Company Profile

Shanghai Opticrystal Materials Co., Ltd was established in 2014 , mainly engaged in the R&D, processing and sales of optical crystals, electronic and semiconductor materials, as well as laboratory equipment, spare parts, consumables and other products .

I. Optical Crystals :

Laser crystals: Nd:YAG, Cr4+:YAG, Yb:YAG, Tm:YAP, Ho:YAG , Ho:YAP, Er:YAG, Er: glass, Nd:YLF, Nd:YVO4, Ti3+:Al2O3 and bonded crystals. **Scintillation crystals:** Ce:LuAG, Ce:GAGG, Ce:YAG. **Piezoelectric crystals:** BaTiO3, Quartz, (PMN-PT), LiTaO3, LiNbO3, LGS. **Magneto-optic crystals:** TGG, TSAG,TLF, KTF, CeF3, YIG. **Acousto-optic crystal:** TeO2. **Birefringent crystals:** YVO4, α-BBO. **Nonlinear crystals:** β-BBO, KDP, DKDP, LBO, KTP, PPLN. **Metal Single crystals:** Al, Cu, Mg, Ni. **Single crystal substrates:** Al2O3, GGG/NGG/SGGG, LSAT, LaAIO3, MgO, MgAl2O4, SrTiO3, YSZ, TiO2. **Special glass:** ITO glass, FTO glass, AZO glass. **Gemstones:** Ruby, Sapphire, Emerald.

II. Precision Optics:

Optical windows, filters, lenses, prisms, objective lenses, cylindrical mirrors, mirrors, beam combiners, beam expanders, wedge mirrors, glued mirrors, etc.; materials include BK7, K9, quartz glass, sapphire, silicon Si , Germanium Ge, zinc selenide ZnSe, calcium fluoride CaF2, magnesium fluoride MgF2, barium fluoride BaF2, zinc sulfide ZnS and so on.

III. Optical Devices:

Photoelectric Pockels Cell: BBO, KDP, DKDP, LN/MgO:LN, LGS, KTP, RTP. **Faraday Optical Isolators:** Polarization-independent isolator, polarization-dependent isolator, near-infrared visible light free-space isolator, in-line isolator, circulator, etc. **Optical Modulators:** lithium niobate phase modulators, fiber-coupled acousto-optic modulators, spatial acousto-optic modulators, acousto-optic Q switches, acousto-optic filters, acousto-optic deflectors, and acousto-optic drivers. **Special Optical Fiber:** special silica optical fiber, single optical fiber, optical fiber bundle, optical fiber passer, optical fiber collimator.

IV. Semiconductor Materials:

Quartz, diamond, GaAs, Si, Ge, ZnO, AlN, GaN, GaO, SiC, LiTaO3, LiNbO3, etc. **Ceramic Substrates:** Si3N4, Al2O3, AlN, ZrO2. **Sputtering targets:** single crystal target, metal target, alloy target, ceramic target, compound target, rare earth target.

V. Laboratory equipment and consumables:

Optical platforms, translation stages, mirror frames, teaching experiment modules, spectrometers, power meters, lasers, pulsed xenon lamps, scientific research electric furnaces, performance testing equipment, consumables, etc.

Shanghai Opticrystal has a professional R&D, processing and sales team. The products have been widely used in laser processing, new energy vehicles, photovoltaics, optical communications, aerospace, ships, nuclear detection, medical beauty, consumer electronics, electricity, Environmental protection, scientific research and other fields, the products are exported to Europe, America and Southeast Asia and other regions. The company adheres to the tenet of "customer-centric, quality first and high-quality service", provides customers with high-quality products and one-stop overall solutions, continuously improves service quality and customer satisfaction, and cooperates with the industry to develop and progress together!

Product Contents:

I. Optical Crystals :

Product Contents:

II. Precision Optics :

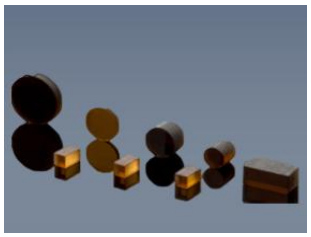
III. Optical Devices:

IV. Semiconductor Materials :

V. Lab Equipment & Consumables:

I. Optical Crystals >>>>>>>>>>>>>Laser crystals

1. Cr $^{4+}$: YAG



Cr $^{4+}$:YAG crystal is excellent passive Q-switched crystal widely used in 1μm neodymium and ytterbium lasers. It has the characteristics of high output efficiency of Q switch and suitable for repetitive frequency work. It has a high resistance to photodamage threshold, is more stable and durable than dyes and color center saturable absorbers, and can replace electro-optic Q switches to output high-power laser pulses in some cases.

Chromium doped yttrium aluminum garnet (Cr $^{4+}$: YAG) Cr: $Y_3Al_5O_{12}$ crystal It is suitable for Q switch, diode pumping, Nd:YAG, Nd:YLF, Nd:YVO_4 pumping lamps and others Lasers with a wavelength of 0.8~1.2um doped with Nd or Yb.

Main features:

High chemical stability and reliability
long life
Good thermal conductivity
High damage threshold (>500MW/cm ^{2})
Available as a high power, solid state and compact passive Q-switched switch
easy to operate

Material properties:

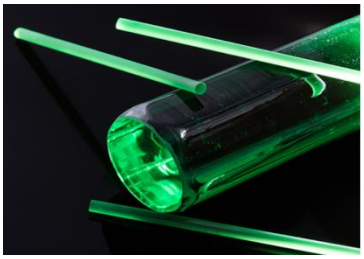
Crystal structure	Cubic system
Lattice constant	12.01 Å
Melting point	1970°C
Moh's hardness	8.5
Density	4.56g/ cm3
Specific heat	0.59J/g.cm ^{3} @0-20°C
Coefficient of thermal expansion	[111] Direction: 7.8×10 $^{-6}$ /K@0~250°C

Product parameters:

Orientation	<111>, <100>±5°
Initial absorption coefficient	0.5～6cm $^{-1}$ @1064nm
Initial transmittance	5%～95% @1064nm
Component size	Diameter: 3~20mm; Length*Width: 3×3~20×20mm
Dimensional tolerance	Diameter: 0/-0.05mm, Length: ±0.5mm
Cylindrical processing	fine grinding
Parallelism of end faces	≤30"
Flatness of end face	λ/8 @632.8nm
Surface Quality	20-10 (MIL-O-13830A)
AR Coating Reflectance	≤0.25% @1064nm
Coating anti-laser damage threshold	≥500MW/ cm2

I. Optical Crystals >>>>>>>>>>>>>Laser crystals

2. CTH :YAG



Ho:Cr:Tm:YA G is an excellent crystal emitting 2.1μm wavelength laser, which is widely used in medical, military and meteorological fields.

Main features:

High pulse output energy
Suitable for repetitive frequency work
Can work efficiently at room temperature
Suitable for lamp pumping, also suitable for diode pumping
The wavelength of laser work is relatively safe for human eyes

Material properties:

Crystal structure	Cubic system
Lattice constant	12.01 Å
Moh's hardness	8.5
density	4.56±0.04 g/ cm^3
Specific heat	0.59J/g.cm^3 @ 0-20℃
Elastic Modulus	310GPa
Young's modulus	3.17×10^4 Kg/mm^2
Poisson's ratio	0.3
Tensile strength	0.13~0.26GPa
Coefficient of thermal expansion	[100] Direction: 8.2×10^{-6} / K @ 0~250℃
	[110] Direction: 7.7×10^{-6} /K@ 0~250℃
	[111] Direction: 7.8×10^{-6} /K@ 0~250℃
Thermal conductivity	14W/m/K@20℃ ; 10.5W/m/K@100℃
Thermo-optic coefficient (dn/dT)	7.3×10^{-6} / K
Thermal shock resistance	790W/m
Solubility	Insoluble in water, slightly soluble in common acids

Product parameters:

Doping concentration	Ho:0.3～0.4at%Cr:0.3～1.2at%Tm:5～6at%
Orientation	<111>±5°
Distortion of transmitted wavefront	≤0.125λ/inch@1064nm
Extinction Ratio	≥25dB
Product Size	Diameter≤15mm, length≤150mm
Dimensional tolerance	Diameter: 0/-0.03mm, Length: 0/+0.5mm
Cylindrical processing	Grinding, polishing, threading
Parallelism of end faces	≤10"
Perpendicularity between end face and rod axis	≤5′
Flatness of end face	λ/10 @632.8nm
Surface Quality	10-5 (MIL-O-13830A)
Chamfer	0.15±0.05mm
Coating	S1/S2: R@2100mm≤0.2%
	Other films can be customized
Laser wavelength	2100nm
Refractive index	1.80 @2094nm
Special	Wedge angle, concave/convex, hot layer gold plating, etc.

3. Er: Glass Erbium Ytterbium Co-doped Phosphate Glass

Er:Glass erbium -ytterbium co - doped phosphate glass is a kind of rare earth-doped laser material based on phosphate glass . The 1.5 μm spectral range provides a useful coherent source that is relatively safe for the human eye . Mainly used for laser ranging and tracking, optical fiber communication, photoelectric countermeasures, strong laser damage, laser medical treatment, laser beauty, with the characteristics of optical waveguide amplification and high-gain optical fiber amplification .

Main features :

High laser efficiency
Low laser threshold
eye safety
highlight conversion

Material properties:

Material	Cr14	CrE5
Orientation	[100] , [110]±0.5°	[100] , [110]±0.5°
Mass density	3.10 g/ cm^3	2.95 g/ cm^3
Moh's hardness	8.5	8.5
Young's modulus	57.6 GPa	57.6 GPa
Tensile strength	2 GPa	2 GPa
Melting point	1970°C	1970°C
Thermal Conductivity	0.7	0.8
Specific heat/(J g^{-1} K^{-1})	0.59	0.59
Thermal Shock Resistance Parameters	800 W/m	800 W/m
Thermal Coefficient Optical Path Length (10 -7 /ºC) (20~100ºC)	3.6	
Linear thermal expansion coefficient (10 -7 / K) (20~100°C)	103	80.5
Linear thermal expansion coefficient (10 -7 / K) (100~300°C)	127	87
Softening temperature (Celsius)	493	519
Transition Temperature (Celsius)	455	476
Chemical durability (weight loss rate in distilled water at 100ºC) (μg/hr.cm^2)	103	
dn/dT (10-6 / ºC) (20~100ºC)	-5.2	-6.8
Refractive Index @ 1535 nm	1.53	1.533
Refractive index (d 589.3nm)	1.539	1.541
Abbe value	64	63.6

Product parameters:

Orientation Tolerance	< 0.5°
Thickness/Diameter Tolerance	±0.05mm
Surface roughness	<λ/8@632nm
Wavefront distortion	<λ/4@632nm
Surface Quality	10-5 (MIL-O-13830A)
Parallelism	10"
Perpendicularity	15'
Clear aperture	>90%
Chamfer	<0.1×45°

I. Optical Crystals >>>>>>>>>>>>>Laser crystals

4. Er: YAG erbium -doped yttrium aluminum garnet

Er: YAG erbium-doped yttrium aluminum garnet is an excellent crystal emitting 2.94μm wavelength laser, suitable for room temperature work, and widely used in laser medical and other fields. It has high slope efficiency, and the laser working wavelength is relatively safe for human eyes.

