Nd: YAG

DESCRIPTION

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.

Compared with Nd:YAG crystals, it has the following characteristics:
- High optical quality
- Good mechanical
- Thermal properties

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, the military, machinery, scientific research, and architecture.

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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

PHYSICAL AND CHEMICAL PROPERTIES OF CRYSTALS

The crystal structure	Cubic - la3d
The lattice constant	12.01
The density/(g/cm^3)	4.56-5.11
Melting point / ° C	1950
Coefficient of thermal conductivity/(w·k^{-1}·m^{-1} @25°C)	14
Specific heat（J·g^{-1}·K^{-1}）	0.59
Thermal expansion rate（10^{-6}·K^{-1} @ 25°C）	[100] orientation - 8.2
	[110] orientation - 7.7
	[111] orientation - 7.8
Hardness (mo)	8.5
Young's modulus/GPa	317
Shear modulus/Gpa	54.66
The extinction ratio/dB	25
Poisson's ratio	0.25

MATERIAL SPECIFICATIONS

Nd the concentration of tolerance % (ATM)	0.1- 2.5(+/-0.1)atm%
Orientation	[001] or [110] or [111] <±0.5°
Parallelism	10″
Vertical	5′
The surface quality	10-5⁽MIL-O-13830A)
Wavefront aberration	λ/4@632 nm
The surface roughness	λ/8@632 nm
Clear aperture	>95 %
Chamfering	<0.2×45°
The length of tolerance	+0.5/-0mm
The 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 (depending on the actual size)
Precision grinding	400 grit
Coating	AR/AR@940+1030;
	HR@1030+HT@940+AR1030;

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OPTICAL PROPERYIES

Laser transition	$4F_{3/2} \rightarrow\; ^4I_{11/2}$
The photon energy	1.86×10^{-19} J
Laser transition wavelengths,λ_l（nm）	1064
Pump transition wavelengths,λ_p（nm）	808
Pump transition bandwidth,λ_p（nm）	<4
Laser transition bandwidth,λ_l（nm）	~0.6
Pump transition section,σ_p（E^{-20} cm^2）	6.7
Laser transition section,σ_l（E^{-20} cm^2）	28
Pump transition saturated strength,φ_p（kW / cm^2）	12
Laser transition saturation intensity,φ_l（kW / cm^2）	2.6
Laser transition saturation flux,Γ_l, sat（J / cm^2）	0.6
The smallest pump intensity,I_{min}（kW / cm^2）	~0
The upper part of the laser tube life,τ (ms)	0.26
The quantum defect part	0.24
Part of the heat generation	0.37
Refractive index	1.8197 @1.064 μm
The fluorescence lifetime	230 μs

SPECTRA