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FOCUS ON HIGH PRECISION OPTICS
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- Windows
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Laser Crystals

Nd:YVO4

Nd:YVO4 crystal is one of the most excellent laser host materials, it is suitable for diode laser-pumped solid state laser. Compactly designed Nd³⁺:YVO4 lasers with green, red and blue light output are really perfect means for material processing. Nd³⁺:YVO4 diode pumped lasers have: wide absorption bandwidth, low lasing threshold, high slope efficiency, large luminescent cross-section, linearly polarized emission and single-mode output.

Advantages

- Lower lasing threshold and higher slope efficiency
- Low dependency on pumping wavelength and tend to single mode output
- Large stimulated emission cross-section at lasing wavelength
- High absorption over a wide pumping wavelength bandwidth
- Optically uniaxial and large birefringence emit strongly-polarized laser

Main Types of Diffusion Bonded Crystals

Crystal Structure	Zircon Tetragonal, Space Group D4h
Lattice Parameters	a=b=7.12Å, c=6.29Å
Dopant Level	0.1~3.0 atm%
Density	4.22g/cm ³
Mohs Hardness	4.6~5, Glass-like
Refractive Indices	n _o =1.9573, n _e =2.1652 @1064nm
Thermal Expansion Coefficient	α _a =4.43×10 ⁻⁶ /K, α _c =11.37×10 ⁻⁶ /K
Thermal Conductivity Coefficient	//c:5.23W/m/K, ⊥c:5.10W/m/K
Lasing Wavelengths	914nm, 1064nm, 1324nm
Thermal Optical Coefficient	d _{no} /dT=8.5×10 ⁻⁶ /K, d _{ne} /dT=3.0×10 ⁻⁶ /K
Stimulated Emission Cross-section	25.0×10 ⁻¹⁹ cm ² @1064nm
Fluorescent Lifetime	90μs @808nm
Absorption Coefficient	31.4cm ⁻¹ @808nm
Absorption Length	0.32mm @808nm
Intrinsic Loss	Less 0.1%cm ⁻¹ @1064nm
Gain Bandwidth	0.96nm (257GHz) @1064nm
Polarized Laser Emission	π polarization, Parallel to optic axis
Diode Pumped Optical to Optical Efficiency	>60%

Specifications of Nd:YVO4

Flatness	< λ/10@632.8nm
Parallelism	≤10"
Perpendicularity	≤5"
Surface Quality	10-5 S/D

Dimensional Tolerance	Rod: Dia \pm 0.1mm, L \pm 0.25mm Slab: \pm 0.1mm
Coating	Upon request
Damage Threshold	\geq 1GW/cm ²

Nd:YAG

Nd:YAG crystal is the most early and mature laser material adopted by R&D, medical, industrial and military customers. It is the ubiquitous presence for near-infrared solid-state lasers and their frequency-doubler, tripler, and higher order multiplier.

Advantages

High Gain, High Efficiency, Low Threshold

High Optical Quality and low Loss at 1064nm

Good Mechanical and Thermal Properties

Easy to operate with TEM₀₀ mode (Q-Switch, pulsed, CW)

Main Properties of Nd:YAG Crystal

Chemical Formula	Nd:Y ₃ Al ₅ O ₁₂
Crystal Structure	Cubic Garnet
Dopant Level	0.6~1.3 atm%
Melting Point	1970°C
Density	4.56 g/cm ³
Mohs Hardness	8.5
Refractive Index	1.82@1064nm
Thermal Expansion Coefficient	7.8x10 ⁻⁶ /K [111], 0-250°C
Thermal Conductivity	14W/m/K @20°C, 10.5W/m/K @100°C
Loss Coefficient	0.003cm ⁻¹ @1064nm
Lasing Wavelength	1064nm
Pump Wavelength	807.5nm
Refraction Time of Terminal Lasing Level	30ns
Radiative Lifetime	550 μ s
Fluorescence Lifetime	230 μ s
Effective Emission Cross Section	2.8x10 ⁻¹⁹ cm ²
Polarized Emission	Unpolarized
Thermal Birefringence	High

Specifications of Nd:YAG

Flatness	$<\lambda/10$ @632.8nm
Paralellism	$\leq 10''$
Perpendicularity	$\leq 5'$
Surface Quality	10-5 S/D
Optical Quality	Interference fringes < 0.125 /inch Extinction ration $\varnothing 3 \sim \varnothing 6.35 > 28$ dB, $\varnothing 7 \sim \varnothing 10 > 25$ dB
Dimensional Tolerance	Rod: Dia \pm 0.1mm, L \pm 0.25mm Slab: \pm 0.1mm
AR-coating	R $< 0.2\%$ (@1064nm)
HR-Coating Reflectivity	R $> 99.8\%$ @1064nm and T $> 95\%$ @808nm

