SinoCeramics

Single Crystals

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Table of Contents…

$LiNbO_3$ Single Crystal:

$LiNbO_3$ single crystal possesses an attractive combination of piezoelectric and electro-optic properties, which are very useful for surface acoustic wave devices, electro-optics, and non-linear optic devices, etc. The SAW filter Q-switch, Electro-optic modulator, parameter, oscillator, and optical wave guide substrates made by $LiNbO_3$

Specifications:
Density: 4.65g/cm^3
Melting Point: 1255°C
Curie Point: 1142
Hardness: 5 (Mohs)

Size: Diameter 25-100mm
Orientation: Z-cut, Y-cut, Y-cut 36°, X-cut 41°, Y-cut 128°

Lithium Niobade Crystal with Dopants

$LiNbO_3$: Fe (0.01-0.1 mol%)
Applications: Apply for erasable volume phase holographic storage

$LiNbO_3$: MgO (1-6 mol%)
Applications: Apply for frequency doubling, optical parametric oscillation

$LiNbO_3$: Mg, Nd
Applications: Apply for self-frequency doubled, Q-switched or modulated lasers

Item	Z Cut
Orientation	Z ± 0.5°
Diameter (mm)	76.2± 0.5
The First Reference Flat OF (mm)	22 ± 1.5 , -Y ± 0.1
The Second Reference Flat CF (mm)	14 ± 1.5 , -X ± 0.5°
Thickness	1.0 ± 0.05
Surface Polish	Both side (10/5)
Bowing (μm)	< 20
Taper	< 10
Edge Angle	Rounding & Polishing

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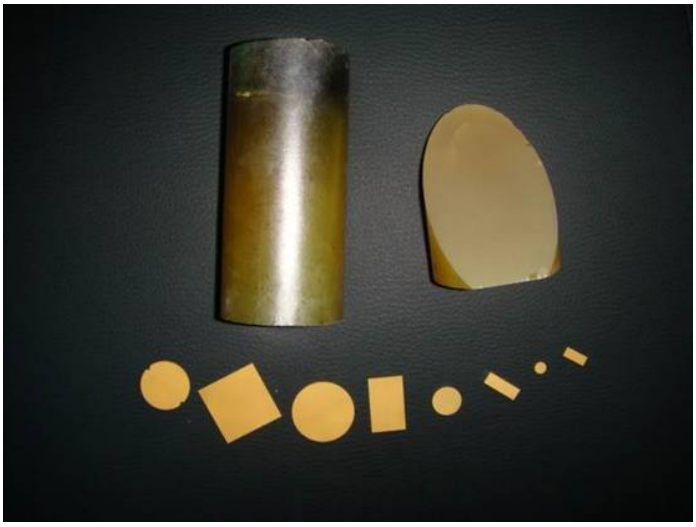
PMN-PT Single Crystal



Specifications

Crystal Type:	A	B
Orientation of Poling:	<001>	<001>
Dielectric Constant:	4000-5500	5000-7500
δ:	< 0.01	< 0.01
K_t:	0.6	0.6
K_p:	0.9	0.9
T_c:	145 ± 3	148 ± 3
d_{33} (pc/N):	1300-1800	1700-2400

BBO Crystal

BBO crystal has large birefringence over the brad transparent range from 189-3500nm, the high damage threshold and stable physical, chemical properties. So it is an excellent crystal to replace Calcite, TiO_2, and $LiNbO_3$, etc. in Glan prisms and displacers for high power and UV wavelength applications. The different dimensions BBO prisms are available from Sinoceramics.

