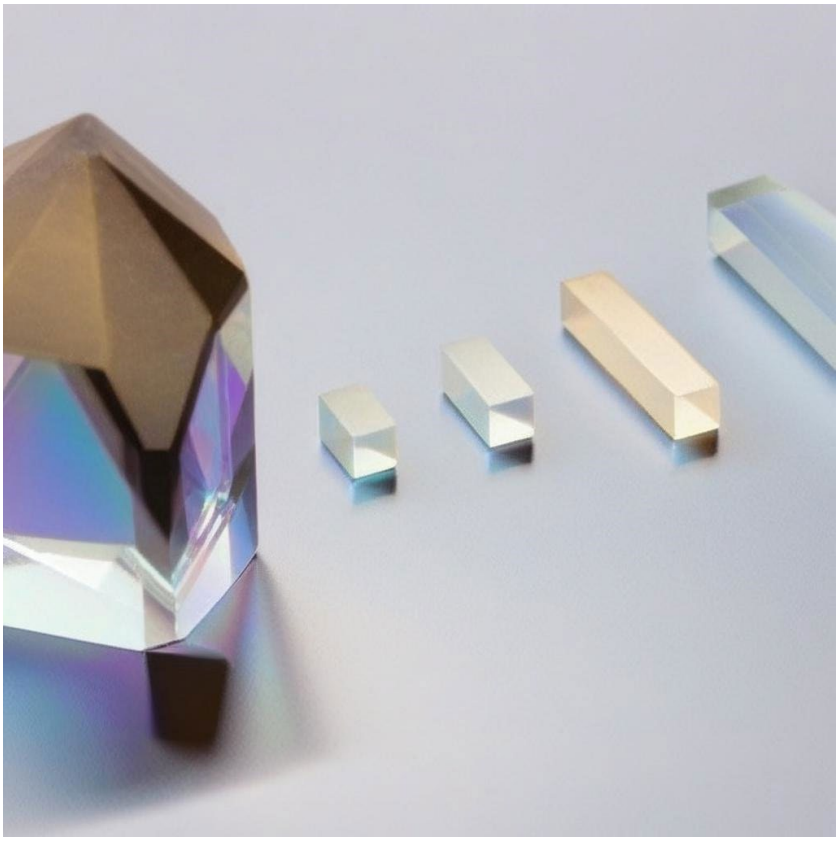
Photonics On Crystals

POC-OC-122429-Nd:KGW Crystal Datasheet

1 Main Features

1. Excellent laser gain material with high emission cross-section and low laser oscillation threshold.
2. High fluorescent lifetime due to reduced quenching effects of Nd^{3+} ions.
3. Wide absorption bandwidth (808 nm) for efficient diode-pumped lasers.
4. Suitable for picosecond and femtosecond laser pulse generation.
5. Custom dimensions and coating options available upon request.



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2. Material General Description

Neodymium Doped Potassium Gadolinium Tungstate (Nd:KGW) is a monoclinic crystal known for its exceptional laser gain properties. Its unique chemical structure minimizes the quenching effects of Nd^{3+} ions, enabling higher doping concentrations and improved fluorescence efficiency. The absorption band at 808 nm (12 nm FWHM) aligns well with commercial diode lasers, providing efficient pumping and low laser threshold.

The material's thermal conductivity, stability under high-power conditions, and broad emission bandwidth make it ideal for diode-pumped solid-state lasers. Additionally, Nd:KGW can function as a Raman converter for generating secondary wavelengths. These characteristics ensure its wide adoption in industrial, medical, and scientific laser systems.

3. General Applications and Examples

1. Industrial Applications

- **Laser Cutting and Drilling**: High-power Nd:KGW lasers provide precision machining capabilities.
  Example: Used in microelectronics for intricate drilling and cutting of semiconductor wafers.
- **Material Processing**: Efficient in marking and engraving non-metallic materials.

2. Medical Applications

- **Laser Surgery**: Nd:KGW lasers are utilized in delicate surgical procedures due to their precise emission wavelengths.
  Example: Ophthalmology surgeries such as corneal reshaping.

3. Scientific Research

- **Spectroscopy and Raman Conversion**: The crystal serves as an efficient Raman laser converter, extending operational wavelengths.
  Example: Raman conversion of 1067 nm to eye-safe spectral ranges.
- **Femtosecond Laser Systems**: Suitable for high-energy laser pulse generation in ultrafast systems.

4. Military and Defense

- **Range Finders**: Diode-pumped Q-switched Nd:KGW lasers provide accurate measurements in range-finding systems.

