Laser Crystal
Nd:YAG

Nd: YAG crystal, also known as a neodymium-doped yttrium aluminum garnet crystal, is a laser medium crystal with good comprehensive properties used for solid-state lasers. The atoms in the Nd:YAG crystal are excited by the flashlamp, and the crystal produces amplified light that propagates at a specific wavelength (1064 nm). Nd:YAG is one of the well-established laser crystals obtained by doping Nd ions into YAG crystals.

Nd:YAG laser crystals have absorption bandwidths of 730-760 nm and 790-820 nm and are usually pumped by flash tubes or laser diodes. Typical laser emission peaks at 1064 nm. Wavelengths at 946 nm, 1120 nm, 1320 nm, and 1440 nm lasers can also be emitted by different measurements. Q-switched and locked modes are suitable for obtaining lasers of different wavelengths (532 nm, 266 nm, 213 nm, etc.) and pulse widths (10-25ns).

Nd:YAG crystals are widely used in various solid-state laser systems – frequency-doubling continuous-wave switching, high-energy Q-switching, etc. Usually, high-concentration doped crystals are used in pulsed lasers, and low-concentration doped crystals are typically used for continuous-wave output.

Nd:YAG crystals have a wide range of applications in biophysics, medicine, machinery, scientific research, and architecture.

Key Features

- High gain coefficient
- High slope efficiency
- Laser threshold is low
- Wide absorption bandwidth
- Excellent optical, mechanical and physical properties

Applications

Holographic

Laser medicine

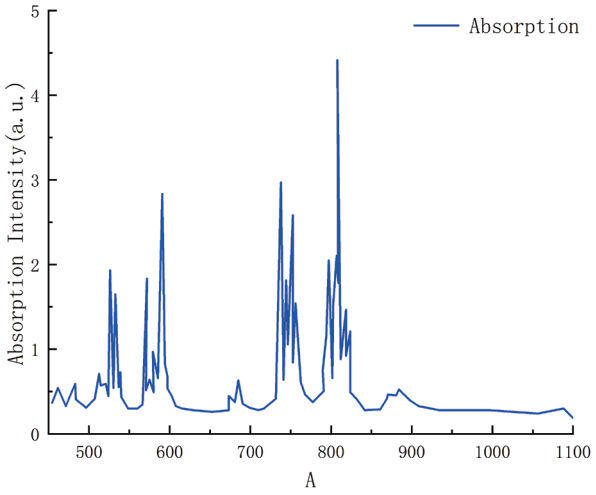
The laser marker

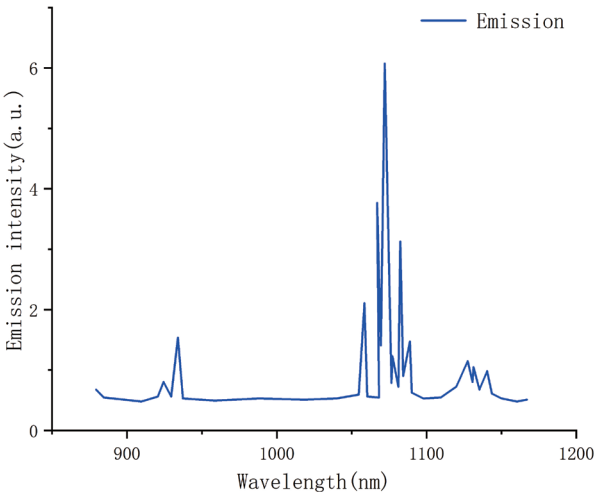
Radar and ranging

Medical applications

Laser range finder

Spectra





Technical Specifications

Material Specifications	
Neodymium Concentration Tolerance（atm%）	0.1- 2.5(+/-0.1)atm%
Orientation	[001] or [110] or [111] <±0.5°
Parallelism	10″
Vertical	5′
Surface Quality	10^{-5}
Wavefront Distortion	λ/4@632 nm
Surface Flatness	λ/8@632 nm
Clear Aperture	>95 %
Chamfering	<0.2×45°
Length of Tolerance	+0.5/-0mm
Thickness/Diameter Tolerance	±0.05 mm
The Largest Size	dia (3~12.7)×(3~150) mm
Damage Threshold	>750 MW/cm^2@1064 nm 10 ns 10 Hz
Extinction Ratio	>30 dB(depends on the actual size)
Precision Grinding	400 grit

Physical and Chemical Properties	
Crystal Structure	Cubic – Ia3d
Lattice Constant	12.01 Å
Density	4.56 g/cm^3
Melting Point	1950 °C
Thermal Conductivity/（W·m^{-1}·K^{-1} @ 25°C）	14
Specific Heat/（J·g^{-1}·K^{-1}）	0.59
Fracture Stress	1.3-2.6*10^3 kg/cm^2
Thermal Expansion Rate/（10^{-6}·K^{-1} @ 25°C）	[100] Orientation–8.2 [110] Orientation–7.7 [111] Orientation–7.8
Mohs Hardness	8.5
Young's Modulus/ Gpa	317
Shear Modulus/ Gpa	54.66
Extinction Ratio	25 dB
Poisson Ratio	0.25

Optical and Spectral Properties	
Laser Transition	$^4F_{3/2} \rightarrow {}^4I_{11/2}$
Photon Energy	1.86×10^{-19} J
Laser Transition Wavelength，λl（nm）	1064
Pump Transition Wavelength，λp（nm）	808
Pump Transition Bandwidth，Δλp（nm）	<4
Laser Transition Bandwidth，Δλl（nm）	~0.6
Pump Transition Peak Section，σp（E-20 cm^2）	6.7
Cross Section of Laser Transition Peak，σl（E-20 cm^2）	28
Pump Transition Saturation Strengthφp（kW / cm^2）	12
Laser Transition Saturation Intensityφl（kW / cm^2）	2.6
Laser Transition Saturation Flux Γl，sat（J / cm^2）	0.6
Minimum Pump Strength Lmin（kW / cm^2）	~0
Upper Laser Tube Life，τ（ms）	0.26
Quantum Defect Fraction	0.24
Fractional Heat Generation	0.37
Refractive Index	1.8197 @1.064 μm
Fluorescence Lifetime	230 μs