Photonics On Crystals

POC-OC-122462-Nd,Cr:YAG Crystal Datasheet

1 Main Features

- Optimized for high energy efficiency and thermal stability.
- Enhanced optical uniformity and UV radiation resistance.
- Continuous, pulsed, Q-switched, and frequency-doubled laser operation capabilities.
- Excellent for solar-pumped and space-based laser systems.
- High power output and superior beam quality.

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2. Material General Description

The Nd:Cr:YAG (Neodymium, Chromium-doped Yttrium Aluminum Garnet) crystal is a well-established laser material that combines the advantages of both neodymium and chromium ions. Chromium ions enhance the absorption efficiency of pump light, particularly in solar-pumped systems, while neodymium ions are responsible for efficient lasing. This crystal offers exceptional thermal and optical properties, including high thermal conductivity and resistance to ultraviolet-induced damage. Nd:Cr:YAG is suitable for continuous, pulsed, and Q-switched laser operations with high power output and stability.

The inclusion of Cr^{3+} ions mitigates fluorescence quenching, ensuring efficient energy transfer and minimal power loss. Nd:Cr:YAG is particularly favored for its robustness in harsh environmental

conditions, making it ideal for aerospace and solar-pumped applications. With a working wavelength of 1064 nm and excellent optical uniformity, it is widely used in various high-precision laser systems.

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3. General Application Examples

- **Solar-Pumped Laser Systems**: Ideal for converting sunlight into laser energy, Nd:Cr:YAG is widely used in high-power solar-pumped lasers for space and terrestrial applications.
- **Space Laser Systems**: The crystal's stability in extreme conditions and efficient energy conversion make it suitable for spaceborne laser technologies.
- **Defense and Security**: Its ability to operate in Q-switched and continuous modes makes it invaluable for target ranging, missile guidance, and laser weapon systems.
- **Industrial Lasers**: Commonly used in high-power cutting, welding, and marking due to its excellent thermal and mechanical properties.
- **Scientific Research**: Nd:Cr:YAG is frequently used in experiments requiring high-energy laser pulses and stable output for spectroscopy and material analysis.

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4. Chemical, Physical, and Structural Properties

Property	Value
Chemical Formula	$Nd^{3+}:Cr^{3+}:Y_3Al_5O_{12}$
Melting Point	1970°C
Mohs Hardness	8-8.5
Thermal Conductivity	10-14 W/m·K
Density	4.56 g/cm³
Working Wavelength	1064 nm

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5. Optical, Laser, or Nonlinear Optical Properties

Property	Value
Pump Source	Solar radiation, Arc Lamp, LD
Laser Emission Wavelength	1064 nm
Mode of Operation	Continuous, Pulsed, Q-switched
Beam Quality	Excellent
Energy Efficiency	High

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6. Spectrum Transmission Curve

- Please contact for spectral data; specific absorption and emission curves will be provided upon request.

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7. Coating Specification

- **Standard Coating**: AR coating optimized for 1064 nm wavelength.
- **Customized Coating**: Available upon request for specific applications.

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8. Standard Fabrication Specifications

Specification	Value
Length Tolerance	±0.1 mm
Parallelism	<20 arcseconds
Perpendicularity	<10 arcminutes
Surface Quality	10-5 Scratch/Dig
Flatness	<λ/10 @ 632.8 nm
Chamfer	<0.1 mm @ 45°

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9. POC Strength and Capabilities

Photonics On Crystals (POC) specializes in producing high-quality laser crystals tailored to demanding applications. POC's advanced manufacturing techniques ensure high optical uniformity, thermal stability, and durability. With decades of expertise, POC delivers reliable crystal solutions for aerospace, defense, industrial, and scientific sectors.

Key Capabilities:

- Custom design and fabrication.
- Fast turnaround times with high precision.
- Comprehensive technical support for advanced laser applications.

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10. Standard Products

Dimensions (mm)	Length	Coating	Doping	Price (USD)
3 x 3	5	AR @ 1064 nm	Nd^{3+} 1.0%	400
3 x 3	10	AR @ 1064 nm + Custom	Nd^{3+} 1.5%	450
Custom	Custom	Custom	Custom	Contact for Quote