Photonics On Crystals

POC-OC-122455-Yb:YLF Crystal Datasheet

1 Main Features

- Broad and smooth emission spectrum with a wide tuning range.
- High absorption cross-sections matching the wavelength of InGaAs laser diodes.
- Low quantum defect for reduced thermal load.
- Simple electronic structure excluding excited-state absorption.
- Custom crystals and specifications available upon request.

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2. Material General Description

Yb:YLF (Ytterbium-doped Lithium Yttrium Fluoride) crystals are advanced laser materials optimized for high-performance applications. Yb:YLF exhibits excellent thermal and mechanical properties, with a wide emission spectrum and broad absorption range centered around 960 nm, perfectly matching InGaAs laser diodes. Its low quantum defect ensures reduced thermal load during operation, making it an ideal choice for continuous-wave (CW) and mode-locked thin-disk laser applications. Yb:YLF's simple electronic structure minimizes excited-state absorption and other detrimental quenching effects, offering high efficiency and reliability. This crystal's low refractive index also eliminates the need for additional anti-reflective coatings in many applications.

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3. General Applications and Examples

Yb:YLF crystals are widely used in:

- **Diode-Pumped Lasers**: Ideal for mode-locked lasers requiring high repetition rates.
- **Thin-Disk Lasers**: Suitable for femtosecond and picosecond pulse generation.
- **Medical Applications**: Used in advanced surgical tools and laser therapy systems.
- **Material Processing**: High-precision cutting, drilling, and marking.
- **Spectroscopy**: Used in non-linear optical experiments and laser spectroscopy due to its broad emission spectrum.
- **Research and Development**: Preferred in high-energy physics and laser research setups.

Example: Yb:YLF has been extensively utilized in femtosecond laser systems, offering pulse durations of <100 fs, making it indispensable in ultrafast applications.

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4. Chemical, Physical, and Structural Properties

Property	Value
Chemical Formula	LiYF4:Yb
Dopant	Yb 5-20 at.%
Density	3.95 g/cm³
Thermal Conductivity	6 W/mK
Mohs Hardness	5
Refractive Index	n = 1.448
Melting Point	819°C
Emission Peak	1033 nm
Absorption Peak	960 nm
Thermal Expansion Coefficient	8-13 x 10^-6/K
Laser Wavelength	1017 nm
Lifetime of Yb^{3+} Energy Level	2.1 ms
Emission Cross-Section	4.1 x 10^-20 cm²

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5. Optical, Laser, or Nonlinear Optical Properties

Optical Property	Value
Absorption Peak Wavelength	960 nm

Absorption Cross-Section	10.5 x 10^-20 cm^2
Absorption Bandwidth at Peak	10 nm
Emission Peak Wavelength	1033 nm
Emission Cross-Section	4.1 x 10^-20 cm^2
Lifetime of Yb^{3+} Energy Level	2.1 ms

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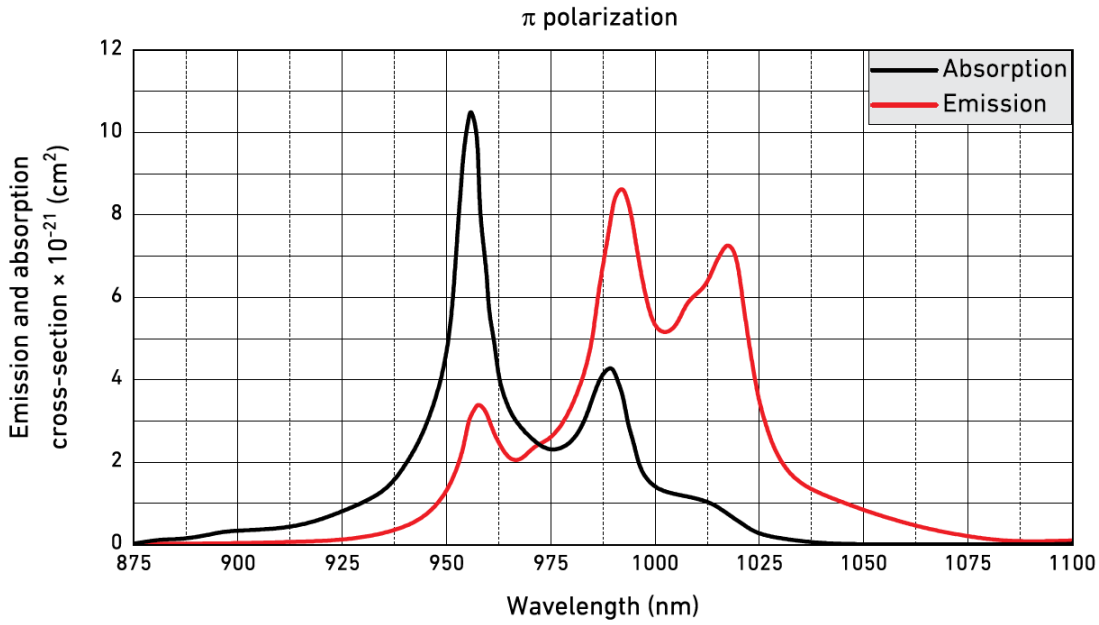
6. Spectrum Transmission Curves

The emission and absorption spectra are with absorption peaking at 960 nm and emission centered around 1033 nm, supporting a wide tuning range. This facilitates efficient diode-pumping and mode-locked operation.



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7. Coating Specification

Type	Wavelength Range	Reflectance
Anti-Reflective (AR)	960 nm, 1030-1060 nm	<0.2%
Broadband AR Coatings	940-1060 nm	<0.2%

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8. Standard Fabrication Specifications

Parameter	Specification
Orientation	Z-cut, Brewster cut

Parallelism Error	<20 arcsec
Perpendicularity Error	<10 arcmin
Surface Quality	20-10 (Scratch/Dig)
Surface Flatness	λ/10 @ 632.8 nm
Face Dimensions Tolerance	±0.1 mm
Protective Chamfers	<0.1 mm at 45°
Laser-Induced Damage Threshold	>10 J/cm² @ 1030 nm, 10 ns
Mount	Unmounted

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9. POC Strength and Capabilities

Photonics On Crystals (POC) is a leading provider of high-quality laser crystals designed to meet the demands of cutting-edge photonic applications. Our crystals are manufactured with precision, ensuring superior optical performance and reliability. Key capabilities include:

- Expertise in custom crystal designs and fabrication.
- Advanced quality control processes to ensure compliance with international standards.
- In-depth consultation and technical support for laser system integration.
- Rapid delivery and competitive pricing for bulk orders.

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10. Standard Products

Face Dimensions	Length	End Faces	Doping	Coatings	Price (USD)
3 x 3 mm	8 mm	Right-Angle Cut	5%	AR/AR @ 960-1060 nm	590
3 x 3 mm	8 mm	Brewster-Angle Cut	5%	Uncoated	540
e8 mm	8 mm	Right-Angle Cut	5%	AR/AR @ 960-1060 nm	680
3 x 3 mm	4 mm	Brewster-Angle Cut	10%	Uncoated	540
3 x 3 mm	2 mm	Right-Angle Cut	10%	AR/AR @ 960-1060 nm	590

Custom dimensions, doping levels, and coatings are available upon request.