Main features:

high slope efficiency
work at room temperature
Laser operating wavelength is relatively safe for human eyes

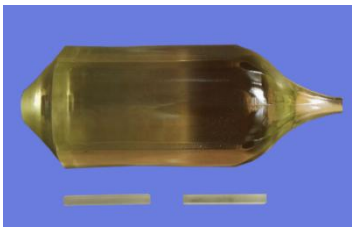
Material properties:

Crystal structure	Cubic system
Lattice constant	12.01 Å
Melting point	1970℃
Moh's hardness	8.5
Density	4.56±0.04g/ cm^3
Specific heat	0.59J /g.cm^3
Elastic Modulus	310GPa
Young's modulus	3.17×10^4 Kg/mm^2
Poisson's ratio	0.3
Tensile strength	0.13~0.26GPa
Coefficient of thermal expansion	[100] Direction: 8.2×10^{-6} /K @0~250℃
	[110] Direction: 7.7×10^{-6} /K @0~250℃
	[111] Direction: 7.8×10^{-6} /K @0~250℃
Thermal conductivity	14W/m/K@20℃
	10.5W/m/K@100℃
Thermo-optic coefficient	dn/dT =7.3×10^{-6} /K
Thermal shock resistance	790W/m
Solubility	Insoluble in water, slightly soluble in common acids

Product parameters:

Doping concentration	50at%
Orientation	<111>±5°
Wavefront distortion	≤0.125λ per inch@632.8nm
Extinction Ratio	≥25dB
Product Size	Ø≤15mm, L≤150mm
Dimensional tolerance	Ø:0/-0.05mm,L:0/+0.5mm
Cylindrical processing	Grinding, polishing, threading
Parallelism of end faces	≤10"
Perpendicularity between end face	≤5′
Flatness of end face	λ/10 @632.8nm
Surface Quality	10/5 (MIL-O-13830A)
Chamfer	0.15±0.05mm
Coating	S1/S2: R≤0.25% @2940nm
	S1: PR＝88%±3% @2940nm; S2: HR≥99.8% @2940nm
	Other films can be customized
Coating anti-laser damage threshold	≥5J/cm2, 10ns, 10Hz
Laser wavelength	
Refractive index	1.79 @2940nm
Special requirements	Wedge angle, concave/convex, hot layer gold plating, etc.

5. Ho:YAG



Ho ion is used as active ion, the pump wavelength is 1.9 μm, and the output wavelength is 2.05 μm unpolarized laser. Due to the excellent physical and chemical properties of the YAG matrix, it can withstand high thermal loads, so it can output 2.05 μm lasers with high power and high repetition frequency. It is an important pump source laser crystal for mid-wave infrared lasers.

Main features:

Unpolarized laser output
high thermal conductivity
Strong thermal shock resistance
Suitable for 1.9μm laser pumping

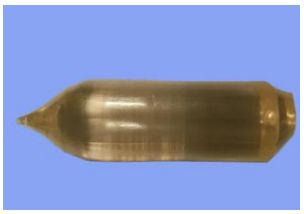
Material properties:

Crystal structure	Cubic system
Lattice constant	12.01 Å
Melting point	1970°C
Moh's hardness	8.5
Density	4.56±0.04g/ ^{cm3}
Specific heat	0.59J/g.cm ^{3} @0-20°C
Elastic Modulus	310GPa
Young's modulus	3.17×10 ^{4} Kg/mm2
Poisson's ratio	0.3
Tensile strength	0.13~0.26GPa
Coefficient of thermal expansion	[100] Direction: 8.2×10 $^{-6}$ /K@ 0~250°C
	[110] Direction: 7.7×10 $^{-6}$ /K@0~250°C
	[111] Direction: 7.8×10 $^{-6}$ /K@0~250°C
Thermal conductivity	14W/m/K@20°C
	10.5W/m/K@100°C
Thermo-optic coefficient (dn/dT)	dn/dT =7.3×10 $^{-6}$ /K
Thermal shock resistance	790W/m
Solubility	Insoluble in water, slightly soluble in common acids

Product parameters:

Doping concentration	0~3at% Can be customized according to customer requirements
Orientation	<111>±5°
Wavefront distortion	≤0.25λ/25mm @632.8nm
Size	Diameter: 3~15mm, Length: 5~180mm , can be customized
Dimensional tolerance	Diameter: +0.00/-0.05mm, Length: ± 0.5mm
Cylindrical processing	Grinding or Polishing
Parallelism of end faces	≤10"
Perpendicularity between end face and rod axis	≤5′
Flatness of end face	≤λ/10@632.8nm
Surface Quality	10-5 (MIL-O-13830A)
Chamfer	0.15±0.05mm
AR Coating Reflectance	≤0.25%

6. Ho :YAP



Ho:YAP laser is around 2um, which is in the atmospheric window. It provides a favorable tool for remote sensing detection and photoelectric countermeasures. It is also an ideal light source for systems such as coherent Doppler wind radar, differential absorption radar and laser range finder. . YAP crystal has excellent thermodynamic properties , and its thermal conductivity is close to that of common YAG crystal. It can suppress thermally induced birefringence and thermal lens effect during laser operation, and can output linearly polarized laser light.

7. Ho:YLF

Ho ions are used as active ions, the pumping wavelength is 1.9 μm, and the output wavelength is 2.05 μm linearly polarized laser, which can well pump ZGP to output 3-5 μm mid-wave infrared laser . Selecting the appropriate doping concentration and crystal size can output a higher power 2.05μm laser, which is an important pump source laser crystal for mid-wave infrared lasers.

Main features:

Linearly polarized laser output
The thermal effect of laser operation is small
Suitable for 1.9μm laser pumping

Material properties:

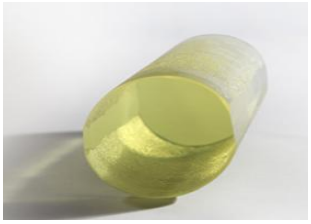
Melting point	825°C
Moh's hardness	4-5
Density	3.95g/ cm^3
Thermal conductivity	0.06W/cm/K
Young's modulus	7.5×1011dynes cm^{-2}
Tensile strength	3.3×108dynes cm^{-2}
Coefficient of thermal expansion	[100] Direction: 13×10^{-6} /K
	[001] Direction: 8×10^{-6} /K

Product parameters:

Doping concentration	0~3at% can be customized according to customer requirements
Orientation	[100] or [001], deviation within 5°
Wavefront distortion	≤0.25λ/25mm @632.8nm
Crystal rod size	Diameter: 3~9.5mm, Length: 5~120mm can be customized
Dimensional tolerance	Diameter: +0.00/-0.05mm, Length: ± 0.5mm
Cylindrical processing	Grinding or Polishing
Parallelism of end faces	≤10"
Perpendicularity between end face and rod axis	≤5′
Flatness of end face	≤λ/10@632.8nm
Surface Quality	10-5 (MIL-O-13830A)
Chamfer	0.15±0.05mm
AR Coating Reflectance	≤0.25%

I. Optical Crystals >>>>>>>>>>>>>Laser crystals

8. Ho:Tm:YLF



Ho:Tm:YLF crystal is a 2μm laser crystal sensitized by Tm ions, and the output wavelength is 2.05μm linearly polarized laser. The pump wavelength is 792nm, and the working mode is: Tm ions absorb the 792nm pump light energy, transfer the energy to the upper energy level of the Ho ion laser through a non-radiative transition method, and emit laser light from the Ho ion. The advantage of this working method is that the structure of the laser is relatively simple, the laser efficiency is high , and it can be miniaturized. Its disadvantage is that the crystal has to bear a large heat loss and is not suitable for high-power output lasers.

Main features:

Linearly polarized laser output

The thermal effect of laser operation is small

Suitable for diode pumped

Suitable for miniaturized compact lasers

Material properties :

Crystal structure	Tetragonal
Melting point	825°C
Moh's hardness	4-5
Density	3.95g/ cm^3
Thermal conductivity	0.06W/cm/K
Young's modulus	7.5×1011dynes cm^{-2}
Tensile strength	3.3×108dynes cm^{-2}
Coefficient of thermal expansion	[100] Direction: 13×10^{-6} /K
	[001] Direction: 8×10^{-6} /K

Product parameters:

Doping concentration	Doping concentration Tm:0~10at% Ho:0~3at% Can be customized according to customer requirements
Orientation	[100] or [001], deviation within 5º
Wavefront distortion	≤0.25λ/25mm @632.8nm
Crystal rod size	Diameter: 3~9.5mm, Length: 5~120mm , can be customized
Dimensional tolerance	Diameter: +0.00/-0.05mm, Length: ± 0.5mm
Cylindrical processing	Grinding or Polishing
Parallelism of end faces	≤10"
Perpendicularity between end face and rod axis	≤5′
Flatness of end face	≤λ/10@632.8nm
Surface Quality	10-5 (MIL-O-13830A)
Chamfer	0.15±0.05mm
AR Coating Reflectance	≤0.25%

9. Nd:GGG

Nd:GGG is an excellent crystal for solid-state heat capacity lasers and high-power pulsed solid-state lasers. Because of its high density and large heat capacity, it is very suitable for heat capacity work.

Nd:GGG crystals can be grown by the melt pulling method planar interface growth technology to obtain large-sized and high-quality crystals, so they are the preferred materials for high-energy heat-capacity solid-state lasers and high-average-power pulsed solid-state lasers.

