

# Neodymium: Yttrium Aluminum Garnet - Nd:YAG

SYNOPTICS manufactures Nd:YAG for use in industrial, medical, military and scientific applications. YAG is grown utilizing the Czochralski technique. The as-grown crystals are then processed into laser rods or slabs, coated in house and inspected per customer specifications. SYNOPTICS' high volume capacity and complete capabilities for growth, fabrication, polishing, and coating makes us the clear choice as your Nd:YAG rod supplier.

## Advantages Of Nd:YAG Include:

- High gain
- Low threshold
- High efficiency
- Low loss at 1.06  $\mu\text{m}$
- Good thermal conductivity and thermal shock characteristics
- Mechanical strength
- High optical quality
- Material characteristics that allow for various modes of operation
- (CW, pulsed, Q-switched, mode locked, and cavity dumped)

### Standard Rod Specifications

<b>Nd Concentrations Available</b>	0.6 – 1.3 $\pm$ 0.1 at %
<b>Wavefront Distortion</b>	> $\lambda$ / 4 per inch of rod length ( $\lambda$ = 632 nm) standard > $\lambda$ / 16 per inch of rod length Opto-Lase
<b>Extinction Ratio</b>	25 dB minimum

### Dimensional / Mechanical Specifications

<b>Diameter Tolerance</b>	+ .000" / - .002"
<b>Length Tolerance</b>	+ .040" / - .000"
<b>Rod End Polished Flatness</b>	$\lambda$ / 10
<b>End Face Parallelism</b>	within 10 arc seconds
<b>End Face Perpendicularity</b>	within 5 arc minutes
<b>Chamfer</b>	0.005" $\pm$ 0.003" x 45°
<b>Surface Quality</b>	10 - 5 scratch-dig per MIL-O-1 3830A
<b>Barrel Finish</b>	55 $\pm$ 5 microinches (other finishes available on request)
<b>Standard Coating</b> (High & Partially Reflective coatings available on request)	Anti-Reflection where R < 0.25% Durability per MIL-C-48497 Damage threshold exceeds 10 J / cm <sup>2</sup>

## Properties of Nd:YAG at 25°C (1.0 at % Nd)

<b>Formula:</b>	Y <sub>2.97</sub> Nd <sub>0.03</sub> Al <sub>5</sub> O <sub>12</sub>
<b>Weight % Nd:</b>	0.725
<b>Nd Atoms / cm<sup>3</sup>:</b>	1.38 x 10 <sup>20</sup>
<b>Wavelength:</b>	1.064 micron
<b>Transition:</b>	<sup>4</sup> F <sub>3/2</sub> — <sup>4</sup> I <sub>11/2</sub>
<b>Fluorescent Lifetime:</b>	230 μsec
<b>Thermal Conductivity:</b>	0.14 W cm <sup>-1</sup> K <sup>-1</sup>
<b>Specific Heat:</b>	0.59 Jg <sup>-1</sup> K <sup>-1</sup>
<b>Thermal Expansion:</b>	6.9 x 10 <sup>-6</sup> °C <sup>-1</sup>
<b>dn / dt:</b>	7.3 x 10 <sup>-6</sup> °C <sup>-1</sup>
<b>Young's Modulus:</b>	3.17 x 10 <sup>4</sup> Kg / mm <sup>-2</sup>
<b>Poisson Ratio:</b>	0.25

### YAG Physical and Chemical Properties

<b>Formula:</b>	Y <sub>3</sub> Al <sub>5</sub> O <sub>12</sub>
<b>Molecular Weight:</b>	596.7
<b>Crystal Structure:</b>	Cubic
<b>Moh Hardness:</b>	8 - 8.5
<b>Melting Point:</b>	1950°C (3540°F)
<b>Density:</b>	4.55 g / cm <sup>-3</sup>

### Refractive Index of YAG

Wavelength	Index n (25°C)
.8	1.8245
.9	1.8222
1.0	1.8197
1.2	1.8152
1.4	1.8121

Specifications and information are subject to change without prior notice.  
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