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 μm
- 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 Specifications

A) Nd concentrations offered are:
0.6 ± 0.1 at %
0.8 ± 0.1 at %
1.1 ± 0.1 at %
1.3 ± 0.1 at %

B) Wavefront distortion is determined by use of a Zygo interferometer system. Wavefront distoration shall be within a maximum λ / 4 per inch of rod length (λ = 632.8 nm) standard and ë / 16 per inch of rod length Opto-Lase.

C) Extinction ratio 25 db minimum.

D) Dimensional / mechanical specifications:
- Diameter tolerance +.000" / -.002"
- Length tolerance +.040" / -.000"
- Rod end polished flat to ë / 10
- Rod end faces are parallel to within 10 arc seconds
- Rod end surfaces are perpendicular to the rod axis to within 5 arc minutes
- Chamfer 0.005" ± 0.003" x 45°
- Surface Quality 10 - 5 scratch-dig per MIL-O-13830A
- Rod barrel is fine ground to 55 ± 5 microinches (other barrel finishes available upon request)

E) Rod end faces are anti-reflection coated for a reflectivity of less than 0.25%. Durability per MIL-C-48497. Total reflective or partial reflective coatings available upon request. Coating damage threshold exceeds 10 J / cm^2.

Table I

YAG Physical and Chemical Properties

Formula:	$Y_3Al_5O_{12}$
Molecular Weight:	596.7
Crystal Structure:	Cubic
Moh Hardness:	8 - 8.5
Melting Point:	1950°C (3540°F)
Density:	4.55 g / cm^{-3}

Table II

Refractive Index of YAG

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

Table III

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

Property	Value
Formula:	$Y_{2.97}Nd_{0.03}Al_5O_{12}$
Weight % Nd:	0.725
Nd Atoms / cm^3:	1.38×10^{20}
Wavelength:	1.064 mm
Transition:	$^4F_{3/2} \rightarrow {}^4I_{11/2}$
Fluorescent Lifetime:	230 μsec
Thermal Conductivity:	0.14 W cm^{-1} K^{-1}
Specific Heat:	0.59 Jg^{-1} K^{-1}
Thermal Expansion:	6.9×10^{-6}°C^{-1}
dn / dt:	7.3×10^{-6}°C^{-1}
Young's Modulus:	3.17×10^4 Kg / mm^{-2}
Poisson Ratio:	0.25
Thermal Shock Resistance:	790 Wm^{-1}

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