Photonics On Crystals

POC-OC-122437-Er:YAG Crystal Datasheet

1 Main Features

- Exceptional slope efficiency and stable room-temperature operation.
- Strong absorption at the hydroxyl absorption peak (2940 nm).
- High emission cross-section supporting efficient laser operation.
- Robust isotropic crystal structure with high thermal conductivity.
- Ideal for applications in the eye-safe wavelength range.

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2. Material General Description

Er:YAG (Erbium-doped Yttrium Aluminum Garnet) crystals are renowned for their robust performance in laser systems operating in the near-infrared spectrum, particularly at the 2940 nm wavelength. This wavelength corresponds to the hydroxyl absorption peak, allowing excellent absorption in biological tissues, making Er:YAG a preferred choice for medical, dental, and surgical laser applications. The cubic symmetry and high thermal conductivity make it thermally stable and highly reliable. The crystals are manufactured to deliver high optical quality and are suitable for both continuous-wave (CW) and pulsed operations, maintaining stable performance even under high thermal loads.

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3. General Applications

Er:YAG Crystals have diverse applications across multiple fields:

Medical and Dental Applications

- Efficient at 2940 nm, suitable for cutting and ablating hard tissues like bone and teeth in dentistry and orthopedics.
- Eye-safe wavelengths enable use in non-invasive surgery.

Industrial Applications

- High-energy pulses from Er:YAG are ideal for material processing, engraving, and thin-film ablation.

Military and Remote Sensing

- Eye-safe wavelengths are ideal for military applications such as rangefinders and LiDAR systems.
- Low thermal load and high stability make them useful in rugged environments.

Examples

- Hard tissue ablation (dental surgery, orthopedics).
- Non-invasive laser treatment for skin rejuvenation.
- High-precision cutting in industrial applications.

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4. Chemical, Physical, and Structural Properties

Property	Value
Chemical Formula	Er:Y3Al5O12
Crystal Structure	Cubic Garnet
Dopant Concentration	Er: 50 at.%
Density	4.56 g/cm³
Refractive Index	1.79 (at 2940 nm)
Melting Point	1970°C
Mohs Hardness	8.5
Thermal Conductivity	13 W/m·K (at 1064 nm)
Thermal Expansion Coefficient	7.8 × 10^-6 /K
Damage Threshold	>500 MW/cm² (1064 nm, 10 ns, 10 Hz)

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5. Optical, Laser, and Nonlinear Optical Properties

Optical Parameter	Value
Laser Wavelength	2940 nm
Photon Energy	6.75 × 10^-20 J
Emission Cross Section	3 × 10^-20 cm²
Refractive Index	1.79 (at 2940 nm)
Pump Bands	600-800 nm
Lifetime of Er Energy Level	6.0 ms
Absorption Peaks	960, 1470, 1532 nm

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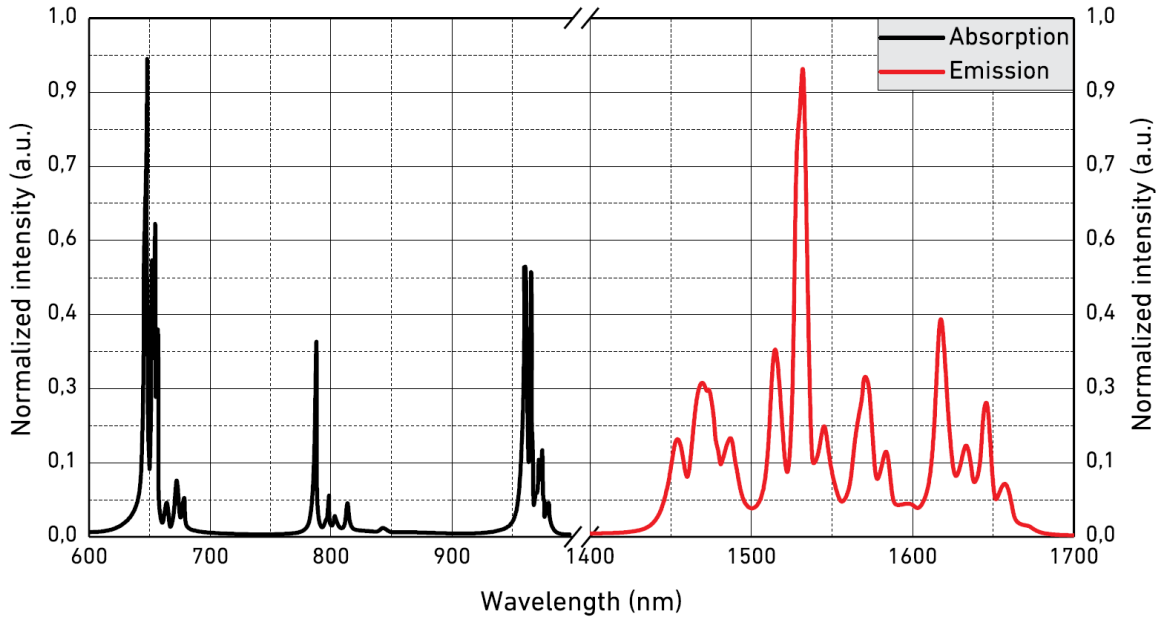
6. Spectrum Transmission

For 2940 nm, Er:YAG demonstrates strong absorption near the hydroxyl peak and a broad emission spectrum. Customized absorption and emission curves are available upon request to optimize for specific applications.



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7. Coating Specification

- **AR Coating:** Anti-reflective coating at 2940 nm with reflectivity R < 0.2%.
- Custom coatings available upon request.

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8. Standard Fabrication Specifications

Parameter	Value

Rod Dimensions	Diameter: 3-6 mm; Length: 50-120 mm
Surface Quality	10/5 Scratch/Dig
Wavefront Distortion	< λ/8 @ 633 nm
Flatness	λ/10 @ 633 nm
Parallelism	20 arc sec
Perpendicularity	15 arc min
Chamfer	0.2 mm × 45°
AR Coating	R < 0.2% @ 2940 nm

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9. POC Strength and Capabilities

Photonics On Crystals (POC) specializes in providing premium-grade laser crystals, offering customized dimensions, doping levels, and coating solutions tailored to diverse industrial, medical, and military requirements. Our advanced manufacturing ensures high optical quality, low defect rates, and tailored solutions for cutting-edge laser systems. Partner with POC for efficient and reliable laser materials.

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10. Standard Products

Face Dimensions	**Length**	**End Faces**	**Doping**	**Coatings**	**Price (USD)**
5 × 5 mm	3 mm	Brewster-angle cut	0.15%	Uncoated	Request
5 × 5 mm	2 mm	Brewster-angle cut	50%	Uncoated	500
Customization	As required	Upon request	Up to 50%	Custom coatings	On Request