

## Neodymium Doped Yttrium Aluminum Garnet (Nd:YAG) Crystal

Nd:YAG crystal is the most widely used solid-state laser material today. Now, we are able to supply of Nd:YAG rods with high optical homogeneity, consistent performance, high processing accuracy and on time delivery. Different specifications and size from  $\phi$  3 x 0.5 mm to  $\phi$  12 x 150 mm are available.

### Basic Properties (1.0 ATM% Nd Doped)

Chemical formula	Nd:Y <sub>3</sub> Al <sub>5</sub> O <sub>12</sub>
Crystal structure	cubic
Lattice constants	12.01 Å
Concentration	$\sim 1.2 \times 10^{20} \text{ cm}^{-3}$
Melting point	1970 °C
Density	4.56 g/cm <sup>3</sup>
Mohs hardness	8.5
Refractive index	1.82
Thermal expansion coefficient	$7.8 \times 10^{-6} / \text{K}$ [111], 0 – 250 °C
Thermal conductivity	14 W/m/K @20 °C, 10.5 W/m/K @100 °C
Lasing wavelength	1064 nm
Stimulated emission cross section	$2.8 \times 10^{-19} \text{ cm}^2$
Relaxation time of terminal lasing level	30 ns
Radiative lifetime	550 $\mu$ s
Spontaneous fluorescence	230 $\mu$ s
Loss coefficient	0.003 cm <sup>-1</sup> @ 1064 nm
Effective emission cross section	$2.8 \times 10^{-19} \text{ cm}^2$
Pump wavelength	807.5 nm
Absorption band at pump wavelength	1 nm
Linewidth	0.6 nm
Polarized emission	unpolarized
Thermal birefringence	high

## Standard Product Specification

Dopant concentration (atomic %)	0.9% ~ 1.1%
Orientation	<111> crystalline direction ( $\pm 5^\circ$ )
Wavefront distortion	$\lambda/8$ per inch, measured by a double-pass interferometer @ 633 nm
Extinction ratio Rods with diameter from 3 mm to 6.35 mm and with length to 100 mm Rods with diameter from 7 mm to 10 mm and with length to 100 mm	>30 dB >28 dB
Dimension tolerances Diameter Length Barrel Finish	$\pm 0.025$ mm ( $\pm 0.001$ "") $\pm 0.5$ mm ( $\pm 0.02$ "") 50 80 micro-inch (RMS) grooved rod barrel are also available
Ends finish Surface figure Parallelism Perpendicularity Surface quality Chamfer Clear aperture	< $\lambda/10$ @ 633 nm <10 arc seconds <5 arc minutes >10/5 scratch / Digper MIL-O-1380A <0.1 mm @ $45^\circ$ extend over the entire faces to the chamfered edges
Anti-reflection coating	single layer $MgF_2$ coating with high damage threshold for high power laser operation, reflectivity $R < 0.25\%$ @ 1064 nm per surface, damage threshold over $750 \text{ MW/cm}^2$ @ 1064 nm, 10 ns and 10 Hz
High-reflection coating:	standard HR coating with $R > 99.8\%$ @ 1064 nm and $R < 5\%$ @ 808 nm can be performed, other HR coatings, such as HR @ 1064/532 nm, HR @ 946 nm, HR 1319 nm and other wavelengths are also available
Standard products in-stock:	the standard Nd:YAG laser rod with dimension of $\phi 3 \times 5$ mm and $\phi 4 \times 50$ mm with AR or HR- coating for Diode Pumped Solid State Lasers (DPO) are ready for immediate delivery

Higher grade or specific Nd:YAG rods or slabs are also available upon request.