Nd:YLF Crystal

Introduction

CASTECH grows Nd:YLF crystals using Czochralski method. The use of high quality starting materials for crystal growth, whole boule interferometry, and precise inspection of scattering particle in crystal using He-Ne laser assures that each crystal will perform well.

Optical Properties

Transparency Range:	180 - 6700 nm
Peak Stimulated Emission Cross Section	1.8×10^{-19}/cm^2(E ∥ c) at 1047nm 1.2×10^{-19}/cm^2(E ⊥ c) at 1053nm
Spontaneous Fluorescence Lifetime	485 μs for 1% Nd doping
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)
Laser Wavelength	1047nm (∥ c, a-cut crystal) 1053nm(⊥ c, a or c-cut crystal)

Physical Properties

Chemical Formula	$LiY_{1.0-x}Nd_xF_4$
Space Group	$I4_1/a$
Nd atoms/cm^3	1.40 X 10^{20} atoms/cm^3 for 1% Nd doping
Modulus of Elasticity	85 GPa
Crystal Structure:	Tetragonal
Cell Parameters:	a=5.16 Å , c=10.85 Å
Melting Point:	819°C
Mohs Hardness:	4~5
Density:	3.99 g/cm^3
Thermal Conductivity	0.063 W/cm/K
Specific Heat	0.79 J/g/K
Thermal Expansion Coefficients	8.3×10^{-6}/k ∥c 13.3×10^{-6}/ k ⊥ c

Index of Refraction

Wavelength(nm)	n_o	n_e
262	1.485	1.511
350	1.473	1.491
525	1.456	1.479
1050	1.448	1.470
2065	1.442	1.464

dn/dT

Wavelength(nm)	E ‖ c	E ⊥ c
436	-2.44 X $10^{-6}/^0$C	-0.54 X $10^{-6}/^0$C
578	-2.86X $10^{-6}/^0$C	-0.91 X $10^{-6}/^0$C
1060	-4.30 X $10^{-6}/^0$C	-2.00 X $10^{-6}/^0$C

The Sellmeier equations (λ in μm):

$n_o^2=1.38757+0.70757\lambda^2/(\lambda^2-0.00931)+0.18849\lambda^2/(\lambda^2-50.99741)$
$n_e^2=1.31021+0.84903\lambda^2/(\lambda^2-0.00876)+0.53607\lambda^2/(\lambda^2-134.9566)$

CASTECH's general Nd:YLF production capabilities including

- Rod sizes from 2mm to 10mm in diameter and from 1mm to 150mm in length
- Orientation of rod axis to crystal axis within 1 degree
- Polished only or AR coated rods
- Nd dopant concentrations between 0.4 and 1.2at%
- Large rod and slab dimensions and non-standard dopant concentrations are available upon request

Specifications

Standard Dopant	1.1 ± 0.1%
Wavefront Distortion	<λ/4 per inch @633nm
Parallelism	<10 arc seconds
Perpendicularity	<5 arc minutes
Chamfer	0.13± 0.07mm @45°
Surface Quality	10/5
End Coating	R<0.15%@1047/1053nm
Surface Flatness	λ/8 @632.8nm