handed or left-handed modification. It has low stress birefringence and highest refractive index homogeneity. Optical transmission range of crystal quartz is 150-4000nm. Due to its piezoelectric properties, low thermal expansion, good mechanical parameters and excellent optical characteristics, quartz is widely used in electronics, laser optics, optical fibre communications, and X-ray optics, etc.



Typical Applications of Piezoelectric Quartz Crystal

- Surface Acoustic Wave (SAW) Device
- Bulk Acoustic Wave (BAW) Device
- Leaky Surface Acoustic Wave (LBAW) Device
- Piezoelectric Transducer (PET)
- Piezoelectric Sensor (PES)

Basic Properties

Crystal Structure	Trigonal, point group 32
Lattice Parameters	a = 5.154Å, c = 13.781Å
Density	2.65 g/cm ³
Mohs Hardness	7
Melting Point	1713°C
Thermal conductivity	//Z = 10.7 W/m.K, ⊥Z = 6.2 W/m.K
Young's modulus	//Z = 97.2 Gpa, ⊥Z = 76.5 Gpa
Solubility	Insoluble in water

Typical properties of Piezoelectric Quartz Crystal

Orientation	36° Y-cut
SAW Velocity	3130 m/s
Electromechanical Coupling Factor	K _s ² = 0.1%
Temperature Coefficients of Delay (TCD)	0

Basic Specifications of Quartz Crystal SAW Wafer

Type Specifications	Wafer
Diameter	Φ3"
Length or Thickness (mm)	0.3~0.5
Orientation	36°Y, 42.7°Y, 34°Y, and other cut
Ref. Flat Orientation	X
Ref. Flat Length	22±1mm
Front Side Polishing	Mirror polished 5-15 Å
Back Side Lapping	0.3-1.0 μm
Flatness (μm)	< 15
Bow (μm)	< 25

Note:

- Other dimension is also available upon request.
- Wafers are packaged in plastic containers (25 pieces wafers each).