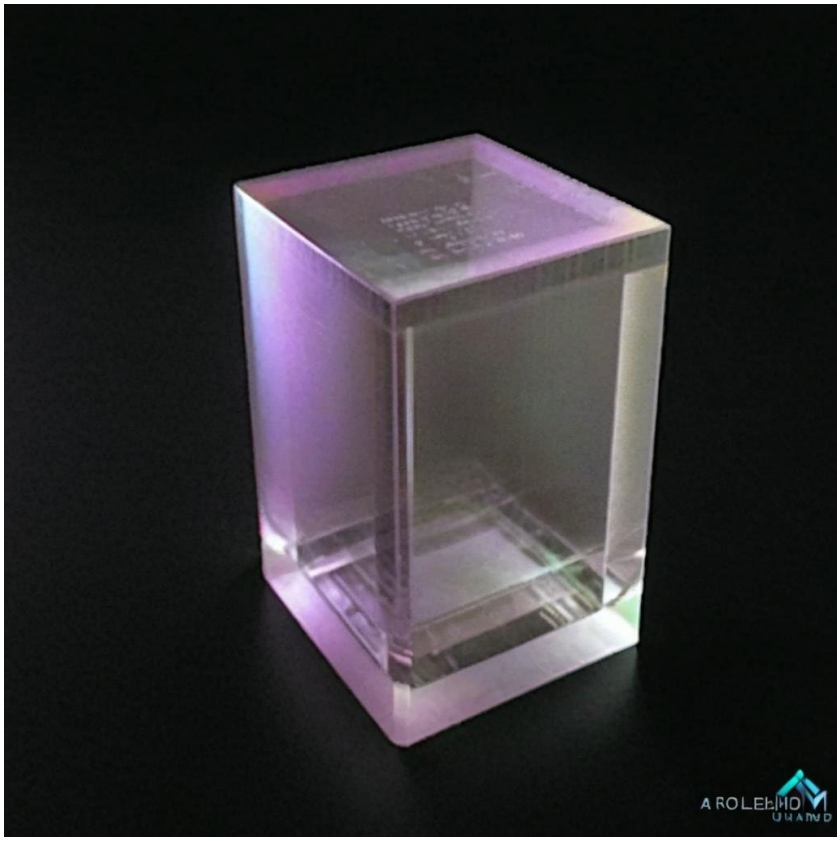
Photonics On Crystals

POC-OC-122457-Er:YLF Crystal Datasheet

1 Main Features

- Low phonon frequency reduces the likelihood of non-radiative relaxations.
- Long lifetimes of laser emitting levels improve energy storage for Q-switched lasers.
- Wide transparency range (VUV to 10 µm) suitable for multiple applications.
- Negative thermo-optic coefficient minimizes thermal-lensing effects.
- Custom crystals available upon request for tailored specifications.



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2. Material General Description

Er:YLF crystals are a highly efficient gain medium for laser systems due to their low phonon frequency, which enhances luminescence quantum efficiency by minimizing non-radiative relaxations. These crystals exhibit a long laser-emitting level lifetime, making them suitable for high-energy storage in Q-switched laser systems. Furthermore, their broad transparency range, extending from the vacuum ultraviolet (VUV) to the mid-infrared region (~10 µm), enables diverse optical applications. The negative thermo-optic coefficient of Er:YLF crystals provides a critical advantage in thermal management by reducing thermal-lensing effects, thus ensuring beam stability even under high-pump-power conditions.

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3. General Applications and Examples

Er:YLF crystals find applications across various domains due to their versatile optical and thermal properties:

1. **Medical Applications**:
    - CW and Q-switched ~3 µm lasers for dental and implant procedures.
    - Effective in otolaryngology and oral surgeries for precise incisions and treatments.
2. **Industrial Applications**:
    - Used in material processing with ultrafast lasers.
    - Ideal for marking and engraving systems operating in the mid-IR range.
3. **Display and Diagnostic Technology**:
    - Up-conversion visible lasers for high-resolution display systems.
    - Useful in diagnostic devices for medical imaging and spectroscopy.
4. **Research Applications**:
    - Pump source for visible lasers using up-conversion techniques.
    - Laser medium in scientific experiments requiring high precision and stability.