Physical Properties

Refractive Index	n_o = 1.6749	
	n_e = 1.5555	
Transmission Range (μm)	0.190-3.5	
Density (g/cm^3)	3.85	
Thermal Expansion Coefficient (10^{-6}/K)	a: 4.0	c:2.0

$LiTaO_3$

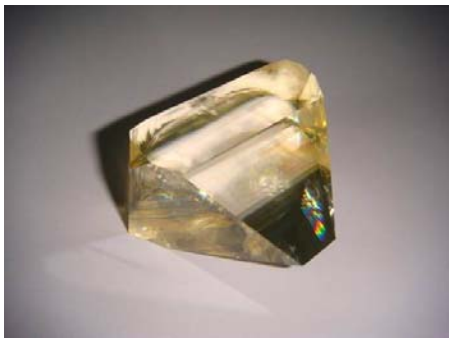
$LiTaO_3$ is also a widely used E-O crystal, due to its optical, NLO and E-O properties similar to those of $LiNbO_3$, but with a higher damage threshold.

Crystal Structure:	Trigonal , Space group R_{3c} , Point group 3m	
Cell Parameters:	a = 5.154Å , c = 13.781Å	
Melting Point:	1650°C	
Curie Temperature:	607°C	
Mohs Hardness:	5.5	
Density:	$7.46 g/cm^3$	
Dielectric Constant:	$\varepsilon_{11}/\varepsilon_o$ 51.7	$\varepsilon_{33}/\varepsilon_o$ 44.5
Elastic Stiffness Coefficient:	C^E_{11} 2.33 ($x10^{11}$ N/m^2)	C^E_{33} 2.77 ($x10^{11}$ N/m^2)
Piezoelectric Strain Constant:	D_{22} 2.4 ($x10^{-11}$C/N)	D_{33} 0.8 ($x10^{-11}$C/N)
Transmission Range:	400 - 4500nm	
Electro-Optical Coefficients:	R_{33} = 30.4 pm/V	
Refractive Index @ 632.8nm:	n_o = 2.176	n_e = 2.180

$KTiOPO_4$ Crystal:

Specifications:

Symmetry: Rhombic
Unit Cell Parameter: a = 1.2818nm , b = 0.6404nm
c = 1.0589nm
Density: $3.01 g/cm^3$
Melting Point: 1172 °C
Specific Heat: 0.1737cal/g·k
Hardness: 5 ~ 6(Mohs)
Penetration Wave Band: 0.35-4.5μm
Light Damage Threshold: > $450 Mw/cm^2$
(1064nm, 10ns, 10Hz)



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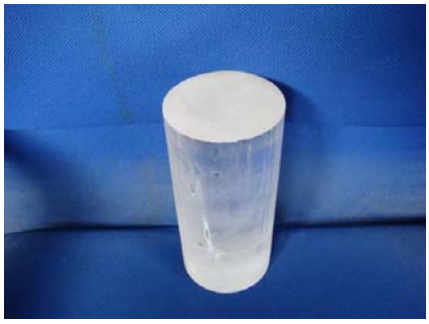
LBO Crystal

Lithium Tetraborate Crystal, $Li_2B_4O_7$ (LBO) with its excellent piezoelectricity has been widely and extensively developed since the last two decades. This piezo crystal is ideal for the production of SAW filters, resonators, and other high frequency devices that feature low density, weak Temperature Coefficient of Delay (TCD), and SAW high coupling factor (k^2), and unnecessary polarization before using.

Specifications:
Crystal Orientation: <110>
Electric Constant: $e_{33} = 0.91c/m$
Coefficient of Dielectric Loss: $\varepsilon^T_{33} = 10.1$
Sound Propagation Velocity: 340m/s
Elastic Constant: $CE_{33} = 5.42x10^{10}N/m^2$, $K_{33} = 0.42$
K = 20.7%



Point Group:	4mm	
Lattice Constant (A):	a = 9.475 , c = 10.283	
Density:	$2.45g/cm^3$	
Hardness (Mho)	~6	
Melting Point (°C)	917	
Dielectric Constant	$E_{11} = 3.5$	$E_{33} = 8.2$
Dielectric Constant:	e_{11}/e_o 51.7	e_{33}/e_o 44.5
Piezoelectric Strain Constant:	D_{15} 8.07 ($x10^{-12}C/M$)	D_{33} 0.8 ($x10^{-12}C/M$)
Temperature Coefficient of Delay:	0 ($x10^{-6}$ /°C @ 25°C)	
SAW Coupling Factor (k^2):	0.7-1.6	
SAW Velocity (m/s):	3402 - 3864	
Coefficient of Thermal Expansion:	$a_{11} = 11.1x10^{-6}$/°C	$a_{33} = 3.7x10^{-6}$/°C
Solubility (m/h):	in Pure Water	a = 0.04 / c = 0.08
	in Concentrated HNO_3	60
	in KOH	0.4
	in C_3HCl_3	0

