Nd:YVO₄

Yttrium vanadate has been growing in popularity because of its high gain, low lasing threshold, and high absorption coefficients at pumping wavelengths, which result from the excellent fit of the neodymium dopant in the crystal lattice. These advantages make Nd:YVO₄ a better choice than Nd:YAG for low-power devices such as hand-held pointers, and others compact lasers.

With advanced technology on growing and manufacturing high optical quality Nd:YVO₄ crystals, FOCTek can provide a wide variety of finished crystals.

Capabilities:
1) Nd Dopant Concentration: 0.1 ~ 3 atm% Tolerance within 10% of concentration
2) Width x Height: 1x1 ~ 16x16mm
3) Length: 0.02 ~ 20mm

Typical Specification and Tolerance:
1) Orientation: a-cut crystalline direction (+-0.2°C)
2) Dimensional Tolerance: +/-0.1mm(typical), +/-0.005mm can be available for High precision.
3) Wavefront Distortion: < /8 at 633nm
4) Surface Quality: better than 20/10 Scratch/Dig per MIL-O-1380A
5) Parallelism: < 10 arc seconds
6) Perpendicularity: < 5 arc minutes
7) Surface Flatness: < /λ/10 at 632.8nm
8) Clear Aperture: Central 95%
9) Chamfer: 0.15mmx45°
10) Damage Threshold: > 15J/cm² (rods without coating)
    > 700 MW/cm² (coating)
11) Coating:
    1) AR@1064nm, R<0.1%;(see coating 6-1)
    2) AR@1064nm, R< 0.1%; HT@808nm, T>95%;(see coating 6-2)
    3) HR@1064nm, R>99.8%; HT@808nm, T>95%;(see coating 6-3)
    4) HR@1064nm, R>99.8%; HR@532nm, R>95% &
       HT@808nm, T>95%;(see coating 6-4)
    5) AR@1064nm, R<0.1%; AR@532nm, R<0.3%;(see coating 6-5)
Lasing Wavelengths
914nm, 1064 nm, 1342 nm

Crystal class
positive uniaxial, $n_a=n_b=n_c$, $n_0=n_0$,
$n_0=1.9573$, $n_0=2.1652$, @ 1064nm
$n_0=1.9721$, $n_0=2.1858$, @ 808nm
$n_0=2.0210$, $n_0=2.2560$, @ 532nm

Thermal Optical Coefficient
d$_n$/dT = 8.5x10$^{-5}$/K, d$_n$/dT = 3.0x10$^{-5}$/K

Stimulated Emission Cross-Section
25.0x10$^{-18}$ cm$^2$, @ 1064 nm

Fluorescent Lifetime
Nd=1.1 atm%
Nd=2.0 atm%
90μs @ 808nm
50μs @ 808nm

Absorption Coefficient
Nd=1.1 atm%
31.4 cm$^{-1}$ @ 808 nm

Absorption Length
Nd=1.1 atm%
0.32 mm @ 808 nm

Intrinsic Loss
Nd=1.1 atm%
Less 0.1% cm$^{-1}$, @ 1064 nm

Gain Bandwidth
0.96 nm (257 GHz) @ 1064 nm

Polarized Laser Emission
$\pi$ polarization; parallel to optic axis (c-axis)

Diode Pumped Optical to Optical Efficiency
> 60%

Sellmeier Equation
(for pure YVO$_4$ crystals)
$n_0^2 = 3.77834 + 0.069736/(\lambda^2 - 0.04724) - 0.0108133\lambda^2$
$n_0^2 = 4.59905 + 0.110534/(\lambda^2 - 0.04813) - 0.0122676\lambda^2$

Atomic Density
~1.37x10$^{20}$ atoms/cm$^3$

Crystal Structure
Zircon Tetragonal, space group D$_{4h}$, a=b=7.12, c=6.29

Density
4.22 g/cm$^3$

Mohs Hardness
Glass-like, ~5

Thermal Expansion Coefficient
$\alpha_c=4.43x10^{-6}$/K, $\alpha_c=11.37x10^{-6}$/K

Thermal Conductivity Coefficient
|C: 5.23 W/m/K, ⊥C: 5.10 W/m/K
How to handle the Nd:YVO₄ crystal

When you receive crystals from FOCTek, please make sure that only qualified personnel are able to open inner packing at clean environment. Please prevent finger print, oil and other substances from adhering to the polished or coated surfaces.

If the surfaces are contaminated, please blow the surfaces with air ball. If there is still pollution on the crystal surfaces, please clean the surfaces with cleaning liquid and soft silk. The mixing liquid of 50% high purity alcohol and 50% high purity ether is recommended as cleaning liquid. Please notify that the contaminated surfaces are very easy to be damaged. When polished surfaces are fogged or damaged, please ask FOCTek for repolishing and coating service.

Marks on the crystals

For general a-cut Nd:YVO₄, there is a dot mark on the surface, which normal to the optical axis. And, if the coating is different on the input and output surface, there is an arrow mark on the crystal side surface, which direct from input surface to output surface.

Standard Products Series

FOCTek have a lot of standard series kits of diode pumped laser optics, it's easy to select what you need listed below.

<table>
<thead>
<tr>
<th>Part</th>
<th>Size (mm)</th>
<th>Nd</th>
<th>Coatings</th>
<th>S1</th>
<th>S2</th>
<th>Unit Price</th>
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<td>NYV001</td>
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