Main features :

Suitable for working in heat capacity mode to obtain high-energy laser output

High-quality large-diameter crystals can be obtained

Material properties:

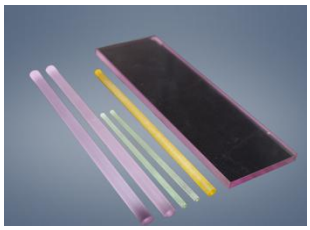
Crystal structure	Cubic system
Lattice constant	12.383 Å
Melting point	1725°C
Density	7.1 g/ cm^3
Moh's hardness	8
Coefficient of thermal expansion	8 x 10^{-6} /K
Poisson's ratio	0.28
Thermo-optic coefficient	dn/dT =17 x10^{-6} /K

Product parameters:

Doping concentration	Nd:0.5~3at%
Orientation	[111], ± 5°
Wavefront distortion	≤1/2λ/25mm@632.8nm (crystal rod)
Extinction Ratio	≥20dB @632.8nm (crystal rod)
Crystal size	Diameter: 2~70mm, Length: 3~100mm or customized according to customer requirements
Dimensional tolerance	Diameter: +0.00/-0.05mm, Length: ± 0.5mm
Cylindrical processing	400# abrasive fine grinding or polishing
Parallelism of end faces	≤10" (Crystal Rod)
Flatness of end face	≤ λ/4@632.8nm (crystal rod)
AR Coating Reflectance	≤0.25% @1064nm
Coating anti-laser damage threshold	≥500MW/ cm^2

I. Optical Crystals >>>>>>>>>>>>>Laser crystals

10. Nd:YAG Nd- doped yttrium aluminum garnet



Nd:YAG Nd -doped yttrium aluminum garnet is the solid-state laser material with the best comprehensive performance. It has the characteristics of high gain, low laser threshold, good thermal conductivity and thermal shock, and is suitable for various working modes (continuous , pulse , Q-switch, Mode-locked), often used in near-far infrared solid-state lasers and double frequency, triple frequency applications, and widely used in scientific research, medical, industrial , military and other fields.

Main features:

High gain , low threshold , high efficiency , high optical quality , low loss , high mechanical strength , excellent thermal conductivity and thermal shock resistance are suitable for various laser working modes (continuous, pulsed, Q-switched, mode-locked, frequency multiplied, etc.) high average power solid-state lasers .

Material properties:

Crystal structure	Cubic system
Lattice constant	12.01 Å
Melting point	1970℃
Moh's hardness	8.5
Density	4.56±0.04g/ cm^3
Specific heat	0.59J/g.cm^3 @0-20℃
Elastic Modulus	310GPa
Young's modulus	3.17×10^4 Kg/ mm^2
Poisson's ratio	0.3
Tensile strength	0.13~0.26GPa
Coefficient of thermal expansion	[100] 8.2×10^{-6} /K @ 0~250℃;[110] 7.7×10^{-6} /K @0~250℃ [101] [111] 7.8×10^{-6} /K @0~250℃
Thermal conductivity	14W/m/K @20℃; 10.5W/m/ K@100℃
Thermo-optic coefficient (dn/dT)	7.3×10^{-6} /K
Thermal shock resistance	790W/m

Product parameters:

Doping concentration	Nd: 0.1～ 2.5at %
Orientation	[111] or [100], ±5°
Wavefront distortion	≤λ/10/inch@632.8nm _ _
Extinction Ratio	≥ 25dB _
Crystal rod size	Diameter:＜ 50 mm, Length:＜ 220 mm ; can be customized
Dimensional tolerance	Diameter: +0.00/-0.05mm, Length: ±0.5mm
Cylindrical processing	Grinding , polishing , threading, etc.
Parallelism of end faces	≤10"
Perpendicularity between end face	≤5′
Flatness of end face	λ/10 @632.8nm
Surface Quality	10-5 (MIL-O-13830A)
Chamfer	0.15±0.05mm
Coating	Anti-reflection coating: R<0.15% @1064nm, R＜0.5% @808nm, R＜0.15% @532nm,Partial reflection film: R=(10~90)%±2% @1064nm High reflection film: R＞99.8% @1064nm, R＞99.8% @808nm
Damage threshold	≥1GW/ cm^2 @1064nm, 10ns, 10Hz

11. Nd:YAP

Nd:YAP is an excellent laser crystal for high-power solid-state lasers Because it outputs linearly polarized light, it is especially suitable for solid-state lasers with electro-optic boxes or harmonic generators to obtain high-efficiency laser output . The 1.34μm wavelength laser emitted by Nd:YAP crystal has greater advantages in laser medical applications than the 1.32μm wavelength laser emitted by Nd:YAG crystal.

Main features:

Output linearly polarized laser

1.079μm laser threshold and output efficiency are similar to 1.064μm of Nd:YAG crystal

1.34μm laser output efficiency is higher than 1.32μm of Nd:YAG crystal

The absorption of water and human body fluid tissue to 1.34μm laser is higher than that of 1.32μm

Material properties:

Crystal structure	Orthorhombic system
Lattice constant	a = 0.518 nm, b = 0.532 nm c = 0.736nm
Melting point	1870℃
Density	5.35 g/ cm^3
Moh's hardness	8.5
Specific heat capacity	400J/(kg K)
Coefficient of thermal expansion	a axis: 9.5 x 10^{-6} /K , b axis: 4.2 x 10^{-6} /K ; c axis: 10.8 x 10^{-6} /K
Thermal conductivity	11W/(m·K)
Refractive index	na=1.91, nb=1.92, nc=1.94
Thermo-optic coefficient	dna/dT=9.7 x 10^{-6} /K dnb/dT=14.5 x 10^{-6} /K

Product parameters:

Doping concentration	Nd: 0.7~ 0.9 at%@1.079 μm (continuous, pulsed laser), 0.85~0.95at%@1.34μm (continuous laser) other doping
Orientation	[010], ±5°
Crystal rod size	Diameter: 2~10mm, length: 20~150mm , can be customized
Dimensional tolerance	Diameter: +0.00/-0.05mm, Length: ± 0.5mm
Cylindrical processing	Grinding and Polishing
Parallelism of end faces	≤10"
Perpendicularity between end face and	≤5′
Flatness of end face	≤λ/10 @632.8nm
Surface Quality	10-5 (MIL-O-13830A)
Chamfer	0.15±0.05mm
AR Coating Reflectance	≤0.25%
Damage threshold	≥500MW/ cm^2

12. Nd:YLF

Nd:YLF is an excellent crystal that is very suitable for mode-locking to obtain short-pulse lasers. Its thermal lens effect is very small, the fluorescence line width is wide, and it outputs linearly polarized light. Nd:YLF crystals have gained important applications in inertial confinement laser fusion scientific research projects.

Main features:

Thermal lensing effect is much smaller than YAG crystal

Relatively small stimulated emission cross-section is conducive to low-threshold continuous operation

Suitable for medium repetition rate high average power Q-switched locks

Efficient single-mode operation with high output power and low beam divergence

The output linearly polarized laser is beneficial to obtain high-efficiency Q-switching and frequency-doubling output

Large diameter round rods or large size slats also obtain uniform pattern laser output

The 1053nm laser wavelength matches the gain curve of phosphate neodymium glass and is suitable as an oscillator and preamplifier for high power neodymium glass laser systems.

Material properties:

Crystal structure	Tetragonal
Melting point	825°C
Moh's hardness	4-5
Density	3.95g/ cm^3
Thermal conductivity	0.06W/cm/K
Young's modulus	7.5×10^{11} dynes cm^{-2}
Tensile strength	3.3×10^{8} dynes cm^{-2}
Coefficient of thermal expansion	[100] Direction: 13×10^{-6} /K
	[001] Direction: 8×10^{-6} /K

Product parameters:

Doping concentration	Nd:~1.0 at%
Orientation	[100] or [001], deviation 5 degrees within
Wavefront distortion	≤0.25λ/25mm @632.8nm
Crystal rod size	Diameter: 3~8mm, length: 10~120mm can be customized according to
Dimensional tolerance	Diameter: +0.00/-0.05mm, Length: ± 0.5mm
Cylindrical processing	Grinding or Polishing
Parallelism of end faces	≤10"
Perpendicularity between end face	≤5′
Flatness of end face	≤λ/10@632.8nm
Surface Quality	10-5 (MIL-O-13830A)
Chamfer	0.15±0.05mm
AR Coating Reflectance	≤0.25% @1047/1053nm
Coating anti-laser damage threshold	≥500MW/ cm^2

13. Nd:YVO4 doped neodymium yttrium vanadate

Nd:YVO 4 neodymium-doped yttrium vanadate crystal is a laser crystal with excellent comprehensive performance for making semiconductor pumped solid-state lasers . It is widely used in machinery, material processing, spectroscopy, wafer inspection, display, medical testing laser printing, Data storage and other fields. It has the characteristics of good thermal conductivity, large stimulated emission cross section, high laser damage threshold, absorption bandwidth, and absorption peak at about 808nm. Because of these advantages, small crystals can be used to make smaller laser devices. Another feature of the Nd:YVO 4 crystal is that it is uniaxial, which makes it emit linearly polarized light. Combined with a frequency doubling crystal, an all-solid-state laser with three wavelengths of green, blue, and red can be realized. Now Nd:YVO 4 lasers have been widely used in many fields such as machinery, material processing, spectroscopy, wafer inspection, display, medical detection, laser printing, and data storage. Moreover, Nd:YVO 4 diode-pumped solid-state lasers are rapidly replacing the traditional water-cooled ion lasers and lamp-pumped lasers in the market, especially in terms of miniaturization and single longitudinal mode output. It can be used in laser diode-pumped all-solid-state (DPSS) micro lasers, lidar, and remote sensing satellite products.