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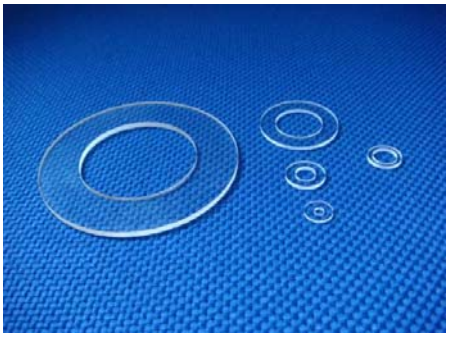
Quartz Crystal Blanks

We offer a wide selection of quartz substrates from various fused quartz supplies. Our engineering is available to assist in the selection of substrates and make recommendations if requested. In order to make sure the parts we make will meet the customer's expectations we maintain a very stringent quality control procedure and observe ISO specifications. Product "traveler" documentation records and our Quality Control Manual are available for inspection by the customer. At the end of the production line it is becoming a standard procedure to have the appropriate part identification laser scribed onto the surface before it will go through final cleaning, inspection, and packaging processes. We can ship the products to any destination and by any method requested by the customer, or we can suggest methods and carriers that are economical and safe.



AT or BT-CUT Round Blanks

Specifications	Example	Available
ZZ' ZZ' Angle:	35°23' ± 3'	± 1' , ± 2' , ± 3'
Diameter:	Æ 8.0 + 0-0.05mm	Æ 4.5 - Æ 9mm
Frequency:	20MHz	3.0 - 100M
Quartz:	Q^3 2.0x10^6	
Others:	At Customer's request	

AT or BT-CUT Strip Blanks

Specifications	Example	Available
ZZ' ZZ' Angle:	35°14' ± 3'	± 1' , ± 2' , ± 3'
Frequency:	20MHz	3.5 - 60M
Quartz:	Q^3 2.0x10^6	
Others:	At Customer's request	

AT or BT-CUT Wafers

Specifications	Example	Available	
ZZ' ZZ' Angle:	35°25' ± 3'	± 1' , ± 2' , ± 3'	
Diameter:	X·Z : 10 x 22mm	10 x 24.5mm	
Thickness:	0.3-0.35mm	0.2-1.10mm	
Parallelism:	0-0.03	0-0.03mm	0-0.05mm

Yttrium Vanadate (YVO_4) Crystal

The yttrium orthovanature (YVO_4) is a positive uniaxial crystal grown with the Czochralski method. It has good temperature stability, along with good physical and mechanical properties, and is ideal for optical polarizing components because of its wide transparency range and large birefringence. It is an excellent synthetic substitute for Calcite ($CaCO_3$) and Rutile (TiO_2) crystals in many applications including fiber optic isolators and circulators, beam displacers and polarizing optics, etc.

