

Neodymium: Yttrium Lithium Fluoride - Nd:YLF

SYNOPTICS currently manufactures Nd:YLF as a standard product and produces YLF doped with other rare earths as required. YLF offers an alternative to the more common YAG host for near IR operation. YLF is grown utilizing a modified Czochralski technique. The as-grown crystals are then processed into laser rods or slabs, coated in house, and inspected per customer specifications.

Advantages Of YLF Include:

- High power, low beam divergence, efficient single mode operation.
- High average power Q-switched at a moderate repetition rate.
- Linear polarized resonators for Q-switching and frequency doubling.
- Potential uniform mode for large diameter rods or slabs.
- Stimulated emission cross section and lifetime product is favorable for low CW threshold.
- 1.053 μm output matches gain curves of Nd:Glass and performs well as an oscillator and pre-amplifier for this host.

The combination of weak thermal lensing, large fluorescence line width and naturally polarized oscillation makes Nd:YLF an excellent material for CW, modelocked operation.

Standard Rod Specifications

Dopant Concentration	± 0.2 at % of specified amount (1.0 at % standard with up to 2.0 at % available)
Available Dopants	Nd, Er, Tm, Ho, Pr (others upon request)
Nd Doped Lasing Wavelengths	1053, 1047, and 1313 nm
Wavefront Distortion	> $\lambda / 4$ per inch of rod length ($\lambda = 632$ nm) standard
Extinction Ratio	25 dB minimum
*Rod Axis Orientation	within 5° of the crystal "a" axis
* drawings provided to show orientation to "c" axis for tilted rods	
Dimensional / Mechanical Specifications	
Diameter Tolerance	+ .000" / - .002"
Length Tolerance	+ .040" / - .000"
Rod End Polished Flatness	$\lambda / 10$ @ 633 nm
End Face Parallelism	within 10 arc seconds
End Face Perpendicularity	within 5 arc minutes
Chamfer	0.005" ± 0.003" @ 45°
Surface Quality	10 - 5 scratch-dig per MIL-O-1 3830A
Rod OD	Fine ground to 25 ± 5 μ inches
Standard Coating (High & Partially Reflective coatings available on request)	Anti-Reflection where $R < 0.25\%$ Durability per MIL-C-48497 Damage threshold exceeds 10 J / cm ²

Properties of YLF Host (LiYF₄)

Growth Direction:	a-axis [100]
Crystal Structure:	Tetragonal
Molecular Weight:	171.8
Density, g/cc:	3.95
Moh Hardness:	4 - 5
Melting Point:	825°C
Refractive Index - @ 0.633 μm	$n_o = 1.453, n_e = 1.475$
@ 1.05 μm	$n_o = 1.448, n_e = 1.470$
Thermal Conductivity	0.06 watts cm ⁻¹ °C ⁻¹
Thermal Expansion	13 x 10 ⁻⁶ / °C along "a" axis 8 x 10 ⁻⁶ / °C along "c" axis
Young's Modulus:	7.5 x 10 ¹¹ dynes cm ²
Tensile Strength:	3.3 x 10 ⁸ dynes cm ²
Thermal Heat Capacity:	0.79 J g ⁻¹ K ⁻¹

Specifications and information are subject to change without prior notice.
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