Photonics On Crystals

POC-OC-122507-Raman Diamond Crystal Datasheet

1 Main Features

- High Raman gain coefficient, achieving exceptional Raman frequency shifts of 1332 cm^{-1}.
- Superior thermal conductivity (>2000 W/m·K) for high-power laser applications.
- Excellent optical transparency and low scattering loss in broad spectral ranges.
- Stable crystal quality with high durability and resistance to environmental sensitivity.
- Customizable dimensions and anti-reflective coatings tailored for specific applications.

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2. Material General Description

Raman Diamond, synthesized through Chemical Vapor Deposition (CVD), is an advanced optical material known for its exceptional Raman scattering properties and optical clarity. Featuring a Raman frequency shift of 1332 cm^{-1} and a linewidth of 1.5 cm^{-1}, it enables precise frequency modulation and efficient Raman amplification. Compared to other Raman materials, such as KGW and YVO_4, Raman Diamond offers significantly higher gain and superior thermal conductivity, ensuring reliable performance under high-power conditions. Its low defect density, combined with extraordinary thermal and mechanical properties, makes it an ideal choice for laser and spectroscopic systems requiring both efficiency and stability.

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3. General Applications and Examples

Raman Diamond is extensively used in high-end optical applications due to its unique properties:

1. **Raman Lasers**: Effective for wavelength-shifting and frequency-stabilized lasers, offering enhanced efficiency with reduced sensitivity to environmental changes.
2. **Spectroscopy**: Ideal for Raman spectroscopy systems requiring high-resolution Raman shifts with minimal noise interference.
3. **High-Power Laser Systems**: Applied as Raman amplifiers in industrial and scientific high-power laser systems, capable of handling demanding thermal and mechanical stresses.
4. **Quantum Optics**: Suitable for single-photon experiments and other advanced quantum applications.
5. **Nonlinear Optics**: Utilized in harmonic generation and frequency mixing due to its exceptional optical properties.

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4. Chemical, Physical, and Structural Properties

Property	Value
Raman Frequency Shift	1332 cm^{-1}
Linewidth	1.5 cm^{-1}
Thermal Conductivity	>2000 W/m·K
Raman Gain	15
Crystal Size	8 mm
Refractive Index	2.41
Density	3.52 g/cm^3

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5. Optical, Laser, and Nonlinear Optical Properties

Parameter	CVD Raman Diamond	KGW	YVO_4	$Ba(NO_3)_2$
Raman Gain	15	4	5	11
Raman Frequency (cm^{-1})	1332	901	892	1047
Thermal Conductivity (W/m·K)	>2000	5	5.2	1.2
Crystal Factor	1440	3	20	1
Size (mm)	8	25	25	25

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6. Spectrum Transmission Curves

The absorption curve highlights a low-loss characteristic in Raman Diamond. Its superior optical clarity across UV to IR wavelengths makes it indispensable in high-performance laser and spectroscopic systems.

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7. Coating Specification

- Anti-Reflective (AR) Coating for optimal transmission at 532 nm, 1064 nm, and other custom wavelengths.
- Coating durability: Designed to withstand high laser power and extended operational lifetimes.

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8. Standard Fabrication Specifications

Parameter	Specification
Crystal Dimensions	6 x 2 x 2 mm
Surface Flatness	<λ/10 at 632.8 nm
Parallelism	<3 arcseconds
Clear Aperture	>90%
Surface Roughness	<3 nm

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9. POC Strength and Capabilities

Photonics On Crystals (POC) leverages state-of-the-art CVD technology to produce Raman Diamond Crystals with exceptional quality. Our facilities ensure consistent, high-purity crystals with customizable dimensions, offering tailored solutions for demanding applications in nonlinear optics, quantum technologies, and laser systems.

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10. Standard Products

Size (mm)	Coating	SKU	Price (USD)
6 x 2 x 2	AR (532 nm)	2001	900
8 x 8 x 2	AR (1064 nm)	2002	1,200
Custom Size	Upon Request	Custom	Quote