Properties of YVO_4 Crystals

Transparency Range:	High transmission from 0.4-5μm				
Crystal Symmetry:	Zircon Tetragonal, Space group D_{4h}				
Crystal Cell:	a = b = 7.12A			c = 6.29A	
Density:	$4.22 g/cm^3$				
Mohs Hardness:	5, (glass-like)				
Hygroscope Susceptibility:	Non-hygroscope				
Thermal Expansion Coefficient:	$\alpha_a = 4.43 \times 10^{-6}/K$			$\alpha_c = 11.37 \times 10^{-6}/K$	
Thermal Conductivity Coefficient:	$C_{\parallel}$: 5.23W/m/K			C_{perp} : 5.10W/m/K	
Crystal Class:	Positive uniaxial with $n_o = n_a = n_b$			$n_e = n_c$	
Thermal Conductivity Coefficient:	$dn_a/dT = 8.5 \times 10^{-6}/K$			$dn_c/dT = 3.0 \times 10^{-6}/K$	
Refractive Indices, Birefringence ($\Delta_n = n_e - n_o$) Walk-off Angle @ 45° (ρ):	@ 0.63mm	n_o = 1.9929	n_e = 2.2154	Δ_n = 0.2225	ρ = 6.04°
	@ 1.30mm	n_o = 1.9500	n_e = 2.1554	Δ_n = 0.2054	ρ = 5.72°
	@1.55mm	n_o = 1.9447	n_e = 2.1486	Δ_n = 0.2039	ρ = 5.69°
Seamier Equation: (λ in μm)	$n_o^2 = 3.77834 + 0.069736 / (\lambda^2 - 0.04724) - 0.0108133\lambda^2$				
	$n_e^2 = 4.59905 + 0.110534 / (\lambda^2 - 0.04813) - 0.0122676\lambda^2$				

High quality YVO_4 crystals with different dimensions are available. Sinoceramics can provide large quantities (~10,000 pcs/month) of YVO_4 wedges and YVO_4 displacers used in fiber optical isolators and circulators.

BGO Crystal

Bismuth germinate $Bi_4Ge_3O_{12}$ commonly abbreviated as BGO, is the crystalline form of an inorganic oxide with cubic eulytine structure, colorless, transparent, and insoluble in water. When exposed to radiation of high-energy particles, or other sources, such as gamma rays and x-rays, it emits a green fluorescent light. The light has a peak wavelength of 480nm, with its high stopping power, high scintillation efficiency, good energy resolution, and non-hygroscopes. BGO is a good scintillation material and has found a wide range of applications in high energy physics, nuclear physics, space physics, nuclear medicine, geological prospecting, and other industries.

Specifications:
Luminous Efficiency: ~ 8000ph/Mev
Afterglow (after 3ms): 0.005%
Chemical Stability: Good
Hardness: 5 Mohs

Physical Properties of BGO

Density (g/m^3):	7.12
Melting Point:	1050°C
Parameter of Crystal Cell (A):	10,518
Refractive Index:	2.15
Radiation Length (cm):	1.1
Peak of Fluorescence Spectra (nm):	480
Decay time (ns):	300
Relative Light Output (%):	10-14Nal (T1)
Energy Resolution (%):	12

Diameters: 2" or 3"
Length: 1" or 6"
Orientation: <110> , <100> , <001>

Armed with the expertise of crystal growth accumulated in the past years, Sinoceramics has developed an unique technology for BGO growing and scaled up into quantity production in the R&D Center of the institute. Now Sinoceramics has become a world-wide famous BGO producer to meet the customer's demands in crystal quality, quantity, cost effectiveness, and delivery schedule. The boules up to 3" dia x 6" long or equivalent rectangular shape can be cultivated and crystal components with different shapes can be provided as required.

LYSO Crystal

The LYSO crystal is an ideal generation sintillator crystal. LYSO stands for Cerium doped Lutetium Yttrium Orthosilicate. This crystal has the advantages of high light output, high density, fast decay time, good energy resolution and low cost. These properties mean that LYSO is an ideal candidate for a range of ray detection applications in nuclear physics and nuclear medicine, which require higher though improved timing resolution and superior energy revolution. Sinoceramics can produce LYSO in high volume and can supply finished pixel, assembled customer specified array, or module configurations.

Physical Properties

Density (g/cm^3)	7.2
Effective Atomic Number	66
Radiation Length (cm)	1.10
Decay Constant (ns)	40-44
Peak Emission (nm)	428
Light Yield (Relative BGO=100%)	190
Index of Refraction	1.82
Peak Excitation (nm)	375
Radiation Hardness (rad)	$> 10^6$
Melting Point (°C)	2,050
Hardness (Mohs)	5.8
Luminous Efficiency (ph/Mev)	2,000
Energy Resolution	10%
Peak of Fluorescence Spectrum (nm)	450
Cleavage	None
Hygroscopicity	No

LYSO Array