Main features:

High absorption coefficient , large stimulated emission cross section , absorption bandwidth , high damage threshold , uniaxial crystal , good physical and optical properties

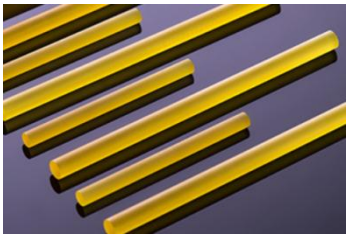
Material properties:

Crystal structure	Zircon tetragon, space group D4h-I4/amd
Lattice constant	a=b=7.12, c=6.29
Density	4.22g/ ^{cm3}
Melting point	1825
Thermal conductivity / (W m $^{-1}$ K $^{-1}$ @	5.2
Thermo-optical coefficient (dn/dT)	dn o /dT=8.5×10 $^{-6}$ /K; dn e /dT=2.9×10 $^{-6}$ /K
Coefficient of thermal expansion/(10 $^{-6}$ K	a = 4.43, c = 11.4
Hardness (Mohs)	4~5

Product parameters:

Doping concentration	0.07%~3%, ±0.05%(at%<1%),±0.1%(at%≥1%)
Orientation	A-cut/C-cut ±0.5 °
Dimensional tolerance	±0.1mm
Flatness	λ/10 @632.8nm
Wavefront distortion	λ/10 @632.8nm
Surface finish	10/5 MIL-O-13830B
Parallelism	10″
Perpendicularity	10′
Chamfer	<0.1mm @45deg.
Chipping	<0.1mm
Clear aperture	>95%
Coating	AR/HR/PR is customized according to customer requirements
Damage threshold	7.5J/cm ^{2} @1064nm, TEM00, 10ns, 10Hz

14. Nd : Ce:YAG



Nd:Ce:YAG is an excellent laser crystal without water-cooling and air-cooling solid-state lasers, and is widely used in small laser range finders and laser medical instruments.

Main features:

high efficiency

low threshold

high optical quality

Good resistance to UV radiation and good thermal stability

Material properties:

Crystal structure	Cubic system
Lattice constant	12.01 Å
Melting point	1970℃
Moh's hardness	8.5
Density	4.56±0.04 g/ cm^3
Specific heat	0.59J/ g.cm3 @0-20℃
Elastic Modulus	310GPa
Young's modulus	3.17×10^4 Kg/ mm^2
Poisson's ratio	0.3
Tensile strength	0.13~0.26 GPa
Coefficient of thermal expansion	[100] Direction: 8.2×10^{-6} /K @0~250℃
	[110] Direction: 7.7×10^{-6} /K @0~250℃
	[111] Direction: 7.8×10^{-6} /K @0~250℃
Thermal conductivity	14W/m/K @20℃
	10.5W/m/K @100℃
Thermo-optic coefficient (dn/dT)	dn/dT =7.3×10^{-6} /K
Thermal shock resistance	790W/m
Solubility	Insoluble in water, slightly soluble in common acids

Product parameters:

Doping concentration	Nd: 1.1～1.4at%, Ce: 0.05～0.1at%
Orientation	[111], ±5°
Wavefront distortion	≤ 1/4 lambda/25mm
Extinction Ratio	≥28dB
Size	Diameter: 3 ~ 6mm , length: 40 ~ 80mm can be customized according to
Dimensional tolerance	Diameter: +0.00/-0.05mm , Length: ±0.5mm
Cylindrical processing	Grinding or Polishing
Parallelism of end faces	≤10"
Perpendicularity	≤5′
Flatness of end face	λ/10 @632.8nm
Surface Quality	10-5 (MIL-O-13830A)
Chamfer	0.15±0.05mm

15. Titanium sapphire (Ti:Al_2O_3)

Titanium-doped sapphire (Ti:Al_2O_3) laser crystal is the core material for femtosecond ultrashort pulse laser and petawatt-level high-power laser technology. The crystal has tunable wavelength (660-1200nm) and wide emission bandwidth (About 600nm), large emission cross-section, high thermal conductivity, excellent physical and chemical properties, etc., is currently the most widely used tunable laser crystal and the most important working medium for ultra-fast, ultra-intense and high-power laser operation.

Main features:

Broad wavelength tunability
Broad absorption pump band
Excellent output efficiency
Short excited state lifetime (3.2 mm)
Narrow clamp width
high damage threshold
Excellent thermal conductivity

Material properties:

Doping concentration	0.0 6 -0.5 wt%
Absorption range/absorption peak	400-600nm / 488nm
Absorption coefficient (@ 490nm)	1.0-7.5cm $^{-1}$
FOM value	100~300
Tuning Range/Emission Peak	660-1050nm / 795nm
Refractive index	1.76 @ 800nm
Fluorescence lifetime	3.2μs (T = 300K)
Crystal structure and unit cell	Hexagonal, a=4.748 Å , c=12.957 Å
Thermal conductivity	0.105cal/cm/sec/℃
Mohs hardness	9 Mohs
Density	3.98 g/ cm3

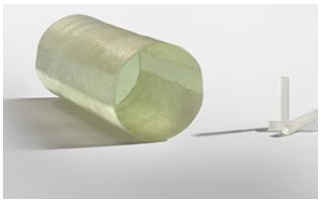
Product parameters:

Diameter size	3 ~ 220mm _
Length	1~80mm
Cutting method	Flat, Brewster's corner or customized
Orientation	[0001]
Wavefront distortion	＜λ/4@632nm
Flatness	＜λ/8@632nm
Clear aperture	>90%
Parallelism	<10"
Surface quality	10/5
Coating	According to customer requirements

I. Optical Crystals >>>>>>>>>>>>>Laser crystals

16. Tm: YLF

Tm: YLF crystal is a negative uniaxial crystal with a negative temperature coefficient of refractive index, which can offset part of thermal distortion, so the output beam quality is high.



The pumping wavelength is 792nm, and the linearly polarized laser light of 1.9μm is output in the a-axis direction. The c-axis output is non-linearly polarized light. Selecting the appropriate crystal size and doping concentration can obtain high-power laser output, and it is an important pump source laser crystal for mid-wave infrared lasers.

Main features:

Linearly polarized laser output
The thermal effect of laser operation is small
Cross relaxation
Efficient
Suitable for diode pumped

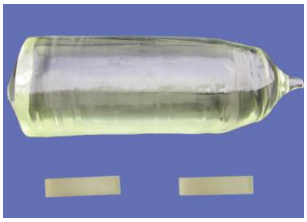
Material properties:

Crystal structure	Tetragonal
Melting point	825°C
Moh's hardness	4-5
Density	3.95g/ cm^3
Thermal conductivity	0.06W/cm/K
Young's modulus	7.5×10^{11} dynes cm^{-2}
Tensile strength	3.3×10^{8} dynes cm^{-2}
Coefficient of thermal expansion	[100] Direction: 13×10^{-6} /K
	[001] Direction: 8×10^{-6} /K

Product parameters:

Doping concentration	0~5at% Can be customized according to customer requirements
Orientation	[100] or [001], ± 5°
Wavefront distortion	≤0.25λ/25mm @632.8nm
Crystal rod size	Diameter: 3~9.5mm, Length: 5~120mm Can be customized according to customer requirements (round rod or plank)
Dimensional tolerance	Diameter: +0.00/-0.05mm, Length: ± 0.5mm
Cylindrical processing	Grinding or Polishing
Parallelism of end faces	≤10"
Perpendicularity between end face	≤5′
Flatness of end face	≤λ/10@632.8nm
Surface Quality	10-5 (MIL-O-13830A)
Chamfer	0.15±0.05mm
AR Coating Reflectance	≤0.25%

17. Tm:YAP



Tm:YAP crystal is one of the most important crystals for LD pumping to emit 2um band laser, with excellent physical and chemical properties . The anisotropy in the structure of the Tm:YAP material makes the emission section also anisotropic, and the Tm:YAP crystals with different orientations have different laser functions, output wavelengths and operating forms .

Compared with the physical and chemical properties of Tm:YAG, the 795nm pump absorption band of Tm:YAP crystal matches the emission wavelength of commonly used high-power AlGaAs diodes better, and its pump absorption bandwidth is 4nm wider than that of Tm:YAG crystal, with higher efficiency , and directly output linearly polarized light.

Tm:YAP crystals are widely used in medical, communication and other fields.

Main features :

Excellent physical and chemical properties

2mm band laser output efficiency is higher than Tm:YAG

Directly Linearly Polarized Light Output

LD pump absorption bandwidth is 4nm wider than that of Tm:YAG crystal

The 795nm pump absorption band matches the emission wavelength of commonly used AlGaAs diodes better

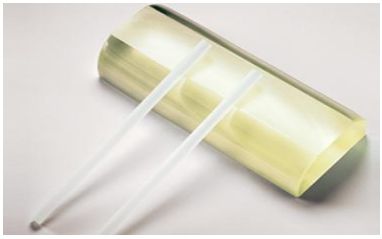
Material properties:

Lattice constant	a = 0.518 nm , b = 0.532 nm c = 0.736 nm
Melting point	1870 °C
Density	5.35 g/ ^{cm3}
Moh's hardness	8.5
Specific heat capacity	400 J/(kg ·K)
Thermal conductivity	11W/(m·K)
Coefficient of thermal expansion	a-axis: 9.5x 10^{-6} /K；b-axis: 4.2 x 10^{-6} /K ; c-axis: 10.8x 10^{-6} /K
Refractive index	na=1.91 , nb=1.92, nc=1.94
Thermo-optic coefficient	dn a /dT=9.7 x 10^{-6} /K ; dn c /dT=14.5 x 10^{-6} /K

Product parameters:

Doping concentration	Tm: 0.2~15at%
Orientation	[010] or [100] ±5°
Crystal size	Diameter 2~10mm, length 2~100mm , can be customized
Wavefront distortion	≤0.125l/25mm @632.8nm
Extinction Ratio	≥25dB
Dimensional tolerance	Diameter: +0.00/-0.04, length ±0.5mm
Cylindrical processing	Grinding or Polishing
Parallelism of end faces	≤10"
Perpendicularity between end face	≤5′
Flatness of end face	l/8 @632.8nm
Surface finish	10/5 (MIL-O-13830A)
Chamfer	0.15±0.05mm
AR Coating Reflectance	≤0.25%

18. Tm:YAG



Tm:YAG is an excellent crystal suitable for AlGaAs diode pumping to emit 2μm band laser, and its application in medical, military and meteorological fields has attracted much attention.

