

Nd:Ce:YAG

In double doped Nd:Ce:YAG crystals Cerium are chosen as sensitizer for Nd³⁺ ions because of its strong absorption in UV spectral region at flash lamp pumping and efficient energy transfer to the Nd³⁺ excited state. As a result - thermal distortion in Nd:Ce:YAG is appreciably less and the output laser energy is greater than that in Nd:YAG at the same pumping. Therefore it is possible to realize high power lasers with good beam quality. Lasing wavelength at 1064 nm, laser damage threshold and thermal conductivity of the Nd:Ce:YAG crystals are the same as for Nd:YAG.

Advantages of Nd:Ce:YAG Crystals

- High efficiency
- Low threshold
- Good anti-violet radiation property
- Good thermal stability
- High optical quality

Optical and Spectral Properties of Nd:Ce:YAG Crystal

Laser transition	$^4F_{3/2} \rightarrow ^4I_{11/2}$
Laser wavelength	1.064 μm
Photon energy	$1.86 \times 10^{-19} \text{ J @ } 1.064 \mu\text{m}$
Emission linewidth	4.5 \AA @ 1.064 μm
Emission cross section (Nd 1 at%)	$2.7 \sim 8.8 \times 10^{-19} \text{ cm}^2$
Fluorescence lifetime (Nd 1 at%)	230 μs
Index of refraction	1.8197 @ 1064 nm

Physical and Chemical Properties

Crystal structure	cubic
Lattice parameters	12.01 Å
Melting point	1970 °C
Moh hardness	8.5
Density	4.56 ± 0.04 g/cm ³
Specific heat (0 – 20)	0.59 J/g.cm ³
Modulus of elasticity	310 GPa
Young's modulus	3.17 × 10 ⁴ Kg/mm ²
Poisson ratio	0.3 (est.)
Tensile strength	0.13 ~ 0.26 GPa
Thermal expansion coefficient	[100] Direction: 8.2 × 10 ⁻⁶ /°C (0 ~ 250 °C) [110] Direction: 7.7 × 10 ⁻⁶ /°C (0 ~ 250 °C) [111] Direction: 7.8 × 10 ⁻⁶ /°C (0 ~ 250 °C)
Thermal conductivity	14 W/m/K (@20 °C) 10.5 W/m/K (@100 °C)
Thermal optical coefficient (d _n /d _T)	7.3 × 10 ⁻⁶ /°C
Thermal shock resistance	790 W/m
Solubility	water: insoluble; common acids: slightly

Specifications of Nd:Ce:YAG Crystal

Dopant concentration	Nd:1.1 ~ 1.4 at%, Ce:0.05~0.1 at%
Orientation	[111] within 5°
Wavefront distortion	≤ 0.2 λ/inch
Extinction ratio	≤ 28 dB
Rod sizes	diameter: 3~6 mm, length: 40~80 mm upon request of customer
Dimensional tolerances	diameter +0.000"/-0.002", length ±0.02"
Barrel finish	ground finish: 400# Grit
Parallelism	≤ 10"
Perpendicularity	≤ 5'
Flatness	λ/10
Surface quality	10-5 (MIL-O-13830A)
Chamfer	0.006" ± 0.002" at 45° ± 5°
AR coating reflectivity	≤ 0.25% (@1064 nm)