

Laser Crystals

NLO Crystals

Birefringent Crystals

AO and EO Crystals

**Yb:YAG**

## Introductions



**Yb:YAG** is one of the most promising laser-active materials and more suitable for diode-pumping than the traditional Nd-doped systems. Compared with the commonly used Nd:YAG crystal, Yb:YAG crystal has a much larger absorption bandwidth to reduce thermal management requirements for

diode lasers, a longer upper-laser level lifetime, three to four times lower thermal loading per unit pump power. Yb:YAG crystal at 1030nm is a good substitute for a Nd:YAG crystal at 1064nm and its second harmonic at 515nm may replace Ar-ion laser(with a large volume), which emit at 514nm.

**Advantage**

Very low fractional heating, less than 11%

Very high slope efficiency

Broad absorption bands, about 8nm@940nm

No excited-state absorption or up-conversion

Conveniently pumped by reliable InGaAs diodes at 940nm(or 970nm)

High thermal conductivity and large mechanical strength

High optical quality

Long life time and good thermal conductivity

**Optical and Spectral Properties**

Items	Specifications
Formula	$\text{Yb}^{3+}:\text{Y}_3\text{Al}_5\text{O}_{12}$
Crystal Structure	Cubic
Lattice Parameters	12.01 Å
Melting Point	1970°C
Density	4.56±0.04g/ cm <sup>3</sup>
Mohs Hardness	8.5
Specific Heat (0-20)	0.59J/g.cm3
Modulus of Elasticity	310GPa
Young's Modulus	3.17×104Kg/mm2
Poisson Ratio	0.3(est.)
Tensile Strength	0.13~0.26GPa
Thermal expansion coefficient	[100]Direction:8.2×10-6/°C(0~250°C) [110]Direction:7.7×10-6/°C(0~250°C) [111]Direction:7.8×10-6/°C(0~250°C)
Thermal Conductivity	14W/m/K(@20°C) 10.5W/m/K(@100°C)
Thermal Optical Coefficient (dn/dT)	7.3×10-6/°C
Thermal Shock Resistance	790W/m
Solubility	Water: Insoluble; Common Acids: Slightly

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Crystal

YBYAG 01

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**Physical and Chemical Properties**

Items	Specifications
Laser Transition	2F5/2→2F7/2
Laser Wavelength	1030nm
Photon Energy	$1.93 \times 10^{-19} \text{J} (@1030\text{nm})$
Emission Linewidth	9nm
Emission Cross Section	$2.0 \times 10^{-20} \text{cm}^2$
Fluorescence Lifetime	1.2 ms
Diode Pump Band	940nm or 970nm
Pump Absorption Band Width	8 nm
Index of Refraction	1.82
Thermal Optical Coefficient	$9 \times 10^{-6} / ^\circ\text{C}$
Loss Coefficient	0.003 cm <sup>-1</sup>

**Specification**

Items	Specifications
Dopant concentration	Yb: 5~25 at%
Wavefront Distortion	$\leq 0.125 \lambda / \text{inch}$
Extinction Ratio	$\geq 28 \text{ dB}$
Rod Sizes	Diameter:2~20mm,Length:5~150mm Upon request of customer
Dimensional Tolerances	Diameter:+0.00"/-0.002"mm, Length: $\pm 0.02$ "
Parallelism	$\leq 10''$
Perpendicularity	$\leq 5'$
Flatness	$\lambda / 10$
Surface Quality	10-5
AR Coating Reflectivity	$\leq 0.2 \% (@1064\text{nm})$
Single pass loss	$< 3 \times 10^{-3} \text{cm}^{-1}$

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