Photonics On Crystals

POC-OC-122496-CeF_3 Crystal Datasheet

1 Main Features

- High density and short decay time, ideal for scintillation applications.
- Excellent performance in high counting rate applications.
- Strong absorption of irradiation for enhanced measurements.
- High time resolution for precise detection processes.
- OEM service and custom crystal dimensions available upon request.

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2. Material General Description

Cerium Fluoride (CeF_3) is a high-performance scintillation crystal, recognized for its high density and short decay time. With a density of 6.16 g/cm³, CeF_3 offers significant advantages in applications requiring rapid response and accurate time resolution, such as high-energy physics experiments, nuclear medicine, and security scanning systems. Its unique characteristics include a hexagonal crystalline structure and dual emission peaks at 310 nm (fast) and 340 nm (slow), providing efficient detection for various scintillation-based technologies. The high thermal and mechanical stability of CeF_3 makes it an ideal choice for radiation detection systems operating in challenging environments.

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3. General Applications and Examples

CeF_3 crystals are widely employed in a variety of advanced technologies. Below are key examples:

- **High-Energy Physics:** Used in particle accelerators and detectors for identifying and measuring ionizing radiation.
- **Nuclear Medicine:** Plays a critical role in PET scanners and other diagnostic imaging equipment, providing high-resolution images.
- **Security Scanning:** Effective for detecting illicit radioactive materials in luggage and cargo.
- **Space Research:** Deployed in space missions for radiation monitoring and cosmic ray detection.
- **Material Research:** Aids in the study of radiation effects on various materials under controlled laboratory settings.

These crystals are also used in OEM setups where custom dimensions and performance optimization are required.

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4. Chemical, Physical, and Structural Properties

Below is a detailed overview of CeF_3's properties:

Property	Value
Density	6.16 g/cm³
Melting Point	1324 °C
Refractive Index	1.68
Radiation Length	17 mm
Emission Peak	340 nm (slow), 310 nm (fast)
Decay Constant	30 ns (slow), 8 ns (fast)
Light Output	8.6%
Crystal Structure	Hexagonal System
Cleavage Plane	(0001)

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5. Optical and Laser Properties

CeF_3 exhibits superior scintillation properties, making it highly efficient for optical and radiation detection applications. While specific nonlinear optical properties are not typically associated with CeF_3, its emission efficiency and decay profile are particularly relevant for scintillation uses. Custom designs are available upon request to optimize performance for specific optical or radiation environments.

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6. Spectrum Transmission Curves

The CeF_3 crystal has dual emission peaks, ensuring efficient detection across a wide spectrum. These are:

- **Fast Peak:** 310 nm for rapid detection.
- **Slow Peak:** 340 nm for applications requiring higher precision.

If additional spectral data is required, further investigation and custom measurements are available.

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7. Coating Specifications

- Standard anti-reflective coatings for optimized performance in scintillation applications.
- Coating options: UV-optimized and custom coatings upon request to meet application-specific requirements.

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8. Standard Fabrication Specifications

Specification	Value
Surface Flatness	< λ/8 @ 632.8 nm
Surface Quality	10-5 Scratch-Dig
Clear Aperture	> 90%
Parallelism	< 20 arc seconds
Perpendicularity Error	< 1°
Thickness Tolerance	± 0.1 mm
Diameter Tolerance	+0/-0.1 mm

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9. POC Strength and Capabilities

Photonics On Crystals (POC) specializes in the precision fabrication and customization of CeF_3 crystals. Our facilities provide:

- Advanced processing for tailored crystal dimensions and coatings.
- A dedicated team ensuring high-quality standards and efficient production timelines.
- Ability to cater to research, industrial, and medical sectors with optimized solutions.

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10. Standard Products

Dimensions (mm)	Coating	Price (USD)	Customization Available
10 x 10 x 2	AR @ 310/340 nm	300	Yes

15 x 15 x 5	AR @ 310/340 nm	500	Yes
20 x 20 x 5	AR @ 310/340 nm	700	Yes

Custom dimensions and coatings are available upon request to meet specific user requirements.