Photonics On Crystals

POC-OC-122499-Ce:LaBr3 Crystal Datasheet

1 Main Features

- Exceptional energy resolution, suitable for nuclear radiation detection.
- Light output 1.5–1.6 times higher than NaI(Tl), providing enhanced sensitivity.
- Short decay time (17–25 ns), ensuring high temporal resolution.
- Superior stability under varying temperatures with excellent linearity.
- High count rate capability and high effective atomic number for robust detection.

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2. Material General Description

The Ce:$LaBr_3$ (Cerium-doped Lanthanum Bromide) crystal is a high-performance scintillation material widely used in nuclear radiation detection applications. With a light output that exceeds that of NaI(Tl) by 1.5 to 1.6 times and a rapid decay time of 17–25 nanoseconds, it delivers exceptional temporal resolution. Its excellent linearity and stability make it an ideal choice for applications where accuracy and reliability are critical. The high effective atomic number and count rate capabilities further enhance its performance, making it suitable for a broad range of nuclear and radiation detection fields.

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3. General Applications and Examples

Ce:$LaBr_3$ crystals are highly versatile and find applications in:

- **Nuclear Radiation Detection**: Efficiently detecting gamma rays due to high energy resolution and photon yield.
- **Medical Imaging**: Utilized in PET and SPECT for superior light output and low decay constant.
- **Environmental Monitoring**: For radiation monitoring in industrial and natural environments.
- **High Energy Physics**: Applied in particle detection experiments requiring precise temporal resolution.
- **Homeland Security**: Critical for detecting illicit radioactive materials and nuclear threats.
- **Scientific Research**: Used in spectroscopy and other advanced research applications.

In radiation detection systems, Ce:$LaBr_3$ crystals are frequently integrated due to their unmatched combination of sensitivity and resolution, improving overall system performance in a variety of applications.

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4. Chemical, Physical, and Structural Properties

Property	Value
Density	5.3 g/cm³
Melting Point	843 °C
Thermal Expansion	8×10^{-6} °C^{-1} (parallel to c-axis)
Refractive Index	1.9
Emission Peak	380 nm
Decay Constant	16 ns
Light Yield	63 photons/kEV
Photoelectron Yield	150%–165% (relative to NaI(Tl))
Crystal Structure	Hexagonal
Cleavage Plane	(100)

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5. Optical and Nonlinear Optical Properties

Ce:$LaBr_3$ is characterized by:

- High light yield, improving detector efficiency.
- Superior photoelectron yield (150–165%) for precise photon detection.
- Consistent light output under varying temperature conditions.
- Sharp emission peak at 380 nm, suitable for photon-based detection systems.

6. Spectrum Transmission Curves

The emission spectrum of Ce:$LaBr_3$ peaks at 380 nm, enabling high detection sensitivity in gamma-ray spectrometry and nuclear applications. Specific transmission curve data can be obtained upon request or measured as part of custom specifications.

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7. Coating Specification

Standard anti-reflection coatings are applied to enhance light transmission and reduce surface reflection. Custom coatings are available based on application requirements.

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8. Standard Fabrication Specifications

Parameter	Specification
Diameter	Customizable (per request)
Thickness	Variable (per application)
Surface Quality	10–5 S/D
Flatness	λ/10 @ 632.8 nm
Parallelism	≤ 10 arcmin
Clear Aperture	> 90%
Protective Chamfer	0.2 mm @ 45°
Operating Temperature	-40 °C to +60 °C

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9. POC Strength and Capabilities

Photonics On Crystals (POC) specializes in sourcing and processing premium scintillation materials like Ce:$LaBr_3$ crystals. With advanced manufacturing capabilities, POC ensures the highest quality standards for surface finish, flatness, and coating customizations. POC also offers OEM services for tailored solutions, catering to a variety of research and industrial applications.

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10. Standard Products

Size	Photoelectron Yield	Coating	Price (USD)	Customization
1 × 1 cm	150%–165%	Custom Coating	500	Available
2 × 2 cm	150%–165%	Custom Coating	900	Available
5 × 5 cm	150%–165%	Custom Coating	2000	Available

For larger orders or specialized applications, contact POC for tailored solutions and pricing.