Main features:
Work in the 2μm eye-safe band range
Effective cross-relaxation between Tm ions and high quantum efficiency
LD pumping efficiency is high

Material properties:

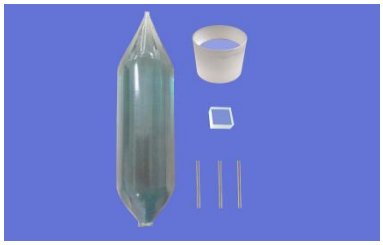
Crystal structure	Cubic system
Lattice constant	12.01 Å
Melting point	1970℃
Moh's hardness	8.5
Density	4.56±0.04g/ cm^3
Specific heat	0.59J/ $g.cm^3$ @0-20℃
Elastic Modulus	310GPa
Young's modulus	3.17×10^4 Kg/ mm^2
Poisson's ratio	0.3
Tensile strength	0.13~0.26 GPa
Coefficient of thermal expansion	[100] Direction: 8.2×10^{-6} /K @0~250℃
	[110] Direction: 7.7×10^{-6} /K @0~250℃
	[111] Direction: 7.8×10^{-6} /K @0~250℃
Thermal conductivity	14W/m/K @20℃
	10.5W/m/K @100℃
Thermo-optic coefficient	dn/dT =7.3×10^{-6} /K
Thermal shock resistance	790W/m
Solubility	Insoluble in water, slightly soluble in common acids

Product parameters:

Doping concentration	Tm:0.5~5at%
Orientation	[111], ± 5°
Wavefront distortion	≤ 0.125λ/25 mm @632.8nm
Extinction Ratio	≥ 25dB @632.8nm
Crystal rod size	Diameter: 2~10mm, Length: 3~150mm
Dimensional tolerance	Diameter: +0.00/-0.05mm, Length: ± 0.5mm
Cylindrical processing	Grinding or Polishing
Parallelism of end faces	≤10"
Perpendicularity between end face	≤5′
Flatness of end face	≤λ/4@632.8nm
Surface Quality	10-5 (MIL-O-13830A)
Chamfer	0.15±0.05mm

I. Optical Crystals >>>>>>>>>>>>>Laser crystals

19. Yb:YAG doped yttrium aluminum garnet



Yb:YAG is an important diode-pumped laser crystal, which is more suitable for diode pumping than traditional Nd-doped laser materials. Compared with the commonly used Nd:YAG crystal, Yb:YAG crystal has a wider diode pump absorption bandwidth, which can effectively reduce the thermal management requirements of laser diodes. At the same time, the Yb ion laser has a long upper-level fluorescence lifetime, no excited state absorption and energy up-conversion, no radiation heat loss, and the heat load generated per unit pump power is 3 to 4 times lower than that of Nd:YAG crystals. Excellent crystal for average power solid-state lasers.

Main features:

high slope efficiency
High optical quality , thermal conductivity and mechanical strength
No excited state absorption and upconversion
The heat load generated by unit pump power is lower than that of Nd:YAG crystal
Diode pump absorption bandwidth is about 8nm@940nm
Suitable for common high power InGaAs laser diode (wavelength 940nm or 970nm) pumping

Material properties:

Crystal structure	Cubic system
Lattice constant	12.01 Å
Melting point	1970℃
Moh's hardness	8.5
Density	4.56±0.04 g/ cm^3
Specific heat	0.59J/ $g.cm^3$ @0-20℃
Elastic Modulus	310GPa
Young's modulus	3.17×10^4 Kg/ mm^2
Poisson's ratio	0.3
Tensile strength	0.13~0.26 GPa
Coefficient of thermal expansion	[100] Direction: 8.2×10^{-6} /K @ 0~250℃

Product parameters :

Doping concentration	0.5～25at%
Orientation	<111>±5°
Wavefront distortion	≤0.125λ/inch@632.8nm _ _
Extinction Ratio	≥25dB
Product Size	Diameter ≤ 30mm, length ≤ 220 mm, slats and discs can be customized
Dimensional tolerance	Diameter: 0/-0.05mm, Length: 0/+0.5mm
Cylindrical processing	Grinding, polishing, threading
Parallelism of end faces	≤10"
Perpendicularity between end face	≤5′
Flatness of end face	λ/10 @632.8nm
Surface Quality	10-5 (MIL-O-13830A)
Chamfer	0.15±0.05mm
Coating	S1/S2: R@1030nm≤0.2%&R@940nm≤2.0%
Damage threshold	≥1GW/ cm2 @1064nm, 10ns, 10Hz
Diode pump absorption wavelength	940nm or 970nm
Special	Wedge angle, concave/convex, hot layer gold plating

I. Optical Crystals >>>>>>>>>>>>>Laser crystals

20. Bonded crystals

Crystal bonding is a composite technology of laser crystals. Since most optical crystals have a high melting point, it is usually necessary to use high-temperature heat treatment to promote the mutual diffusion and fusion of molecules on the surface of two crystals that have undergone precision optical processing, and finally form a stable chemical bond. Combination in the true sense, so crystal bonding technology is also called diffusion bonding technology (or thermal bonding technology).

Main features:

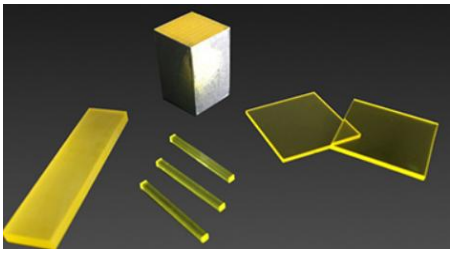
Reduce laser rod thermal lensing
Improve beam quality
Make the laser device system more compact, miniaturized and integrated

Product parameters:

Material	doping concentration	size	length
YVO_4 + Nd:YVO_4 + YVO_4	0.1%-3%	1×1-20×20	0.5-30
		Φ2-15	
YAG + Nd:YAG + YAG	0.1%-2.5%	1×1-20×20	0.5-200
		Φ2-15	
YAG + Nd:YAG + Cr^{4+}:YAG	0.1%-2.5% / 0.6-7	1×1-20×20	0.5-200
		Φ2-15	
YAG + Nd:Ce:YAG + Cr^{4+}:YAG	0.6 - 7	1×1-20×20	0.5-200
		Φ2-10	
YAG + Yb:YAG + Cr^{4+}:YAG	1%-45% / 0.6-7	1×1-20×20	0.5-200
		Φ2-10	

I. Optical Crystals >>>>>>>>>>>>>Scintillation crystals

1. Ce:GAGG cerium doped gadolinium aluminum gallium garnet



Ce:GAGG cerium-doped gadolinium aluminum gallium garnet is a relatively new single crystal scintillator with many properties such as high light yield, high density, good energy resolution, emission peaks well matched to silicon sensors, low Intrinsic Energy Resolution.

Main features:
High light output
high energy resolution
high density
no self-radiation
No deliquescence

Typical application:
Computed tomography (CT), positron emission tomography (PET), single photon emission computerized tomography (SPECT), particle accelerators, X-ray and gamma-ray detection, nuclear radiation sensing, industrial security inspection, high-energy physics and other fields .

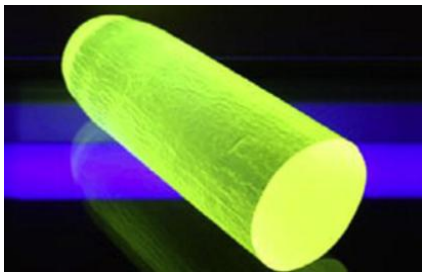
Material properties:

molecular formula	$Ce:Gd_3Al_2Ga_3O_{12}$
density	6.63g/ cm^3
hardness	8 Mohs
melting point	1850°C
atomic number	54.4
growth method	Czochralski
Thermal expansion coefficient	TBA* 10^{-6}

Product parameters:

Orientation accuracy	<0.5°
size	Customized
tolerance	±0.05mm
Parallelism	＜30″
Perpendicularity	<15'
smoothness	10-5
Clear aperture	>90%
Chamfer	＜0.1mm @45°

2. Ce: LuAG doped with cerium lutetium aluminum garnet



Ce:LuAG is a scintillation crystal with excellent performance, which has fast decay (80ns), high light yield, and emission peak at 510nm, which is comparable to the sensitivity of industrial silicon CCD detectors and good mechanochemical stability.

Main features:
Good mechanical and chemical stability
high density
fast decay time
non-hygroscopic

Typical application:
Micro-nano CT
High Energy Gamma and Charged Particle Detection
X -ray, beta , ultraviolet ray imaging screen with high spatial resolution
LED lighting and laser lighting

Material properties:

molecular formula	$Ce:Lu_3Al_5O_{12}$
density	6.73g/ cm^3
hardness	8.5 Mohs
melting point	1970°C
emission peak	510nm
Lattice constant	a=11.914 Å
Reflection coefficient	1.84
Coefficient of expansion	$8.8*10^{-6}$ /°C
decay time	80 ns
energy resolution	<8%

Product parameters:

Orientation accuracy	<0.5°
size	Customized
tolerance	±0.05mm
Parallelism	＜10″
smoothness	10-5
Perpendicularity	<15'
Chamfer	＜0.1mm @45°

3. Ce :YAG doped with cerium yttrium aluminum garnet

Ce:YAG , as a scintillation crystal, has high luminous efficiency and wide light pulse, high light yield (15 000Ph/Mev) and fast decay time (78ns) , and its luminous peak (550nm) It can well match with the sensitive detection wavelength of silicon photodiodes, and has high coupling efficiency, and is suitable for use when photodiodes are used as photodetectors and for detecting lightly charged particles. In addition, Ce:YAG Crystals are also widely used as phosphors in cathode ray tubes and can be used in white light LED as a fluorescent conversion material.

Main features:

The emission wavelength matches the sensitive detection wavelength of silicon photodiodes, with fast attenuation, no afterglow, no deliquescence, high temperature resistance, stable chemical properties, and can be used in extreme detection environments.

Typical application:

light particle detection

Alpha Particle Detection

gamma ray detection

Electron detection imaging and high-resolution microscopic imaging, etc.

Material properties:

performance	YAG (Ce)
Density (g/cm3)	4.55
Irradiation length (90% absorption)	2.61
Decay time (ns) (fast/slow) (intensity	85/300 (72/28)
Luminescence peak wavelength (nm)	550
Light output (%NaI:Tl)	31
Refractive index	1.82
Whether deliquescence	no
Melting point (°C)	1970
energy resolution @662KeV 137Cs (%)	11.1
effective atomic number	35

Product parameters:

Orientation accuracy	<0.5°
tolerance	±0.05mm
Parallelism	＜10″
smoothness	10-5
Perpendicularity	<15'
Chamfer	＜0.1mm @45°

4. Ce:YAP the crystal

Ce : YAP is a fast scintillation crystal with excellent performance. It has high light output, fast decay time , good thermal stability and mechanical properties, and stable chemical properties. Ce:YAP scintillation crystals are mainly used in fast Gamma ray detection, animals PET scanning system, electronic imaging (SEM), high energy physics, low and medium energy XX-ray two-dimensional imaging and other fields.

