Photonics On Crystals

POC-OC-122478- Germanium Crystal Datasheet

1 Main Features:

- High optical transmission in the 2–12 µm infrared range.
- Excellent mechanical strength and thermal conductivity.
- Low absorption at 10.6 µm, ideal for CO_2 laser optics.
- Insoluble in water, ensuring stable and durable operation.
- Suitable for infrared imaging systems, spectrometers, and ATR applications.

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2. Material General Description:

Germanium Crystal (Ge) is a chemically inert optical material with excellent transmission in the infrared spectral range of 2–12 µm. Its high hardness and thermal conductivity make it a preferred choice for demanding applications, including infrared thermal imaging systems, spectrometers, and CO_2 laser optics. With a minimal absorption at 10.6 µm, Germanium Crystal is ideal for use in CO_2 laser windows and output coupling mirrors. It also serves as a base material for infrared filters, including anti-reflective (ATR) applications. Germanium's high refractive index allows it to operate efficiently in 50% beam-splitting systems without the need for additional coatings.

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3. General Applications:

Germanium Crystals are widely used across a range of applications:

- **Infrared Thermal Imaging Systems:** Germanium windows provide high optical performance in thermal imaging devices, offering efficient infrared transmission for precise imaging results.
- **Spectrometers and Analytical Instruments:** Used in infrared spectrometers due to its broad transmission spectrum and thermal stability.
- **CO_2 Laser Optics:** Germanium is extensively applied in CO_2 laser systems as windows, lenses, and output coupling mirrors due to its low absorption at 10.6 µm.
- **Infrared Filters and ATR Lenses:** Its high refractive index and low dispersion make Germanium ideal for ATR lenses and beam-splitting filters.
- **Aerospace and Defense:** Germanium optics are utilized in advanced infrared surveillance and targeting systems due to their durability and optical properties.

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4. Chemical, Physical, and Structural Properties:

Property	Value
Density	5.33 g/cm³
Hardness	Mohs scale: 6–6.5
Thermal Conductivity	59 W/m·K
Thermal Expansion Coefficient	5.8 × 10^-6 /°C
Melting Point	937°C
Crystal Structure	Diamond Cubic
Cleavage Plane	<111>
Common Crystal Orientation	<111>, <100>, <110>

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5. Optical and Nonlinear Optical Properties:

Property	Value
Transmission Range	2–12 µm
Refractive Index	n = 4.002 (at 10.6 µm)
Absorption Coefficient	<0.027 cm^-1 at 10.6 µm
Reflective Loss	53% (both surfaces, uncoated)
dn/dT (Thermal Coefficient)	396 × 10^-6 /°C
Lattice Constant	5.658 Å

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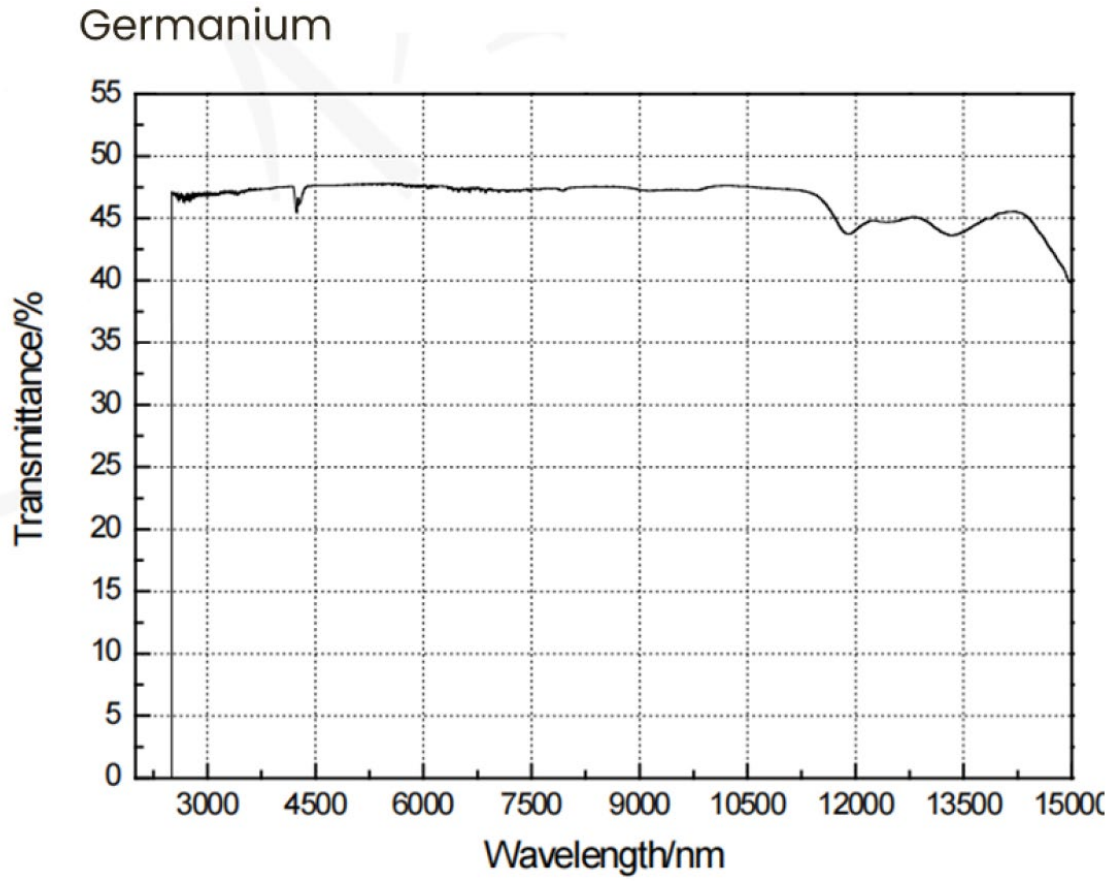
6. Spectrum Transmission Curves:

Germanium Crystal demonstrates excellent transmission from 2 µm to 12 µm, with very low absorption losses around 10.6 µm. Transmission efficiency improves significantly with anti-reflective (AR) coatings.



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7. Coating Specifications:

- **AR Coating:** Enhances transmission in the 2–12 µm range.
- **Custom Coatings:** Available upon request for specific laser wavelengths, such as 10.6 µm for CO_2 laser optics.

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8. Standard Fabrication Specifications:

Specification	Value
Surface Flatness	λ/4 @ 632.8 nm
Surface Quality	40-20 scratch-dig
Clear Aperture	>90%

Specification	Value
Chamfer	<0.25 mm × 45°
Length Tolerance	±0.1 mm
Thickness Tolerance	±0.1 mm
Parallelism	<1'

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9. POC Strength and Capabilities:

Photonics On Crystals (POC) is a leading supplier of precision optical components, specializing in high-quality Germanium Crystals for infrared applications. With advanced fabrication capabilities, POC ensures:

- Custom dimensions and coatings tailored to application-specific needs.
- Exceptional material quality with rigorous quality control.
- Comprehensive technical support for optical system integration.
- Efficient global delivery and responsive customer service.

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10. Standard Products:

Dimensions (mm)	Coating	Price (USD)	SKU
25 × 2	AR @ 10.6 µm	150	GE25AR
50 × 5	AR @ 10.6 µm	280	GE50AR
75 × 10	AR @ 10.6 µm	450	GE75AR
Custom Size	On request	On request	CUSTOM