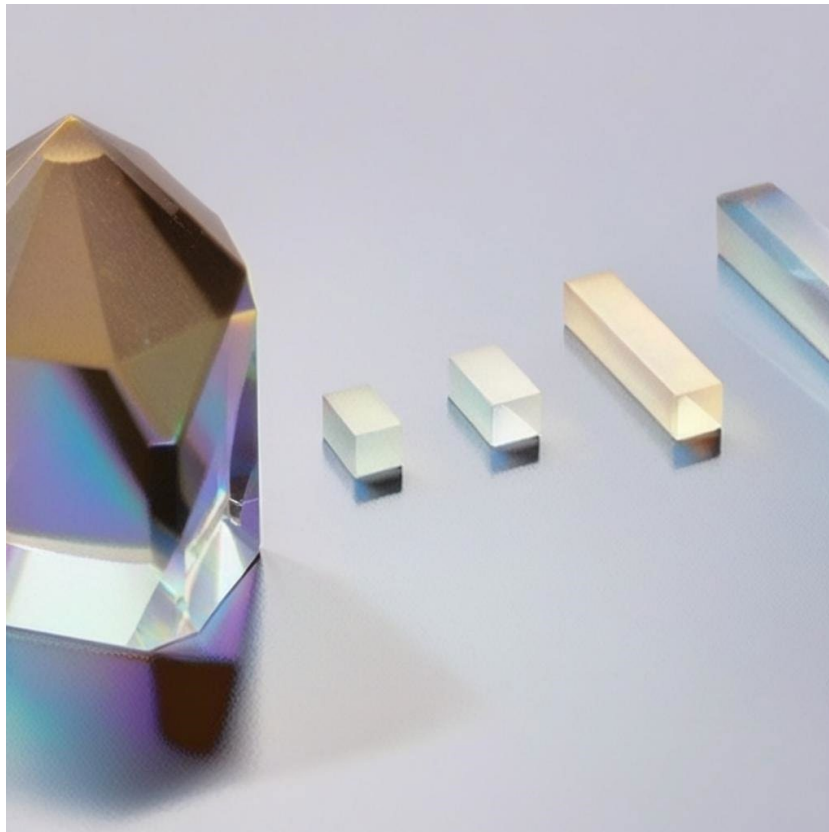


POC-OC-122446- Er:Cr:YAG Crystal Datasheet

1 Main Features

- Broad absorption band for efficient pumping, optimized for 2940 nm laser emission.
- Excellent thermal conductivity and mechanical durability for stable operations.
- High slope efficiency and low threshold, suitable for high-power laser systems.
- Applicable for CW, free-running, and Q-switched laser operations.
- Customized doping levels and coatings are available for various applications.



2. Material General Description

The Er,Cr:YAG (Erbium, Chromium-doped Yttrium Aluminum Garnet) crystal is a highly efficient solid-state laser material known for its strong emission at 2940 nm. This wavelength corresponds to the hydroxyl absorption peak, making it ideal for precise applications in the medical, dental, and environmental fields.

Chromium doping enhances the pumping efficiency by broadening the absorption band, while erbium doping ensures high conversion efficiency for the mid-IR laser output. The material exhibits excellent thermal and mechanical properties, reducing thermal stress and ensuring long-term operational reliability. With high slope efficiency and low thresholds, Er,Cr:YAG crystals are ideal for both continuous-wave (CW) and pulsed laser operations.

3. General Application and Examples

Er,Cr:YAG crystals have a wide range of applications across industries:

- Medical Applications:** The 2940 nm wavelength aligns with the water absorption peak, enabling precise and effective tissue ablation in surgical procedures, including dermatology, ophthalmology, and dentistry. It is widely used in treatments such as skin resurfacing, dental hard tissue drilling, and lithotripsy.
- Environmental Monitoring:** Er,Cr:YAG lasers are used for detecting water vapor and other molecules in the atmosphere due to the crystal's strong absorption properties.
- Industrial Applications:** The robust nature of Er,Cr:YAG makes it suitable for laser marking, engraving, and drilling, especially in materials requiring precise control over heat distribution.
- Military and Defense:** Its mid-IR emission makes it valuable for rangefinding, secure optical communication, and target designation.
- Research and Development:** It is an excellent choice for high-energy experiments, mid-IR spectroscopy, and optical parametric oscillators.

4. Chemical, Physical, and Structural Properties

Property	Value
Crystal Formula	Er,Cr:YAG (Y ₃ Al ₅ O ₁₂)
Crystal Structure	Cubic
Lattice Parameter	12.01 Å
Melting Point	1970 °C
Density	4.56 g/cm ³
Mohs Hardness	8.5
Thermal Conductivity	10 W/m·K
Thermal Expansion	8.1 × 10 ⁻⁶ /K
Specific Heat	0.65 J/g·K
Doping Levels	Er: 50 at.%, Cr: 1–2 at.%

5. Optical and Laser Properties

Property	Value
Emission Wavelength	2940 nm

Pump Bands	600–800 nm
Absorption Peak Wavelengths	808 nm, 980 nm
Fluorescence Lifetime	0.1–10 ms (varies with doping)
Emission Cross-Section	$3 \times 10^{-20} \text{ cm}^2$
Laser Transition	4I11/2 → 4I13/2
Optical Clarity (Transmission)	>90%

6. Spectrum Transmission Curve

The Er,Cr:YAG crystal demonstrates high transmission efficiency within the 2940 nm range, making it ideal for applications requiring precise wavelength control. POC can provide detailed transmission spectra on request.

7. Coating Specifications

- **AR Coating:** Anti-reflection coatings are available for 2940 nm and adjacent wavelengths.
- **Standard Coating:** Reflectivity <0.2% @ 2940 nm.
- **Coating Durability:** Designed to withstand high-energy pulses and CW operation.

8. Standard Fabrication Specifications

Parameter	Specification
Orientation	<111>
Diameter Tolerance	+0/-0.05 mm
Length Tolerance	±0.5 mm
Surface Flatness	$\lambda/10$ @ 632 nm
Parallelism	<10 arc sec
Perpendicularity	<5 arc min
Surface Quality (Scratch/Dig)	10-5
Clear Aperture	>90%
Chamfer	0.1 mm x 45°

9. POC Strength and Capabilities

Photonics On Crystals (POC) offers Er,Cr:YAG crystals manufactured with high precision and exceptional quality standards. Our extensive expertise ensures:

- Tailored doping levels to match specific application requirements.
- Robust AR/HR coatings for diverse laser systems.
- Advanced fabrication capabilities to meet precise customer specifications.

POC's commitment to excellence ensures the delivery of crystals with superior performance and reliability across global markets.

10. Standard Products

Dimension	Length	End Faces	Coating	Price (USD)
3 x 3 mm	10 mm	Brewster	AR @ 2940 nm	Request
5 x 5 mm	15 mm	Flat/Flat	Uncoated	Request
8 x 8 mm	20 mm	Brewster	AR/HR @ 2940 nm	Request
Custom	Custom	Custom	Custom	Request

Customization options are available for size, doping level, and coatings.