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4. Chemical, Physical, and Structural Properties

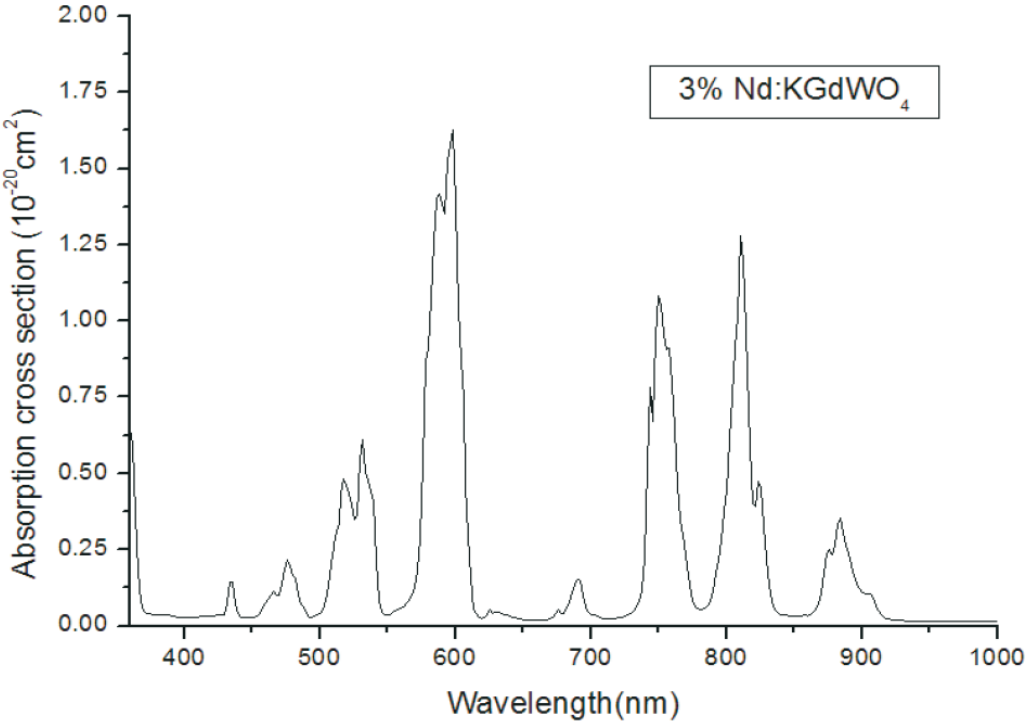
Property	Value
Crystal Structure	Monoclinic
Space Group	c_2/c (C2/c)
Lattice Parameters	a = 8.087 Å, b = 10.374 Å, c = 7.588 Å
Density	7.27 g/cm³
Refractive Index (at 1067 nm)	$n_x = 2.049$, $n_y = 1.978$, $n^z = 2.014$
Mohs Hardness	5
Melting Point	1075 °C
Thermal Conductivity	$K_x = 2.6$ W/m·K, $K_y = 3.8$ W/m·K, $K^z = 3.4$ W/m·K
Young's Modulus	115.8 GPa (E_x), 92.4 GPa (E_y)
Thermal Expansion Coefficient	$\alpha_x = 4 \times 10^{-6}$/K, $\alpha_y = 1.6 \times 10^{-6}$/K, $\alpha^z = 8.5 \times 10^{-6}$/K

5. Optical, Laser, and Nonlinear Optical Properties

Property	Value
Emission Wavelength	1070 nm
Stimulated Emission Cross-Section	1.48×10^{-19} cm²
Fluorescent Lifetime	110 µs (3% doping), 90 µs (8% doping)
Absorption Bandwidth	14 nm
Absorption Cross-Section	1.28×10^{-19} cm²
Gain Bandwidth	15 nm
Pump Wavelength	808 nm (FWHM 12 nm)
Refractive Index	$n_x = 2.049$, $n_y = 1.978$, $n^z = 2.014$

6. Spectrum Transmission Curves

Nd:KGW demonstrates excellent transmission efficiency from visible to near-infrared wavelengths. The graph below illustrates the crystal's transparency curve, indicating strong absorption at 808 nm and emission at 1070 nm.