Main features:

Good optical output temperature characteristics , fast decay time , high energy resolution

High time resolution and stable chemical performance

Technical parameters:

performance	Ce:YAP	LFS	Ce: LYSO	BGO	NaI
Relative light output (%)	70	75	70-75	15	100
decay time (ns)	25	<40	40	300	230
energy resolution (%)	——	10	10	12	7.8
Radiation hardness (rad)	10^{6}	10^{8}	10^{8}	10^{2-3}	10
Afterglow (after 6mS,%)	no	no	no	no	0.3-0.5%

Material properties:

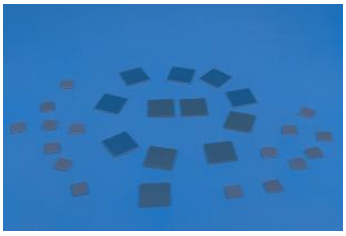
performance	Ce:YAP	LFS	Lyso	BGO	CsI(Tl)	NaI
Crystal structure	Orthogonal	monoclinic	monoclinic	cube	cube	cube
density (g/cm^3)	5.4	7.4	7.1	7.1	4.51	3.7
Melting point (°C)	1875	2050	2047	1050	894	651
effective atomic number	39	64	66	74	54	51
peak wavelength (nm)	370	425	420	480	550	410
Refractive index	1.96(a)	1.81	1.81	2.15	1.79	1.85
Mohs Hardness (Mohs)	8.6	5.8	5.8	4.5	2	2
deliquescence	no	no	no	no	yes	yes

Product parameters:

Orientation accuracy	<0.5°
tolerance	±0.05mm
Parallelism	＜10″
smoothness	10-5
Perpendicularity	<15'
Chamfer	＜0.1mm@45°

I. Optical Crystals >>>>>>>>>>>>>Piezoelectric crystals

1. Barium titanate ($BaTiO_3$)

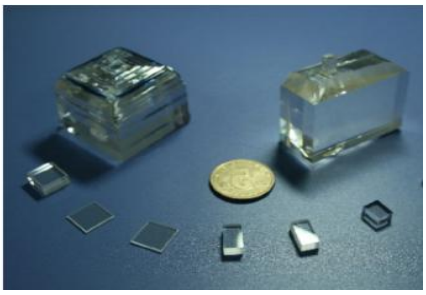


$BaTiO_3$ barium titanate single crystal has excellent photorefractive properties, high self-pumped phase conjugate reflectivity and two-wave mixing (optical amplification) efficiency, and has great potential application prospects in optical information storage; at the same time It is also an important substrate substrate material.

Material properties:

Crystal structure	Quartet			
density	6.02 (g/cm3)			
melting point	1612°C			
Dielectric constant	ea=3700 ec=135 (free state)			
	ea=2400 ec=60 (blessing status)			
Refractive index		515nm	633nm	800nm
	no	2.4912	2.4160	2.3681
	no	2.4247	2.3630	2.3235
Passed wavelength range	0.43-6.30mm			
photoelectric coefficient	r1T3=8±2pm/V; rT33=105±10pm/V; rT42=1300±100pm/V			
Self-pumped phase conjugate reflectivity (0 degree cut)	50 - 70 % for l = 515nm(Ce: BaTiO3)			
	40 - 60 % (PureBaTiO3) for l = 515nm			
	50 - 80 % for l = 633nm(Ce: BaTiO3)			
	40 - 60 % for l = 633nm (PureBaTiO3)			
Two-Wave Mixing Coupling Coefficient	10-40 cm^{-1}			
Absorption loss	l: 515nm	633nm	800nm	
	a: 0.285cm^{-1}	0.108cm^{-1}	0.033cm^{-1}	
Orientation	<100>, <001>, <110>, <111>±0.5º			
Dimensions (mm)	10×10×1/0.5mm, 5×5×1/0.5mm can be customized			
polishing	single or double sided			
Surface roughness	Ra≦10Å			
Package	Class 100 clean bag			

2. Potassium tantalum niobate (KTN) crystal



KTN potassium tantalum niobate (KTa1-xNbxO 3 ; KTN for short) crystal is a multifunctional crystal with excellent performance, which has remarkable electro-optic effect and photorefractive effect. The crystal is generally grown by the melt method and has good thermal stability. properties, chemical stability and mechanical stability. Based on the above advantages, KTN crystal has a wide range of applications in the fields of nonlinear optics, optical storage, optical communication and optoelectronics.

Main features:

High electro-optic coefficient;

Good piezoelectric and pyroelectric effects.

Typical application:

Capacitors, Resonators

Sensors, Light Detectors

Electro-optic switch

Photorefractive device

Material properties:

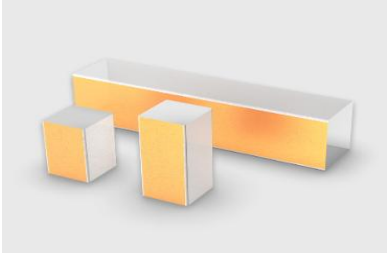
The main parameters:	
Transmittance	Nearly 100% @488-3500nm
Dielectric constant	Equivalent to BaTiO 3
Electromechanical Coupling Coeffic	higher than LiTaO 3 17 times
Electro-optic coefficient	Pockels effect, Kerr effect
Refractive index	2.14-2.33

Product parameters:

Crystal orientation tolerance	<100>±0.5°
size	5x5mm, 10x10mm, can be customized according to customer needs.
thickness	0.5-10mm
polishing	Single Throw/Double Throw
Surface roughness	Ra＜1nm
Package	Class 100 packaging bag, class 1000 ultra-clean room.

3. Lanthanum gallium silicate LGS /LGT/LGN

LGS lanthanum gallium silicate crystal ($La_3Ga_5SiO_{14}$) belongs to the space group P321, point group 32, and is a promising new type of piezoelectric material for the manufacture of surface acoustic wave (SAW) and bulk surface wave (BAW) devices. electrical material. At the same time, LGS crystals can be used to make electro-optic Q switches. Devices made of LGS crystals have high thermal stability.



Main features:

high thermal stability

Low equivalent series resistivity

The electromechanical coupling coefficient is 3-4 times that of quartz

typical application:

Electro-optic Q-switching switch

SAW filter

Bulk Acoustic Wave Filters, Resonators

Gyroscope etc.

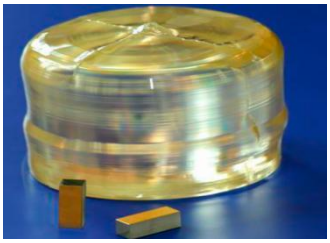
Material properties:

molecular formula	$La_3Ga_5SiO_{14}$
Crystal structure	Trigonal system
growth method	Czochralski
hardness	6.6 Mohs
density	5.754g/ cm^3
melting point	1470°C
Dielectric constant	ε_{11}=18.27 ; ε_{33}=55.26
Thermal expansion coefficient	$\alpha_{11}=5.15\times10^{-6}$ /K; $\alpha_{33}=3.65\times10^{-6}$ /K
Electromechanical Coupling Coefficient	0.28～0.46
Piezoelectric strain constant	d_{11}=6.3 ; d_{14}=-5.4

Product parameters:

Dimensions	2 inches, 3 inches, 10*10*0.5, 20*20*0.5 or customized
Thickness Tolerance	±0.02mm
cutting direction	X/Y/Z, (0,138.5,27) or customized, accuracy ±0.2°
Parallelism	＜30″
Perpendicularity	<15'
Flatness	<λ/10 @633nm
Chamfer	＜0.1mm @45°
smoothness	10-5

4. Lithium niobate $LiNbO_3$



LN lithium niobate is an inorganic substance with a chemical formula of $LiNbO_3$. It is a negative crystal and a ferroelectric crystal . The polarized lithium niobate crystal has piezoelectric, ferroelectric, photoelectric, nonlinear optics, thermoelectric, etc. A multi-functional material with photorefractive effect at the same time. Lithium niobate crystal is a good piezoelectric transduction material, ferroelectric material , electro-optic material , as an electro-optic material, it plays an optical modulation role in optical communication, and is widely used in parametric oscillators, frequency doubling, acousto-optic devices, and optical modulation device. The incorporation of MgO can effectively improve the anti-damage threshold of the crystal.

Main features:

Curie temperature 1140±5℃; High modulation bandwidth; Stable physical and chemical properties

typical application:

SAW filters, isolators, narrowband filters, sensors, photonic tunable filters, acousto-optic devices, optical gyroscopes, optical waveguide optical switches, optical modulation directional couplers, optical communication modulators, interferometers, gyrators , high-speed long-distance communication devices and frequency multiplier devices, etc.

Material properties:

Crystal structure	Trigonal system
Lattice parameters	a=0.515Å, c=13.863Å, Z=6Å
melting point	125 0 ±5°C
Curie point	1140±5°C
Moh's hardness	5
density	4.6 5 g/ cm^3
Dielectric constant	ε11/ε0=85; ε33/ε0=29.5
Thermal expansion coefficient	a1=a2=2×10 $^{-6}$ / ℃ , a3=2.2×10 $^{-6}$ / ℃ @25 ℃
Resistivity	38 W/m/K @ 25 °C
Light transmission range	370-5000nm
piezoelectric constant	d22=2.04×10-11 ^{C} /N, d33=0.6×10-11 ^{C} /N, d15=7×10-11 ^{C} /N,
Electro-optic coefficient	gT33=32pm/V, gS33=31pm/V; gT31=10pm/V, gS31=8.6pm/V
Refractive index	no=2.2827 ne=2.1928 @633nm

Product parameters:

Dimensions	4"/6"/8" Ingot, Wafer, or Custom Size (SAW/Optical Grade)
doping	Undoped or dopable MgO
Wafer Thickness	0.25, 0.35, 0.50(mm) can be customized
Tangential	Y42°/Y36°/Y128°/X/Y/Z can be customized according to customer
surface treatment	Polished on one side, Polished on both sides
TTV	≤ 5μm
Warpage	≤40μm
Oriented Edge Width	32.0±2.0mm can be customized
polished surface	Roughness Ra≤1nm
Chamfer	0.1mm@45° or round edge

5. Lithium tantalate $LiTaO_3$

LT lithium tantalate $LiTaO_3$ crystal is an important multifunctional crystal material. The crystal has excellent piezoelectric, ferroelectric, acousto-optic and electro-optic effects , so it has become an important choice in the fields of surface acoustic wave SAW devices, optical communications, lasers and optoelectronics. basic functional materials. Polished LT wafers are widely used in the manufacture of electronic communication devices such as resonators, filters, transducers, etc., especially for the manufacture of high-frequency surface acoustic wave devices due to their good electromechanical coupling, temperature coefficient and other comprehensive properties, and are used in Mobile phones, walkie-talkies, satellite communications, aerospace and many other high-end communication fields.

