Neodymium Doped Gadolinium Orthovanadate ($Nd:GdVO_4$)

CASTECH's $Nd:GdVO_4$ is featured by

- Large stimulated emission cross section at laser wavelength;
- High absorption coefficient and wide bandwidth at pump wavelength;
- Low dependency on pump wavelength;
- Good thermal conductivity;
- Low lasing threshold and high slope efficiency;
- High laser induced damage threshold;
- Strongly-polarized laser output.

Specifications

Crystal structure	Tetragonal
Space Group	$I4_1/amd$
Lattice parameter	a=0.721nm, b=0.635nm
Lasing Transition	$^4F_{3/2} \rightarrow {}^4I_{11/2}$
Lasing wavelength	1062.9nm
Emission Cross Section (at 1064nm)	$7.6x10^{-19}$ cm^2
Absorption Cross Section (at 808nm)	$4.9x10^{-19}$ cm^2
Absorption Coefficient (at 808nm)	$74cm^{-1}$
Index of Refractivity (at 1064nm)	n_o=1.972, n_e=2.192
Thermal Conductivity (<110>)	11.7W/m/K
Density	$5.47g/cm^3$
Nd Dopant level (atomic)	0.1%, 0.2%, 0.3%, 0.5%, 0.7%, 1.0%...

Material Properties: Comparing $Nd:GdVO_4$ and $Nd:YVO_4$

Crystal	$Nd:GdVO_4$		$Nd:YVO_4$	
Crystal Structure, Space Group	Tetragonal, $I4_1/amd$		Tetragonal, $I4_1/amd$	
Lattice constants (nm)	a:0.721 b:0.635		a:0.721 b:0.629	
Melting temperature(^{0}C)	1780		1825	
Thermal expansion @25^{0}C, x10^{-6}/^{0}C	a	1.5	a	4.43
	b	7.3	b	11.4
Specific heat @25^{0}C, cal/mol·K	32.6		24.6	
dn / dT, x10^{-6} /^{0}C	4.7		2.7	

Information Regarding Neodymium Laser Host Crystals

Crystal	Nd:YVO_4	Nd:$GdVO_4$	Nd:YAG
Laser wavelengths	1064.3nm,1342.0 nm	1062.9 nm,1340 nm	1064.2 nm,1338.2 nm
Emission bandwidth (linewidth at 1064 nm)	0.8nm	No data	0.45nm
Effective laser cross section (emission cross section at 1064 nm)	15.6 x 10^{-19} cm^2	7.6 x $10^{-19}$$cm^2$	6.5 x $10^{-19}$$cm^2$
Polarization	Parallel to c-axis	Parallel to c-axis	unpolarized
Radioactive lifetime (microseconds) at 1% Nd doping	~ 100 μs	~ 95 μs	230 μs
Pump wavelength	808.5 nm	808.4 nm	807.5 nm
Peak pump absorption at 1% doping	~ 41 cm^{-1}	~ 57 cm^{-1}	
Thermal conductivity, W/m/K	5.1	11.7	14
Doping concentration range	0.1 - 3.0%	0.1 - 3.0%	0.1-2.0%

CASTECH Warranty on Nd:YVO_4 Specifications

- Transmitting wavefront distortion: less than λ/4 @ 633nm
- Dimension tolerance:(W±0.1mm)x(H±0.1mm)x(L+0.2/-0.1 mm)
- Clear aperture:>90% central area
- Flatness: λ/8 @ 633 nm, and λ/4 @ 633nm for thickness less than 2mm
- Scratch/Dig code: 10/5 to MIL-PRF-13830B
- Parallelism: better than 20 arc seconds
- Perpendicularity: 5 arc minutes
- Angle tolerance:<±0.5°
- AR coating: R<0.2% at 1064nm,
- HR coating: R>99.8%@1064nm, T>95%@808nm
- Quality Warranty Period: one year under proper use.