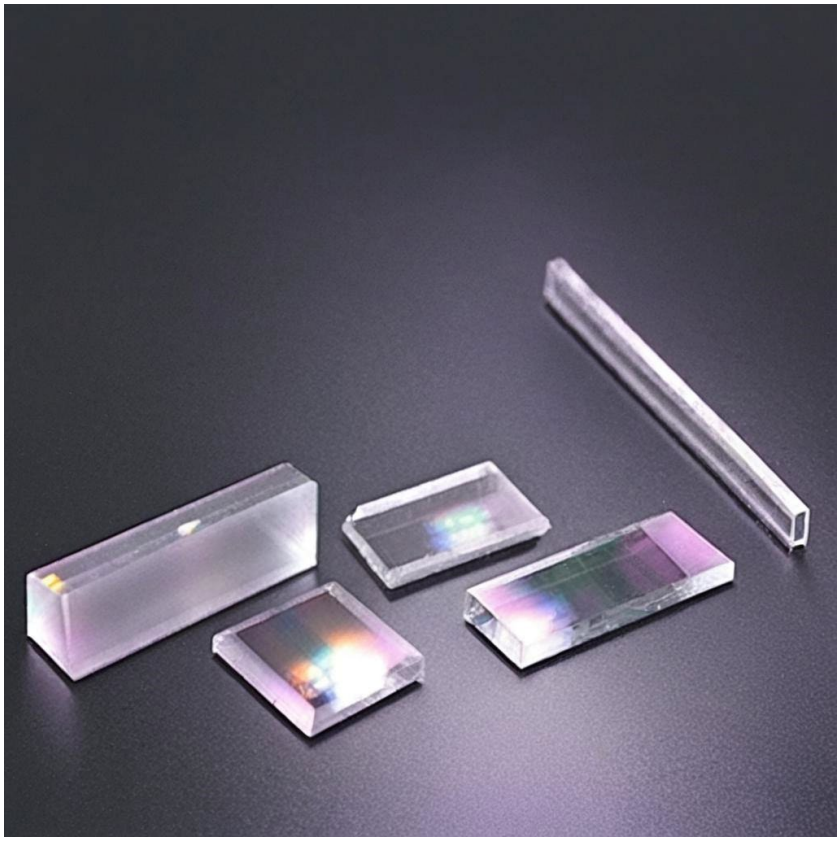
Photonics On Crystals

POC-OC-122497-$PbWO_4$ Crystal Datasheet

1 Main Features

- High-density scintillation crystal with short radiation length.
- Exceptional performance in nuclear physics and high-energy applications.
- Dual emission peaks for enhanced detection sensitivity.
- Reliable OEM services for custom dimensions and high-quality processing.
- Excellent mechanical and optical stability under operational conditions.



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2. Material General Description

Lead Tungstate ($PbWO_4$) is a highly efficient scintillation crystal known for its superior density and compact radiation length. With a density of 8.28 g/cm³ and a melting point of 1123 °C, $PbWO_4$ provides reliable performance in high-energy physics and nuclear science. It is particularly suited for detecting ionizing radiation due to its fast decay constant and strong emission peaks at 530 nm (slow) and 440 nm (fast). This crystal's high refractive index of 2.16 and stable cleavage plane (101) ensure excellent optical performance and mechanical stability, making it ideal for applications requiring precise radiation monitoring and high counting rates. $PbWO_4$ is widely employed in scientific research and industrial applications, with additional customization available to meet specific user requirements.

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3. General Applications and Examples

$PbWO_4$ crystals are extensively utilized in diverse fields, primarily focusing on applications requiring efficient radiation detection. Some of the key examples include:

- **Nuclear Physics:** $PbWO_4$ serves as a core material in particle detectors for measuring and identifying ionizing radiation in high-energy physics experiments.
- **Medical Imaging:** This crystal is integrated into PET scanners and other nuclear medicine devices to deliver precise and high-resolution images for diagnostic purposes.
- **Space and Astrophysics:** $PbWO_4$ is used in cosmic ray detection systems and radiation monitoring tools in space exploration missions.
- **Security Systems:** A crucial material in X-ray and gamma-ray detection for baggage and cargo screening, ensuring high-security standards in airports and customs.
- **Industrial Monitoring:** $PbWO_4$ provides accurate radiation measurement in industrial processes, including power plants and material research facilities.

Its robust mechanical and thermal properties make it adaptable for challenging environments and specialized applications.

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4. Chemical, Physical, and Structural Properties

The following table summarizes the chemical, physical, and structural properties of $PbWO_4$:

Property	Value
Density	8.28 g/cm³
Melting Point	1123 °C
Refractive Index	2.16
Radiation Length	9.2 mm
Emission Peak	530 nm (slow), 440 nm (fast)
Decay Constant	30 ns (slow), 6 ns (fast)
Light Output	0.5%
Crystal Structure	Hexagonal System
Cleavage Plane	(101)

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5. Optical and Laser Properties

While $PbWO_4$ is not widely recognized for laser or nonlinear optical properties, its scintillation properties make it highly efficient for radiation detection. Key features include:

- Dual emission peaks for precise radiation measurement.

- High refractive index for efficient light transmission.
- Excellent mechanical and optical stability, ensuring durability under high-energy applications.

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6. Spectrum Transmission Curves

$PbWO_4$ crystals exhibit dual emission peaks at 530 nm (slow) and 440 nm (fast), which optimize radiation detection for a broad range of applications. Spectrum transmission data can be customized and provided upon request based on specific application requirements.

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7. Coating Specification

- Standard anti-reflective (AR) coatings for the spectral range covering 440 nm and 530 nm.
- Custom coating solutions available for specific radiation or optical 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) offers advanced processing and customization services for $PbWO_4$ crystals, including:

- Precision cutting, polishing, and coating tailored to client specifications.
- High production standards ensuring consistent quality and performance.
- Expertise in integrating $PbWO_4$ crystals for scientific, industrial, and medical applications.
- Dedicated support for custom OEM solutions.

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10. Standard Products

Photonics On Crystals

Dimensions (mm)	Coating	Price (USD)	Customization Available
10 x 10 x 2	AR @ 440/530 nm	350	Yes
15 x 15 x 5	AR @ 440/530 nm	550	Yes
20 x 20 x 5	AR @ 440/530 nm	750	Yes

Custom dimensions and coating solutions are available to meet specific user requirements. Contact POC for further details.