Nd:YLF

Nd:YLF is grown utilizing a advanced modified Czochralski technique. Nd:YLF offers an alternative to the more common Nd:YAG host for near IR operation. The combination of weak thermal lensing, large fluorescence line width and naturally polarized oscillation makes Nd:YLF an excellent material for CW, modelocked operation.

Advantages of Nd:YLF Crystal

- 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
- Stimulated emission cross section and lifetime product is favorable for low CW threshold
- 1053nm output matches gain curves of Nd:Glass and performs well as an oscillator and pre-amplifier for this host.

Basic Properties

Formula	Nd: $LiYF_4$
Crystal Structure	Tetragonal
Space Group	$I4_1/a$
Lattice Parameters	a=5.16Å,c=10.85 Å
Moh Hardness	4-5
Melting Point	825°C
Density	3.95 g/cm^3
Thermal Conductivity	0.06 W /cm°C
Heat Capacity	0.79 J g^{-1} K^{-1}
Thermal Expansion	13 x 10^{-6} °C^{-1} (along a axis) 8 x 10^{-6} °C^{-1} (along c axis)
Young's Modulus	7.65x10^8 g/cm^2

Optical Properties

Transparency Region	180 ~ 6700 nm
Peak Stimulated Emission Cross Section	1.8×10^{-19} cm^2 (E ∥ c) at 1047 nm 1.2×10^{-19} cm^2 (E ⊥ c) at 1053 nm
Spontaneous Fluorescence Lifetime	485μs for 1% Nd
Scatter Losses	<0.2%/cm
Peak Absorption Coefficient (for 1.2% Nd)	α =10.8cm^{-1} (792.0 nm E ∥ c) α =3.59cm^{-1} (797.0 nm E ⊥ c)
Fluorescent Lifetime (Nd 1at%)	230 μs
Laser Wavelength	1047nm (∥ c, or a-cut crystal) 1053nm (⊥ c, or c-cut crystal)
Index of Refraction	n_e = 1.456, n_o = 1.479 at 525 nm n_e = 1.448, n_o = 1.470 at 1050 nm
Therm-optic Coefficients (dn/dT)	-2.44x10^{-6}/°C, -0.54x10^{-6}/°C at 436 nm -2.86x10^{-6}/°C, -0.91x10^{-6}/°C at 578 nm -4.30x10^{-6}/°C, -2.00x10^{-6}/°C at 1060 nm
Sellmeier Equations (λ in μm)	n_o^2 =1.38757+0.70757λ^2/(λ^2 -0.00931)+0.18849λ^2/(λ^2 -50.99741) n_e^2 =1.31021+0.84903λ^2/(λ^2 -0.00876)+0.53607λ^2/(λ^2 -134.9566)

YLF exhibits tetragonal symmetry with crystallographic axes a=b≠c, which are orthogonal , α = β =g=90°. YLF is a uniaxial crystal with its optical axis aligned with the c axis. Our standard Nd:YLF is grown along the a direction. The π-transition (E ∥ c) occurs at 1047nm with an emission cross-section 50% greater than the σ-transition (E ⊥ c) cross section at 1053nm.

Standard Specifications

Standard Nd Dopant Concentration	1.0±0.1%
Wavefront Distortion	≤ 0.25λ/inch
Extinction Ratio	≥28 dB
Rod Sizes	Diameter: 3~15mm, Length: 1~150mm
Dimensional Tolerances	Diameter: +0.00/-0.05mm, Length +0.5/-0.2 mm
Flatness	λ/8 @633 nm
Parallelism	< 10 arc seconds
Perpendicularity	< 5 arc minutes
Surface Quality	10/5 Scratch/Dig per MIL-O-13830A
Barrel Finish	50 - 80 micro-inch (RMS)
Clear Aperture	> Central 90%
AR Coatings	R < 0.15% @1047nm or 1053nm per surface

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