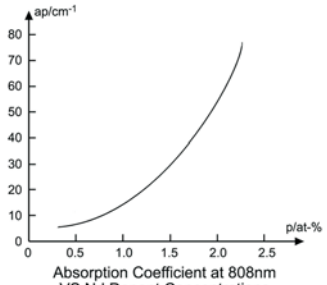
Nd:YVO_4

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:YVO_4 is a better choice than Nd:YAG for low-power devices such as hand-held pointers, and others compact lasers.

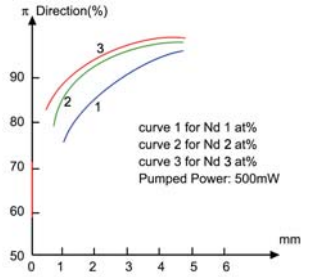
With advanced technology on growing and manufacturing high optical quality Nd:YVO_4 crystals, FOCtek can provide a wide variety of finished crystals.

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



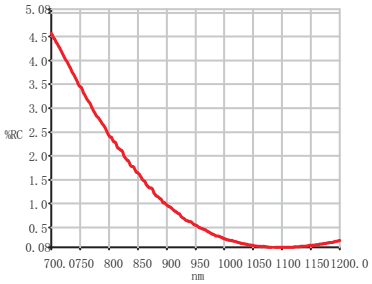
Absorption Coefficient at 808nm VS Nd Dopant Concentrations



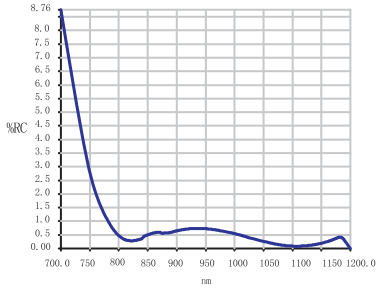
Nd:YVO4 Absorption Efficiency VS Length

Typical Specification and Tolerance:

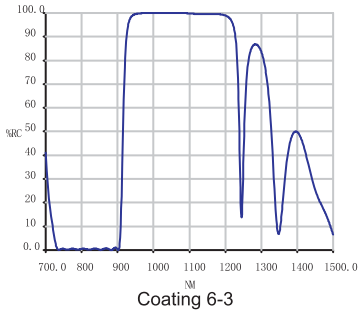
1) Orientation: a-cut crystalline direction (+/-0.2°C)
2) Dimensional Tolerance: +/-0.1mm(typical), +/-0.005mm can be available for High precision.
3) Wavefront Distortion: < λ/8 at 633nm
4) Surface Quality: better than 20/10 Scratch/Dig per MIL-O-1380A
5) Parallelism: < 10 arc seconds
6) Perpendicularity: < 5 arc minutes
7) Surface Flatness: < λ /10 at 632.8nm
8) Clear Aperture: Central 95%
9) Chamfer: 0.15mmx45°
10) Damage Threshold: > 15J/cm^2 (rods without coating)
> 700 MW/ cm^2 (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)