Main features:

Curie temperature point 603±2℃; Electromechanical coupling coefficient R15≥0.3; Stable chemical and physical properties

typical application:

Surface acoustic wave filter, resonator Q switch, optical modulator, acousto-optic switch, laser frequency doubling, optical parametric oscillator, optical memory, high temperature and high frequency ultrasonic detector, infrared detector, optical pickup device, etc.

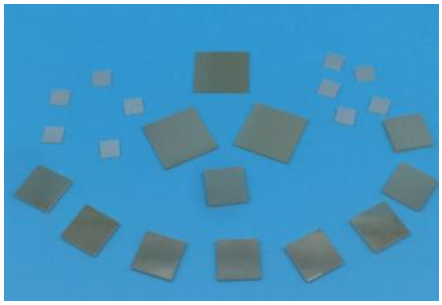
Material properties:

Crystal structure	Trigonal system
Lattice constant	a=5.154Å,c=13.783Å
density	7.45g/ cm^3
melting point	1650°C
Curie temperature	603±2℃
Moh's hardness	5.5~6.0
Dielectric constant	es11/eo:39~43, es33/eo:42~43; et11/eo:51~54, et33/eo:43~46
Resistivity	1015wm
Thermal expansion coefficient	a1=a2=1.61×10^{-6} /℃, a3=4.1×10^{-6} /℃
Refractive index	n0=2.176, ne=2.180 @633mn
Electro-optic coefficient	R33=30.4
Pyroelectric coefficient	2.3×10^{-7} C/cm^2 /K
Through range	400nm-5000nm

Product parameters:

size	4"/6"/8" ingot, wafer, or custom size (SAW/Optical)
doping	Undoped or dopable Fe
Wafer Thickness	0.25, 0.35, 0.50(mm)
Tangential	Y42°/Y36°/X/Y/Z can be customized according to customer needs
surface treatment	Polished on one side, Polished on both sides
TTV	≤ 5μm
polished surface	Roughness Ra≤1nm
Chamfer	0.1mm@45° or round edge

6. PMN-PT lead magnesium niobate - lead titanate

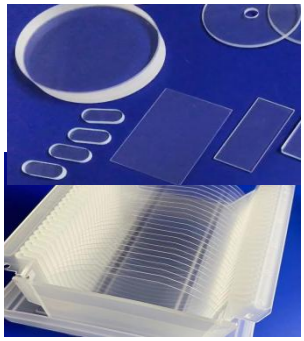


PMN-PT lead magnesium niobate-lead titanate single crystal material has the characteristics of high piezoelectric constant, large electromechanical coupling coefficient, high dielectric constant and low loss, especially the piezoelectric performance is better than ordinary The piezoelectric material should be improved by about 10 times, so that it can be used in a wider range of application fields than traditional PZT piezoelectric ceramics, such as sonar, stacked drive, ultrasonic imaging, optics, etc. It has been recognized and applied.

Material properties:

Main performance parameters	
molecular formula	[Pb(Mg 1/3 Nb 2/3)O 3] (1-x) - [PbTiO 3] x, X=0.24-0.40
Crystal structure	Quartet, (nearly cubic)
Cell parameters	a=4.024 Å (R3m)
melting point	1280°C
growth method	Crucible drop method (Bridgeman method)
density	8.1 g/ cm^3
Moh's hardness	3.5
Thermal expansion coefficient	10.4x10 $^{-6}$ /K
Dielectric constant (polarization) ε	4000-5500 @1KHz
Piezoelectric constant d 33	1200-1500;1500-2000;2000-2500 pC/N
Curie temperature	135-150°C
phase transition temperature	50-90°C (monoclinic-tetragonal phase transition)
motor coupling constant	K33 (longitudinal mode): > 92%; Kt (transverse mode): 59-62%; K33
Coercive electric field	2-2.5 kv/cm
Orientation	<100>, <110> ,<111>
Crystal orientation tolerance	±0.3-0.5°
size	5x5mm, 10x10mm, 20x20mm, Dia50.8mm
thickness	0.5-10mm
Package	Class 100 packaging bag, class 1000 ultra-clean room.

7. Quartz



Quartz crystal is a kind of piezoelectric crystal. The piezoelectric effect of quartz crystal is used to realize frequency control, stability or selection. The electronic components made include quartz crystal resonators, quartz crystal oscillators and quartz crystal filters. Mainly used in communications, home appliances, automobiles and other various industrial and consumer electronics products. Quartz crystal also has excellent optical properties such as wide light transmission range (170nm-2500nm), good optical uniformity, and high transmittance. It can be used to make optical components such as ultraviolet windows, optical wave plates, optical rotation plates, and optical low-pass filters. It is used in high-definition camera, optical instrument and optical fiber communication and other fields.

Material properties:

density	2.65g/ cm^3
Moh's hardness	7
Temperature Coefficient	aa=6.2x10 $^{-6}$ /k ac=10.7x10 $^{-6}$ /k
Refractive index	no=1.5350, ne=1.5438 @ 1 μm
damage threshold	>1GW/cm^2

Product parameters :

Wafer:

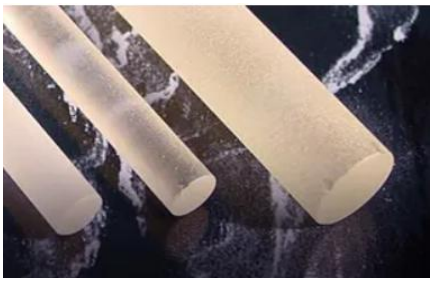
Specification	4"	6"	8"	10"	12"
diameter mm	100	150	200	250	300
Tolerance(±)mm	0.2	0.2	0.2	0.2	0.2
Thickness mm	>0.10	>0.30	>0.40	>0.50	＞＜0.50
Main reference side	32.5/47.5/57.5 etc.				
TTV(um)	<3	<3	<3	<5	<5
Warp(um)	≤ 30	≤ 40	≤ 50	≤ 50	≤ 50
Orientation	AT cut, ST cut, X cut and Z cut				
Chamfer mm	fillet				
polishing	Single Throw/Double Throw				
Polished Ra	≤1nm				
back	fine grinding				

Substrate:

Orientation	AT cut, ST cut, X cut and Z cut
Dimensional tolerance mm	+/- 0.02
Thickness Tolerance mm	+/- 0.02
Flatness	λ /10
RoughnessRa	<1nm
smoothness	10/5

I. Optical Crystals >>>>>>>>>>>>>Magneto-optic crystals

1. KTF potassium terbium fluoride



KTF crystal has lower absorption coefficient and thermo-optic coefficient. This crystal is very suitable for high-power Faraday rotator and optical isolator.

Main features:

Wide wavelength coverage: 500nm-3000nm

large crystal size

High coating threshold

good uniformity

Material properties:

Crystalline orientation	Regular <100>
Diameter Tolerance	+ 0.00/-0.0 5mm
Chamfer	≦0. 15mm @ 45°
roll off	fine grinding
Perpendicularity	≤ 10 ′
Parallelism	≤ 6 0″
Face type	≤λ/10 @633nm
surface finish	10-5
through wavefront error	≤λ /4 /25.4mm @633nm
coating	A R , R ≦0.25%

TGG and KTF :

Material	TGG $Tb_3Ga_5O_{12}$	KTF KTb_3F_{10}
Lattice structure	cube	cube
Through the spectral range	400-1500nm	400-1500nm
Verdet constant, 1064nm	39	36
Refractive index, 1064nm	1.944	~1.5
Density (g/cc)	7.2	5.86
Absorption, 1064nm	~0.16%/cm	~0.02%/cm
Thermo-optic coefficient	17.9 x 10^{-6} K^{-1}	~1 x 10^{-6} K^{-1}
nonlinear index of refraction	~2 x 10-19 m^2 / W	~1x 10^{-20} m^2 /W
Thermal conductivity	7.4	1.67
Thermal expansion×10^{-6} ℃	7.3	13.7

I. Optical Crystals >>>>>>>>>>>>>Magneto-optic crystals

2. LTF lithium terbium fluoride

LTF lithium terbium fluoride (LiTbF 4) crystal has a tetragonal scheelite structure, the c-axis is the optical axis, and has the characteristics of large Verdet constant, low bulk absorption coefficient, negative thermo-optic coefficient and small nonlinear coefficient. It is a magneto-optic crystal material with excellent performance. When LTF crystals are used in high-power Faraday rotators and magneto-optical isolators, they can overcome the problems of traditional TGG crystals, such as the decrease in isolation caused by the "temperature rise" caused by the large volume absorption coefficient, and the deterioration of the quality of the front-end beam. After years of technical research, the company has realized the stable production of LTF crystals with a diameter of 2 inches, and can provide users with customized LTF crystal products of various sizes and specifications.

Main features:

Small body absorption coefficient (≤150ppm/cm)
large crystal size
Good optical uniformity
Small thermo-optic coefficient and nonlinear refractive index coefficient
High resistance to photodamage threshold

Product parameters:

Crystal diameter	2mm～15mm
Crystal length	10mm～40mm
crystal axis	c-axis
Orientation accuracy	≤5′
Extinction Ratio	≥30dB
use band	400～1500nm (except Tb ion intrinsic absorption peak around 487nm)
Body Absorption Coefficient	≤150 ppm/cm
through wavefront distortion	≤0.125λ/25mm @633nm
Verdet constant	38 rad/T•m @1064nm
Side droop	≤5′
Flatness of end face	≤λ/10 @633nm
Parallelism of end faces	≤10″
AR Coating Residual Reflectance	AR,R ≤0.2%

3. TGG terbium gallium garnet

TGG terbium gallium garnet crystal (Tb_3Ga_5 0i2, TGG) has a high Verdet constant, low transmission loss, high thermal conductivity and high laser damage threshold in the visible and near-infrared region, and it is easy to grow large-sized crystals *It* is currently the best magneto-optical material for making Faraday isolators and optical rotators in this band (400-1100nm, excluding 470nm-500nm). It is widely used in YAG , Ti - doped sapphire and other multi-stage amplification, ring and The seeds are injected into the laser.

