

**Nd:YVO<sub>4</sub> Crystal (Neodymium Doped Yttrium Orthovanadate)**

Nd:YVO<sub>4</sub> is one of the most promising commercially available diode pumped solid state laser materials. It has high laser induced damage threshold and good mechanical in addition to optical properties. Its large stimulated emission cross-section and high absorption of pump laser make it a right crystal for pocket laser. Nd: YVO<sub>4</sub> can produce IR green and blue laser by using minor different set-up. A broad absorption band centered at 808nm and favorable mechanical properties make Nd:YVO<sub>4</sub> well suited for compact, efficient, high power diode-pumped lasers. Natural birefringence gives rise to a highly polarized output at 1064.3 and 1342nm.

**Basic Properties of Nd:YVO<sub>4</sub>**

Atomic Density:	1.26x10 <sup>20</sup> atoms/cm <sup>3</sup> (Nd1.0%)
Crystal Structure:	Zircon Tetragonal, space group D <sub>4h</sub> -I <sub>4</sub> /amd a=b=7.1193Å, c=6.2892Å
Density;	4.22g/cm <sup>3</sup>
Mohs Hardness:	4-5(Glass-like)
Thermal Expansion Coefficient(300K):	$\alpha$ a=4.43x10 <sup>-6</sup> /K $\alpha$ c=11.37x10 <sup>-6</sup> /K
Thermal Conductivity Coefficient(300K):	//C:0.0523W/cm/K ⊥ C:0.0510W/cm/K

**Optical Properties of Nd:YVO<sub>4</sub>:**

Lasing wavelength:	1064nm, 1342nm
Thermal optical coefficient (300K):	dno/dT=8.5×10 <sup>-6</sup> /K dne/dT=2.9×10 <sup>-6</sup> /K
Stimulated emission cross-section:	25×10 <sup>-19</sup> cm <sup>2</sup> @ 1064nm
Fluorescent lifetime:	90μs (1% Nd doping)
Absorption coefficient:	31.4cm <sup>-1</sup> @ 810nm
Intrinsic loss:	0.02cm <sup>-1</sup> @ 1064nm
Gain bandwidth:	0.96nm @ 1064nm
Polarized laser emission:	π polarization; parallel to optic axis(c-axis)
Diode pumped optical to optical efficiency:	>60%
Sellemeier equations (λ in μm)	n <sub>o</sub> <sup>2</sup> =3.77834+0.069736/(λ <sup>2</sup> -0.04724)-0.010813λ <sup>2</sup> n <sub>e</sub> <sup>2</sup> =4.59905+0.110534/(λ <sup>2</sup> -0.04813)-0.012676λ <sup>2</sup>

## Laser Properties of Nd:YVO4

The major laser properties of Nd:YVO4 vs Nd:YAG are listed in Table below, including stimulated emission cross-sections ( $\sigma$ ), Absorption Coefficient ( $\alpha$ ), Fluorescent lifetime ( $\tau$ ), Absorption Length ( $L_a$ ), threshold Power ( $P_{th}$ ) and Pump Quantum Efficiency.

Laser crystal	Doping (atm%)	$\sigma$ ( $\times 10^{-19} \text{cm}^2$ )	$\alpha$ ( $\text{cm}^{-1}$ )	$\tau$ ( $\mu\text{s}$ )	$L_a$ (mm)	$P_{th}$ (mW)	Effi. (%)
Nd:YVO4 (a-cut)	1.0	25	23	90	0.32	30	52
	2.0	25	46	50	0.14	78	48.6
Nd:YVO4 (c-cut)	1.1	7	9.2	90		231	45.5
Nd:YAG	0.85	6	7.1	230	1.41	115	38.6

HGO offer Nd:YVO4 specifications

Doping	0.07%~3%
Doping concentration tolerance	$\pm 0.05\%$ (atm% < 1%), $\pm 0.1\%$ (atm% $\geq 1\%$ )
Orientation	A-cut/C-cut $\pm 0.5^\circ$
Dimension Tolerance	$\pm 0.1 \text{mm}$
Flatness	$\lambda/10$ @ 632.8nm
Wavefront distortion	$\lambda/6$ @ 632.8nm
Surface Quality	10/5 per MIL-O-13830B
Parallelism	10''
Perpendicularity	10'
Bevel/Chamfer	<0.1mm @ 45deg.
Chips	<0.1mm
Clear Aperture	>95%
Coating	AR/HR/PR coating upon customer's request
Damage Threshold	750MW/ $\text{CM}^2$ at 1064nm, TEM00, 10ns, 10Hz
Quality Warranty Period	One year under proper use

Nd:YVO4 crystals with diffusion bonded undoped YVO4 endcaps are also available from HG Optonics.,Inc. Please visit [here](#).