Other HR Coatings	HR@1064/532nm, HR@946nm, HR@1319nm and other wavelengths are also available
Damage Threshold	$\geq 500 \text{ MW/cm}^2$

Cr:YAG

Cr⁴⁺:YAG Crystal is an excellent crystal for passively Q-switching diode pumped or lamp-pumped Nd:YAG, Nd:YLF, Nd:YVO₄ or other Nd and Yb doped lasers at wavelength from 0.8 to 1.2 μm . Passive Q-switches or saturable absorbers provide high power laser pulses without electro-optic Q-switches, thereby reducing the package size and eliminating a high voltage power supply. Cr⁴⁺:YAG is more robust than dyes or color centers and is the material of choice for 1 μm Nd lasers.

Main Properties of Cr⁴⁺:YAG Crystal

Chemical Formula	Cr ⁴⁺ :Y ₃ Al ₅ O ₁₂
Crystal Structure	Cubic Garnet
Dopant Level	0.5~3 atm%
Mohs Hardness	8.5
Melting Point	1970°C
Density	4.55 g/cm ³
Refractive Index	1.82@1064nm
Thermal Expansion Coefficient	8.2x10 ⁻⁶ /K[100], 7.7x10 ⁻⁶ /K[110]
Thermal Conductivity	12.13 W/m/K @25°C
Fluorescence Lifetime	3.4 μs
Base State Absorption Cross Section	4.3x10 ⁻¹⁸ cm ²
Emission State Absorption Cross Section	8.2x10 ⁻¹⁹ cm ²

Specifications of Cr⁴⁺:YAG

Flatness	$< \lambda/10$
Parallelism	$\leq 10''$
Perpendicularity	$\leq 5'$
Surface Quality	20-10 S/D
Initial Transmittance	1%~98%
Dimensional Tolerances	Rod: Dia \pm 0.1mm, L \pm 0.25mm
	Slab: \pm 0.1mm
Coating	Upon request
Damage Threshold	$\geq 500 \text{ MW/cm}^2$

Diffusion Bonded Crystals

Diffusion Bonded Crystals are crystals consisting of two, three or more parts with different dopant levels. Usually, doped and undoped materials are used. Diffusion Bonded Crystals are used to decrease thermal lensing effect considerably. This bonding technology in laser applications can not only greatly improve the laser performance and beam quality, but also conducive to the intergration of laser systems and access to large-size crystal.

Advantages

- Decrease thermal effect
- Improve efficiency
- High damage threshold
- Improve beam quality
- Compact size

Main Types of Diffusion Bonded Crystals

Material	Doping Concentration	Aperture(mm2)	Length(mm)
YAG+Nd:YAG	0.6~1.3%	2x2-20x20	2-200
YAG+Cr4+:YAG	0.5~3%	2x2-20x20	2-50
Nd:YAG+Cr4+:YAG	0.6~1.3%/0.5~3%	2x2-20x20	2-200
YAG+Nd:YAG+YAG	0.6~1.3%	2x2-20x20	3-200
YAG+Nd:YAG+Cr4+:YAG	0.6~1.3%/0.5~3%	2x2-20x20	3-200
YAG+Nd:YAG+Cr4+:YAG+YAG	0.6~1.3%/0.5~3%	2x2-20x20	5-200
YVO4+Nd:YVO4+YVO4	0.1~3%	2x2-10x10	1-20
YVO4+Nd:YVO4+YVO4	0.1~3%	Φ2-10	3-20

Specifications of Nd:YVO4+YVO4

Flatness	<λ/10
Parallelism	≤20"
Perpendicularity	≤15´
Surface quality	20-10 S/D
Dimensional tolerances	+/-0.1mm
Coating	Upon request

Specifications of Nd:YAG+YAG+Cr:YAG

Flatness	<λ/10
Parallelism	≤10"
Perpendicularity	≤10´
Surface quality	20-10 S/D
Dimensional tolerances	+/-0.1mm
Coating	Upon request

Specifications of Diffusion Bonded Crystals

Flatness	<λ/10
Parallelism	≤10"
Perpendicularity	≤5´
Surface quality	20-10 S/D
Dimensional tolerances	+/-0.1mm
Coating	AR or HR Coating

Name	E-mail	Telephone	Message	send message
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Toptec Optics, Inc.

Tel:+86-591-8347 7500

Fax:+86-591-8347 7600

Email:sales@toptecoptics.com

24 Baihuazhou Road,Pushang Industrial Park,Fuzhou 350008,China