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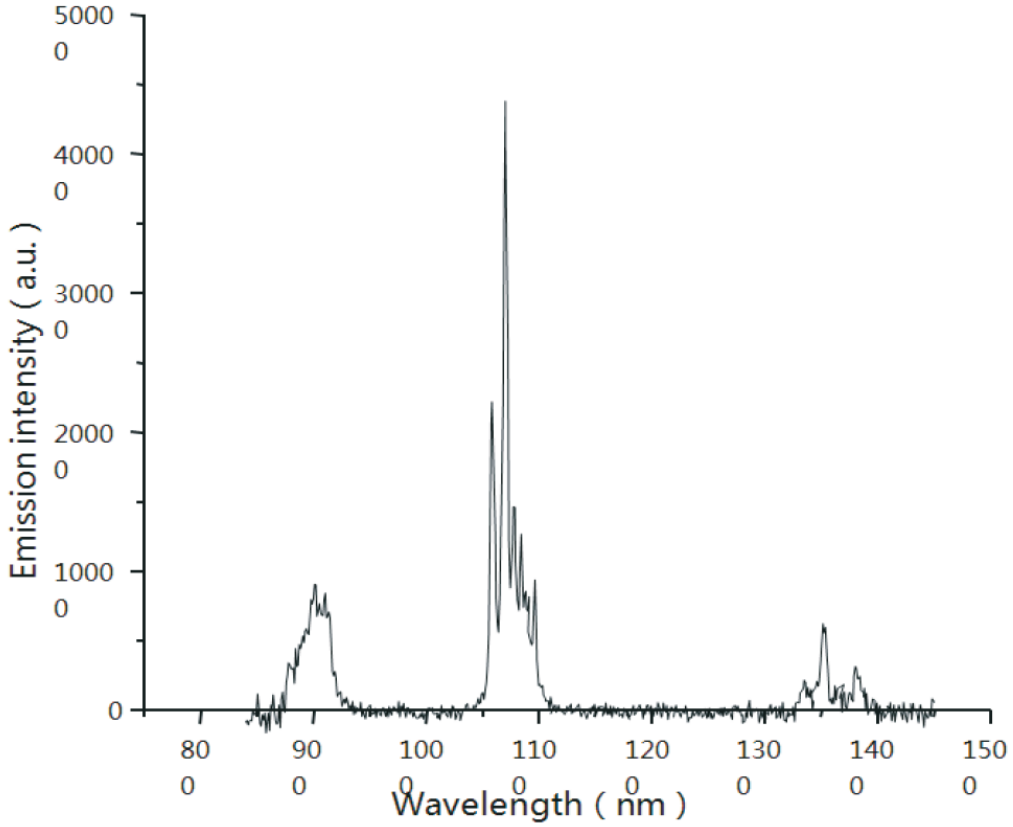