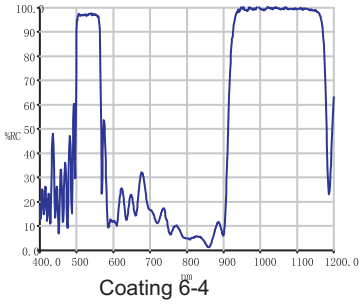
Coating 6-1



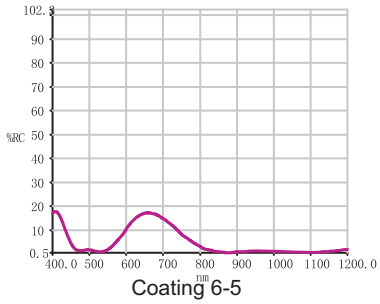
Coating 6-2



Coating 6-3



Coating 6-4



Coating 6-5

Lasing Wavelengths		914nm, 1064 nm, 1342 nm
Crystal class		positive uniaxial, $n_o=n_a=n_b$, $n_e=n_c$, n_o=1.9573, n_e=2.1652, @ 1064nm n_o=1.9721, n_e=2.1858, @ 808nm n_o=2.0210, n_e=2.2560, @ 532nm
Thermal Optical Coefficient		$dn_a/dT=8.5\times10^{-6}$/K, $dn_c/dT=3.0\times10^{-6}$/K
Stimulated Emission Cross-Section		25.0×10^{-19} 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		π polarization; parallel to optic axis (c-axis)
Diode Pumped Optical to Optical Efficiency		> 60%
Sellmeier Equation (for pure YVO4 crystals)		$n_o^2 = 3.77834 + 0.069736/(\lambda^2 - 0.04724) - 0.0108133.\lambda^2$ $n_e^2 = 4.59905 + 0.110534/(\lambda^2 - 0.04813) - 0.0122676.\lambda^2$

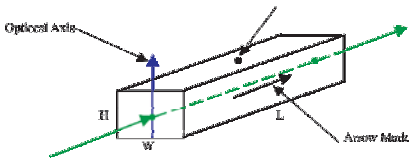
Atomic Density	~1.37x1020 atoms/cm^2
Crystal Structure	Zircon Tetragonal, space group D_{4h}, a=b=7.12, c=6.29
Density	4.22 g/cm^2
Mohs Hardness	Glass-like, ~5
Thermal Expansion Coefficient	$\alpha_a=4.43\times10^{-6}$/K, $\alpha_c=11.37\times10^{-6}$/K
Thermal Conductivity Coefficient	||C: 5.23 W/m/K; ⊥C: 5.10 W/m/K

How to handle the Nd:YVO_4 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:YVO_4, 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 cruystal 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.

Part	Size (mm)	Nd	Coatings		Unit Price
			S1	S2	
NYV001	3x3x1	0.5%	AR@1064nm, HT@808nm	AR@1064nm,	$48
NYV002	3x3x1	1%	AR@1064nm, HT@808nm	AR@1064nm,	$48
NYV003	3x3x1	1%	HR@1064nm, HT@808nm,	AR@1064nm,	$79
NYV004	3x3x1	1%	HR@1064nm,HT@808nm,HR@532nm	AR@1064nm,	$99
NYV005	3x3x3	0.5%	AR@1064nm, HT@808nm	AR@1064nm, HT@808nm	$99
NYV006	3x3x3	0.5%	HR@1064nm, HT@808nm	AR@1064nm, HT@808nm	$129
NYV007	3x3x5	0.5%	AR@1064nm, HT@808nm	AR@1064nm, HT@808nm	$129
NYV008	3x3x8	0.5%	AR@1064nm, HT@808nm	AR@1064nm, HT@808nm	$179
NYV009	3x3x12	0.5%	AR@1064nm, HT@808nm	AR@1064nm, HT@808nm	$219
NYV010	3x3x3	1.0%	AR@1064nm, HT@808nm	AR@1064nm, HT@808nm	$96
NYV011	3x3x3	1.0%	HR@1064nm, HT@808nm	AR@1064nm, HT@808nm	$129
NYV101	3x3x0.5	3.0%	HR@1064nm, HR@532nm,HT@808nm	AR@1064nm&532 nm	$99
NYV102	3x3x1	1.0%	HR@1064nm, HR@532nm,HT@808nm	AR@1064nm&532 nm	$99
NYV103	3x3x1	2.0%	HR@1064nm, HR@532nm,HT@808nm	AR@1064nm&532 nm	$99
NYV104	3x3x3	1.0%	HR@1064nm, HR@532nm,HT@808nm	AR@1064nm&532 nm	$129
NYV105	3x3x5	0.5%	HR@1064nm, HR@532nm,HT@808nm	AR@1064nm&532 nm	$199
NYV106	3x3x2	1.0%	HR@1064nm, HR@532nm,HT@808nm	AR@1064nm&532 nm	$159
NYV107	3x3x2	0.5%	HR@1064nm, HR@532nm,HT@808nm	AR@1064nm&532 nm	$159