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4. Chemical, Physical, and Structural Properties

Property	**Value**
Orientation	a-cut
Clear Aperture	>90%
Face Dimensions Tolerance	±0.01 mm
Length Tolerance	±0.1 mm
Parallelism Error	<20 arcsec
Perpendicularity Error	<10 arcmin
Protective Chamfers	<0.1 mm at 45°
Surface Quality	20–10 S-D
Surface Flatness	λ/10 @ 632.8 nm
Density	3.95 g/cm³
Mohs Hardness	5
Thermal Conductivity	5 $W \cdot m^{-1} \cdot K^{-1}$

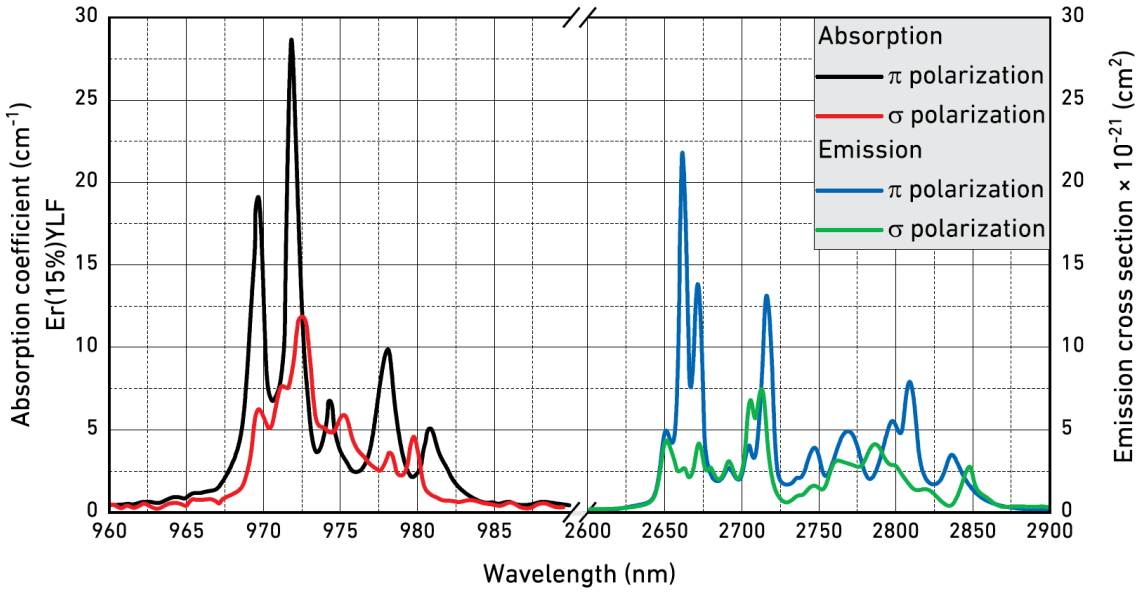
dn/dT	$-2 \times 10^{-6}\ K^{-1}$
Thermal Expansion Coefficient	$8 \times 10^{-6}\ K^{-1}$
Refractive Index (@2070 nm)	$n_a = 1.442$; $n_e = 1.446$
Typical Doping Level	15 at.%

5. Optical, Laser, or Nonlinear Optical Properties

Property	Value
Absorption Peak Wavelength	972 nm
Absorption Cross-Section	$28 \times 10^{-20}\ cm^2$
Absorption Bandwidth	~1 nm
Laser Wavelength	2810 nm
Lifetime of Er^{3+} Energy Level	4 ms
Emission Cross-Section (@2800 nm)	$1.5 \times 10^{-20}\ cm^2$
Crystal Structure	Tetragonal

6. Spectrum Transmission Curves

The transmission spectrum demonstrates excellent transparency across a wide range from VUV to ~10 µm, facilitating various optical and laser applications. Specific transmission curves can be provided upon request based on user requirements.



7. Coating Specification

- **Uncoated**: Default configuration for user-specific coatings.
- **Custom Coatings Available**: Anti-reflective (AR) coatings for optimized performance can be provided upon request.

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8. Standard Fabrication Specifications

Specification	Value
Face Dimensions Tolerance	±0.01 mm
Length Tolerance	±0.1 mm
Surface Flatness	λ/10 @ 632.8 nm
Parallelism Error	<20 arcsec
Perpendicularity Error	<10 arcmin
Clear Aperture	>90%
Protective Chamfers	<0.1 mm at 45°
Surface Quality	20–10 S-D

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9. POC Strength and Capabilities

Photonics On Crystals (POC) specializes in manufacturing high-quality laser crystals tailored to diverse application needs. Our advanced fabrication technology ensures precision, durability, and consistent performance. Key advantages include:

- Customization options for coating and doping levels.
- State-of-the-art production facilities for rapid prototyping and bulk manufacturing.
- Expertise in crystal growth and thermal management solutions.

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10. Standard Products

Face Dimensions	Length	End Faces	Coatings	Price (USD)
3 × 3 mm	8 mm	Right-angle cut	Uncoated	$540
3 × 3 mm	8 mm	Brewster-angle cut	AR (custom request)	$540
8 mm × 8 mm	2 mm	Right-angle cut	AR (custom request)	$680

Customization options available upon request for dimensions, coatings, and doping concentrations.