Main features:
Large Verdet constant (40 rad/T m @1064nm)
Low light loss (<0.1%/cm)
High thermal conductivity (7.4W m K)
High laser damage threshold (>1GW/cm^2)

Typical applications: Faraday rotators, optical isolators

Material properties:

molecular formula	$Tb_3Ga_5O_{12}$
growth pattern	Czochralski
density	7.13g/ cm^3
hardness	8.0
melting point	1725°C
Refractive index	1.954 @ 1064nm

Product parameters:

Orientation accuracy	[111] ±15′
wavefront distortion	<λ/8
Extinction Ratio	>30dB
Diameter Tolerance	0.00-0.05mm
Length Tolerance	±0.1mm
Chamfer	0.10mm @45º
Flatness	<λ/10 @ 633nm
Parallelism	<30"
Perpendicularity	<5'
smoothness	10-5
coating	AR, R<0.2% @1064nm or according to customer requirements
damage threshold	＞10J/cm^2 @1064nm 10ns 10KHZ
Size range	According to customer size

4. TSAG Terbium Scandium Aluminum Garnet

TSAG is a key isolator material for fiber lasers. As an ideal visible and infrared magneto-optic crystal, it has the advantages of high Verdet constant and excellent thermal and mechanical properties.

Main features:

Large Verdet constant (48rad/T m @ 1064nm), about 20% higher than TGG;

Low absorption (<2500ppm/cm @ 1064nm)

high power applications

Isolator Miniaturization

Typical applications: Faraday rotators, optical isolators

Material properties:

molecular formula	$Tb_3Sc_2Al_3O_{12}$
Lattice parameters	a=12.3 Å
Growth method	Czochralski
Density	5.91g/ cm^3
Melting point	1970±10℃
Transmittance range	400nm-1600nm
Verdet constant (rad/M/T)	218/152/48 @532nm/633nm/1064nm

Product parameters:

Orientation accuracy	[111]±15′
wavefront distortion	<λ/8
Extinction Ratio	>30dB
Diameter Tolerance	0.00-0.05mm
Length Tolerance	±0.1mm
Chamfer	＜0.1mm @45°
Flatness	<λ/10 @633nm
Parallelism	＜30″
Perpendicularity	<5'
smoothness	10-5
coating	AR, R<0.2%@1064nm or according to customer requirements
damage threshold	>10J/cm^2 @1064nm 10ns 10KHZ

I. Optical Crystals >>>>>>>>>>>>>Magneto-optic crystals

1. YIG yttrium iron garnet

YIG, with the chemical formula $Y_3Fe_5O_{12}$, is a garnet-type ferrite. It is a synthetic crystal of iron oxide with multiple magnetic properties. It belongs to the cubic crystal system and has good gyromagnetic effect, low saturation magnetization, and resonance. With the advantages of small line width, high resistivity, and low dielectric loss, it is widely used in the fields of optics and microwave, and is an important type of ferrite product. Yttrium iron garnet (YIG) has excellent optical and microwave properties. In the optical field, the Faraday effect of yttrium iron garnet can be used to manufacture products such as mid-infrared isolators, laser modulators, and optical fiber current sensors; in the microwave field, yttrium iron garnet has high Q resonance characteristics and can be used to manufacture magnetic Resonant filters, tuned oscillators, bandpass filters and other products.

Main features:

Low temperature dependence of Faraday rotation

1.2-5mm highly transparent

High Q for microwave applications

Grown with flux technology

Excellent performance for optical and microwave applications

Typical application:

Optical isolators

Multiplexers

Tuned oscillators

Band stop filter

Optical switch

Magnetic field sensor

Fiber optic sensor

Application diagram:

Figure 1. Faraday Rotator in an Optical Isolator

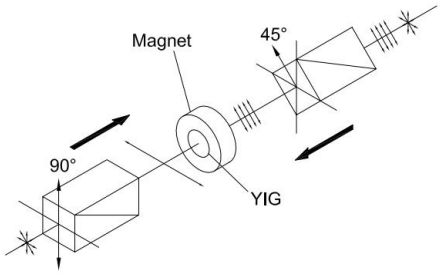


Figure 1: Faraday rotation

Figure 2. Magnetic Resonace Filter Concept

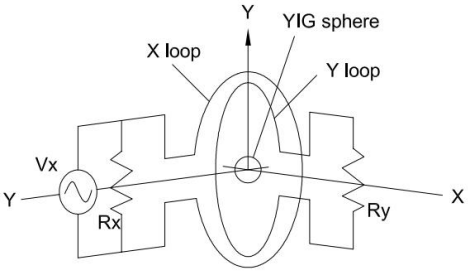


Figure 2: Magnetic resonance filtering

I. Optical Crystals >>>>>>>>>>>>>Magneto-optic crystals

Material properties:

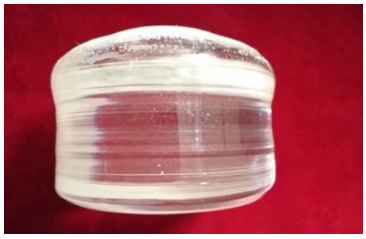
@ 25°C	Pure YIG	Ga:YIG
molecular formula	$Y_3Fe_5O_{12}$	$Y_3Fe_{4.05}Ga_{.95}O_{12}$
Molecular weight (grams)	737.95	751.13
Crystal structure	Cubic	Cubic
space point group	La3d	La3d
Density (g-cm ^{3})	5.17	5.28
Melting point (°C)	1555	1545
Hardness (moh)	6.5-7.0	
Lattice constant (Å)	12.376	12.36
Saturation magnetization (Gauss)	1780	400
Ferromagnetic Resonance	<0.30	<0.95
Magnetic anisotropy (erg/cm ^{3})	-6.20 x 10 $^{-3}$	-1.7 x 10 $^{-3}$
Magnetic anisotropy (erg/cm ^{3})	-0.05 x 10 $^{-3}$	-6.20 x 10 $^{-3}$
effective g factor	2	2
Gyromagnetic Ratio (MHz/Gauss	2.8	2.8
Magnetostriction coefficient	-2.73 x 10 $^{-6}$	-0.95 x 10 $^{-6}$
	-1.25 x 10 $^{-6}$	-0.95 x 10 $^{-6}$
	-2.20 x 10 $^{-6}$	
Resistivity (Ù/cm)	1 x 10 ^{14}	
Young's modulus	2 x 10 ^{12}	1 x 10 ^{12}
Poisson's ratio	0.29	0.25
Dielectric constant	15	15
Curie temperature (K)	553	
Thermal conductivity (W/cm $^{-1}$ /C	0.074	
Coefficient of thermal expansion	1.04 x 10 $^{-5}$	
Refractive index , 1310 nm	2.2	
Refractive index , 1550 nm	2.19	
specific heat	4.5	
Optical absorption , 1310 nm (cm	0.05	0.05
Faraday rotation , 1310 nm (mm	21.4	14.5
Magneto-optic effect (A $^{-1}$)	0.14	0.6
Transmittance1 (%)	>95	>95

Product parameters:

Faraday rotator	Length 2.1, 2.7mm
diameter	1.8 to 5mm
Dimensional tolerance	Length: ±0.1mm, Diameter: ±0.05mm
Orientation	<100>
Flatness	<λ/4 @633nm
smoothness	10/5
Parallelism	<10′
coating	Customized

I. Optical Crystals >>>>>>>>>>>>>Acousto-optic crystal

1. Tellurium oxide (TeO_2) crystal



TeO2 crystal, also known as tellurium dioxide, is an acousto-optic crystal material with high quality factor and excellent performance. TeO 2 crystal has the advantages of fast response, low driving power, high diffraction efficiency, stable and reliable performance, etc. Widely used in various acousto-optic devices such as acousto-optic deflectors, acousto-optic modulators, acousto-optic harmonics, acousto-optic filters and tunable filters. The resolution of acousto-optic devices made of tellurium oxide can be increased by orders of magnitude under the same clear aperture, so TeO 2 crystal is an acousto-optic device material with broad application prospects, especially for acousto-optic modulators and acoustic Optical harmonics are widely used in optical computing, optical communication, and optical microscopic imaging.

Main features:

High refractive index; Sound attenuation is small; High quality factor; Excellent sound and light characteristics
Larger acousto-optic quality factor; High transparency to visible light

Material properties:

Attributes	value
chemical formula	TeO_2
Molar mass	159.60 g/mol
color	colorless
density	5.99 ± 0.03 / cm^3
melting point	733°C
hardness	3-4 Mohs hardness tester
thermal expansion	$10^{-6} K^{-1}$:
symmetry	Tetragonal, 422 (D 4)
Lattice parameters	a = 4.8122 Å;
Transmittance	＞70% @ 633nm
launch range	0.33 ~ 5.0μm
Dielectric constant	ε 11 = 22.9; ε 33 = 24.7
Elastic constant · 10^{-10} N/m^2	c 11 = 5.57; c 33 = 10.58; c 44 = 2.65; c 66 = 6.59; c 12 = 5.12; c 13 = 2.18
Photoelastic coefficient@632.8nm	p11 = 0.0074; p12 = 0.187; p13 = 0.340; p31 = 0.0905; p33 = 0.240 ; p44 = -0.17; p66 = -0.0463

TeO2 modulator characteristics :

Main features of AOM	for TeO2 modulator
Optical wavelength range	514nm, 633nm, 1064nm, 1330nm
optical aperture	0.3 mm – 3 mm
Operating mode	longitudinal, shaft (001)
light rise time	Beam diameter from 9-200 nsec
Beam splitting (633 nm)	10-30mrad
Diffraction efficiency	70-85%
Modulation frequency (-3db)	6-50MHz