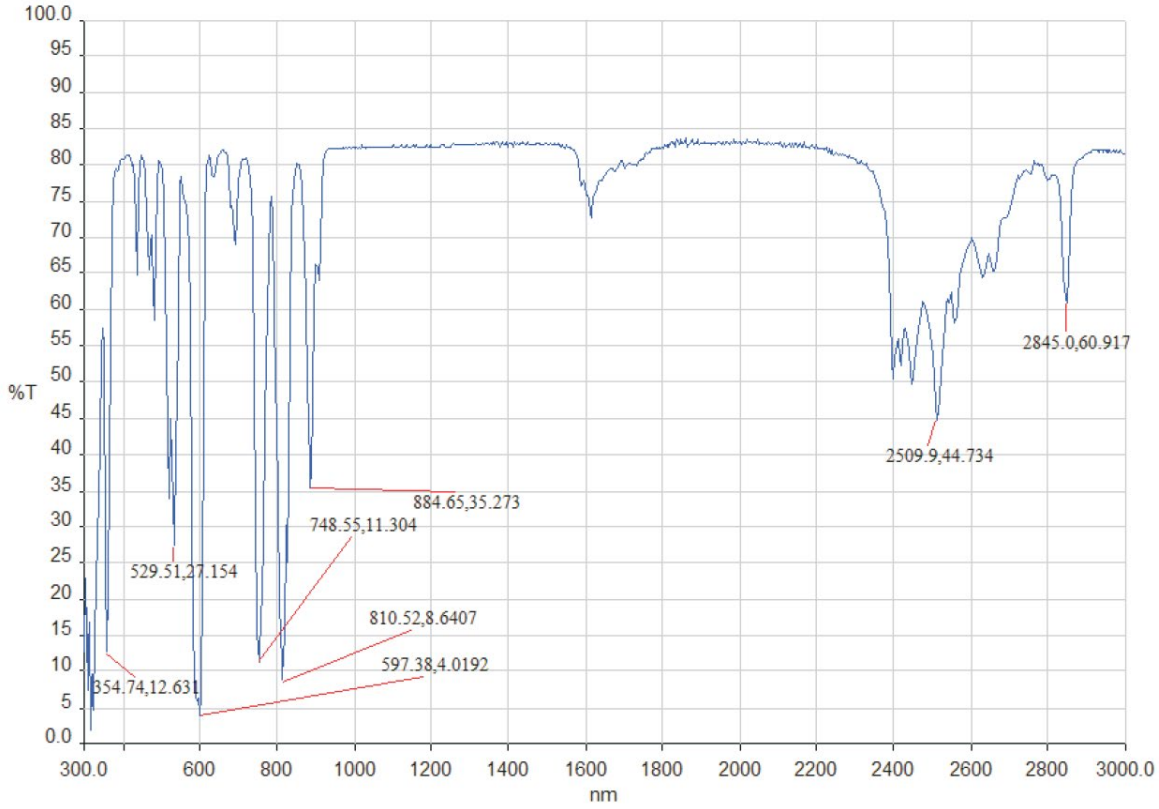

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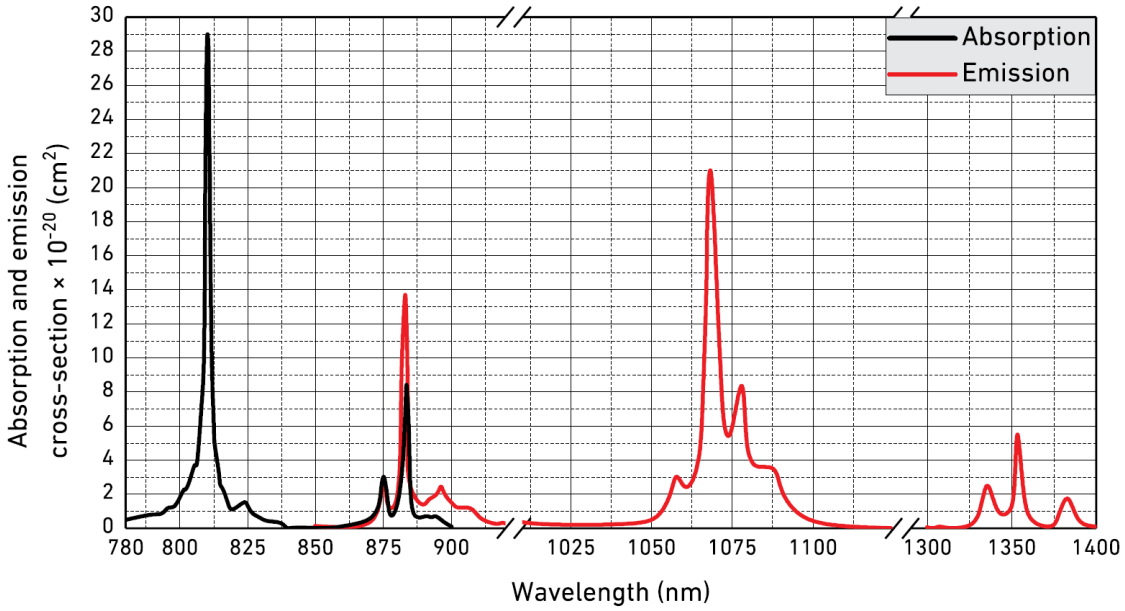

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7. Coating Specification

Coating Type	Specifications
AR Coating	R < 0.2% at 808 nm, R < 0.15% at 1067 nm
Custom Coatings	Available upon request

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8. Standard Fabrication Specifications

Specification	Value
Orientation	[010]
Standard Dopant Concentration	Nd: 3%, 5%, 8%
Maximum Length	50 mm
Dimensional Tolerance	Diameter: ±0.1 mm, Length: ±0.5 mm
Surface Quality (Scratch/Dig)	20/10
Surface Flatness	λ/6 @ 633 nm
Parallelism	<20 arc seconds
Perpendicularity	<15 arc minutes

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9. POC Strength and Capabilities

Photonics On Crystals (POC) is a leading manufacturer of laser crystals, including Nd:KGW. Key advantages include:

- **Custom Solutions**: Tailored dimensions, dopant concentrations, and coatings for specific laser applications.
- **High Precision**: Advanced polishing and inspection for superior quality assurance.
- **Global Reach**: Proven expertise in supporting industrial, medical, and research applications.

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10. Standard Products

Dimensions (mm)	Length (mm)	Doping	Coating	SKU	Price (USD)
3 × 3	5	3%	AR@808-1067 nm	7798	$480
3 × 3	60	3%	AR@1067 nm	7800	Request Quote
3 × 3	5	5%	AR@808-1067 nm	7796	$480
3 × 3	5	5%	Uncoated	7797	$420
Custom	Custom	Custom	Customizable	Custom	Request Quote