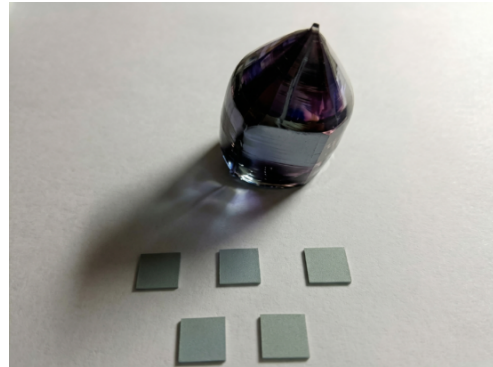


## LASER CRYSTALS

# Nd:YVO<sub>4</sub> Laser Crystal

## Product Brochure &amp; Technical Reference

Nd:YVO<sub>4</sub> gain crystals for diode-pumped solid-state laser projects. Review polarization, crystal orientation, dopant concentration, geometry and the pump/laser coating design.



Reference product image. Shown geometry is illustrative.

## Material reference properties / options

| Property                                  | Typical Value                                                             |
|-------------------------------------------|---------------------------------------------------------------------------|
| Atomic density                            | $1.26 \times 10^{20}$ atoms/cm <sup>3</sup> , Nd 1.0%                     |
| Crystal structure                         | Zircon tetragonal, space group I41/amd                                    |
| Lattice constants                         | $a = b = 7.1193$ Å, $c = 6.2892$ Å                                        |
| Density                                   | 4.22 g/cm <sup>3</sup>                                                    |
| Mohs hardness                             | 4-5, glass-like                                                           |
| Thermal expansion coefficient at 300 K    | $\alpha_a = 4.43 \times 10^{-6}$ /K; $\alpha_c = 11.37 \times 10^{-6}$ /K |
| Thermal conductivity coefficient at 300 K | //C: 0.0523 W/(cm K); perpendicular C: 0.0510 W/(cm K)                    |

Reference values and options for selection. Confirm the material grade, geometry, test conditions and acceptance criteria for the quoted configuration.

## LASER CRYSTALS

# Configuration & quotation

Define the component around your application

Application examples: Compact diode-pumped solid-state laser modules; 1064 nm CW and pulsed laser systems; Frequency-doubled 532 nm green lasers with KTP, LBO or BBO

## Specifications of Nd:YVO4 Laser Crystal

| Parameter               | Typical Value / Option                                                      |
|-------------------------|-----------------------------------------------------------------------------|
| Material                | Nd:YVO4 / neodymium-doped yttrium orthovanadate                             |
| Nd doping               | 0.07%-3 at%                                                                 |
| Doping tolerance        | +/-0.05 at% for doping below 1 at%; +/-0.1 at% for doping at or above 1 at% |
| Orientation             | A-cut or C-cut, +/-0.5 degrees                                              |
| Dimension tolerance     | +/-0.1 mm                                                                   |
| Flatness                | $\lambda/10$ at 632.8 nm                                                    |
| Wavefront distortion    | $\lambda/6$ at 632.8 nm                                                     |
| Surface quality         | 10/5 per MIL-O-13830B                                                       |
| Parallelism             | $\leq 10$ arcsec                                                            |
| Perpendicularity        | $\leq 10$ arcmin                                                            |
| Bevel / chamfer         | <0.1 mm at 45 degrees                                                       |
| Chips                   | <0.1 mm                                                                     |
| Clear aperture          | >95%                                                                        |
| Coating                 | AR, HR, or PR coating; IAD, EB, or IBS coating upon customer request        |
| Damage threshold        | About 750 MW/cm <sup>2</sup> at 1064 nm, TEM00, 10 ns, 10 Hz                |
| Quality warranty period | One year under proper use, subject to final sales terms                     |

## Optical Properties of Nd:YVO4 Laser Crystal

| Property                                                          | Typical Value                                                                                                                                       |
|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Lasing wavelengths                                                | 1064 nm, 1342 nm, 914 nm                                                                                                                            |
| Thermal optical coefficient at 300 K                              | $dn_o/dT = 8.5 \times 10^{-6}/K$ ; $dn_e/dT = 2.9 \times 10^{-6}/K$                                                                                 |
| Stimulated emission cross section                                 | $25 \times 10^{-19} \text{ cm}^2$ at 1064 nm                                                                                                        |
| Fluorescence lifetime                                             | 90 $\mu\text{s}$ , 1% Nd doping                                                                                                                     |
| Absorption coefficient                                            | 31.4 $\text{cm}^{-1}$ at 810 nm                                                                                                                     |
| Intrinsic loss                                                    | 0.02 $\text{cm}^{-1}$ at 1064 nm                                                                                                                    |
| Gain bandwidth                                                    | 0.96 nm at 1064 nm                                                                                                                                  |
| Polarized laser emission                                          | Pi polarization, parallel to optic axis / c-axis                                                                                                    |
| Diode-pumped optical-to-optical efficiency                        | $\geq 50\%$ , depending on cavity and test conditions                                                                                               |
| Sellmeier equations for the YVO4 host, $\lambda$ in $\mu\text{m}$ | $n_o^2 = 3.77834 + 0.069736/(\lambda^2 - 0.04724) - 0.0108133 \lambda^2$ ; $n_e^2 = 4.59905 + 0.110534/(\lambda^2 - 0.04813) - 0.0122676 \lambda^2$ |

## Prepare your quotation

| RFQ Item               | Information to Provide                                                                                          |
|------------------------|-----------------------------------------------------------------------------------------------------------------|
| Doping and orientation | Nd doping concentration, a-cut or c-cut orientation, and orientation tolerance.                                 |
| Geometry               | Length, width, thickness, chamfer, clear aperture, and drawing if available.                                    |
| Optical specification  | Surface quality, flatness, wavefront distortion, parallelism, perpendicularity, and chips requirement.          |
| Coating requirement    | AR, HR, PR, pump wavelength coating, 1064 nm coating, 1342 nm coating, or dual-band coating.                    |
| Laser design           | Pump wavelength, pump power, cavity type, CW or Q-switched operation, frequency conversion, and cooling method. |
| Order information      | Prototype quantity, recurring demand, inspection criteria, packaging requirement, and delivery schedule.        |

Reference values and options for selection. Confirm the material grade, geometry, test conditions and acceptance criteria for the quoted configuration.

### Send drawings for engineering review

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