YLF

LASER COMPONENTS offers Nd, Pr, Er, Tm, Ho and no doped YLF crystals using the Czochralski technique. The use of high quality starting materials for crystal growth, whole boule interferometry and precise measurement of bulk losses using transmission spectroscopy assures that each crystal will perform to customer specifications.

Capabilities

- Dopant concentrations between 0.5 and 3.0 mol%
- Rod sizes from 1 mm to 25.4 mm in diameter and from 1 mm to 180 mm in length
- Large rod and slab dimensions and non-standard dopant concentrations are available upon request
- AR, HR and HT coating are available upon request
- Orientation of rod axis to crystal a-axis or c-axis within 2 degrees

Specifications

Dopant concentration tolerance	±0.1%
Parallelism	<10 arc seconds
Perpendicularity	<5 arc minutes
Chamfer	0.1 mm @ 45°
Clear aperture	95%
Surface quality	10/5
Surface flatness	λ/10 @ 633 nm
Wavefront distortion	<7 mm diameter: λ/10 @ 633 nm ≥7 mm diameter: λ/8 @ 633 nm
Damage threshold	over 15 J/cm² TEM00, 10 ns, 10 Hz

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Physical Properties

Chemical formula	$LiY_{1.0x}Nd_xF_4$
Lattice parameters	a = 5.16 A c = 10.85 A
Crystal structure	tetragonal
Space group	$14_1/a$
Nd atoms/cm³	1.40 x 10^{20} atoms/cm³ for 1% Nd doping
Knoop hardness	300 kg/mm²
Melting point	819 °C
Density	3.99 g/cm³
Modulus of elasticity	85 GPa
Thermal expansion	8.3 x 10^{-6}/K along c axis
Coefficient	13.3 x 10-6/K along a axis
Thermal conductivity	0.063 W/cm K
Specific heat	0.79 J/g K

Optical Properties

Transparency region	180 nm to 6.7 µm
Peak stimulator emission	1.8 x 10^{-19} cm² (E ∥ c) at 1.047 µm
Cross section	1.2 x 10^{-19} cm² (E ⊥ c) at 1.053 µm
Spontaneous fluorescence lifetime	485 µs for 1% Nd
Scatter losses	<0.2 %/cm
Peak absorption coefficient	α = 10.8 cm^{-1} (792.0 nm E ∥ c)
(for 1.2% Nd)	α = 3.59 cm^{-1} (797.0 nm E ⊥ c)

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Sellmeier Equation

$$n_o^2 = 1.38757 + \frac{0.70757\lambda^2}{\lambda^2 - 0.00931} + \frac{0.18849\lambda^2}{\lambda^2 - 50.99741}$$

$$n_e^2 = 1.31021 + \frac{0.084903\lambda^2}{\lambda^2 - 0.00876} + \frac{0.53607\lambda^2}{\lambda^2 - 134.9566}$$

dn/dT

Wavelength	E ∥ c	E ⊥ c
436 nm	−2.44 x 10⁻⁶/°C	−0.54 x 10⁻⁶/°C
578 nm	−2.86 x 10⁻⁶/°C	−0.91 x 10⁻⁶/°C
1.06 µm	−4.30 x 10⁻⁶/°C	−2.00 x 10⁻⁶/°C

Index of Refraction

Wavelength	n_o	n_e
262 nm	1.485	1.511
350 nm	1.473	1.491
525 nm	1.456	1.479
1050 nm	1.488	1.470
2065 nm	1.442	1.464

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