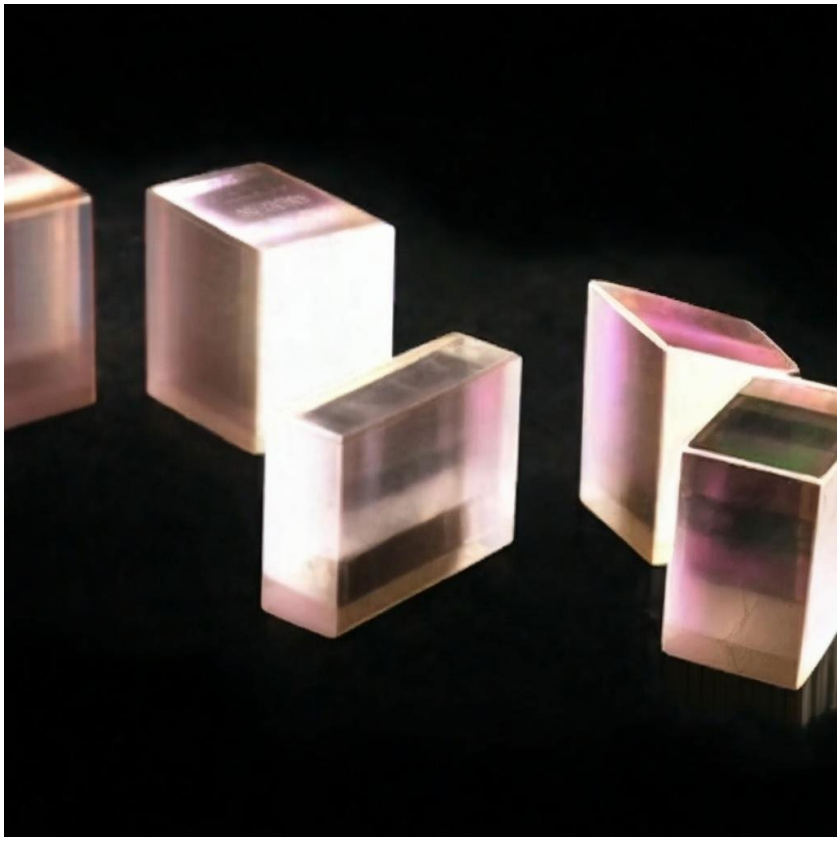
Photonics On Crystals

POC-OC-122461-Tm:KYW Crystal Datasheet

1 Main Features

- Broad fluorescence band for efficient lasing.
- Large emission cross-section enabling high-energy output.
- Relatively low upper-level lifetime for fast energy release.
- Optically biaxial structure with excellent birefringence properties.
- Custom crystal dimensions and specifications available upon request.



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2. Material General Description

Tm:KYW (Thulium-doped Potassium Yttrium Tungstate) crystals are high-performance solid-state laser materials designed for CW and Q-switched laser applications emitting near the 2 µm wavelength range. The double tungstate structure of Tm:KYW makes it optically biaxial, with a wide fluorescence band and large emission cross-section. These properties are especially valuable in generating femtosecond pulses in solid-state laser systems. Tm:KYW also demonstrates superior thermal stability, making it suitable for high-power operations while ensuring minimal thermal lensing effects.

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3. General Applications and Examples

Tm:KYW crystals find application across a diverse range of fields due to their unique laser output capabilities and stable performance. Specific use cases include:

1. **Medical Applications**: In surgery, particularly in laser ablation, implant procedures, and dermatology.
2. **Environmental Monitoring**: Precision spectroscopy for atmospheric and pollutant analysis.
3. **Industrial Metrology**: Integration into laser systems for material processing, distance measurement, and 3D mapping.
4. **Defense and Aerospace**: Usage in laser rangefinders and lidar systems for advanced tracking and reconnaissance.
5. **Research**: Generation of ultrafast femtosecond laser pulses in optical and photonics laboratories.

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4. Chemical, Physical, and Structural Properties

Property	**Value**
Chemical Formula	$Tm:KY(WO_4)_2$
Doping Concentration	~5 at.% (typical)
Density	6.5 g/cm³
Mohs Hardness	4.5
Melting Point	~1300°C
Crystal Structure	Monoclinic
Refractive Index (1040 nm)	2.015 (Np), 2.021 (Nm), 1.997 (Ng)
Thermal Conductivity	3.5 W/m·K
Thermal Expansion Coefficient	$\alpha x = 13 \times 10^{-6}$, $\alpha y = 10 \times 10^{-6}$, $\alpha z = 15 \times 10^{-6}\ K^{-1}$

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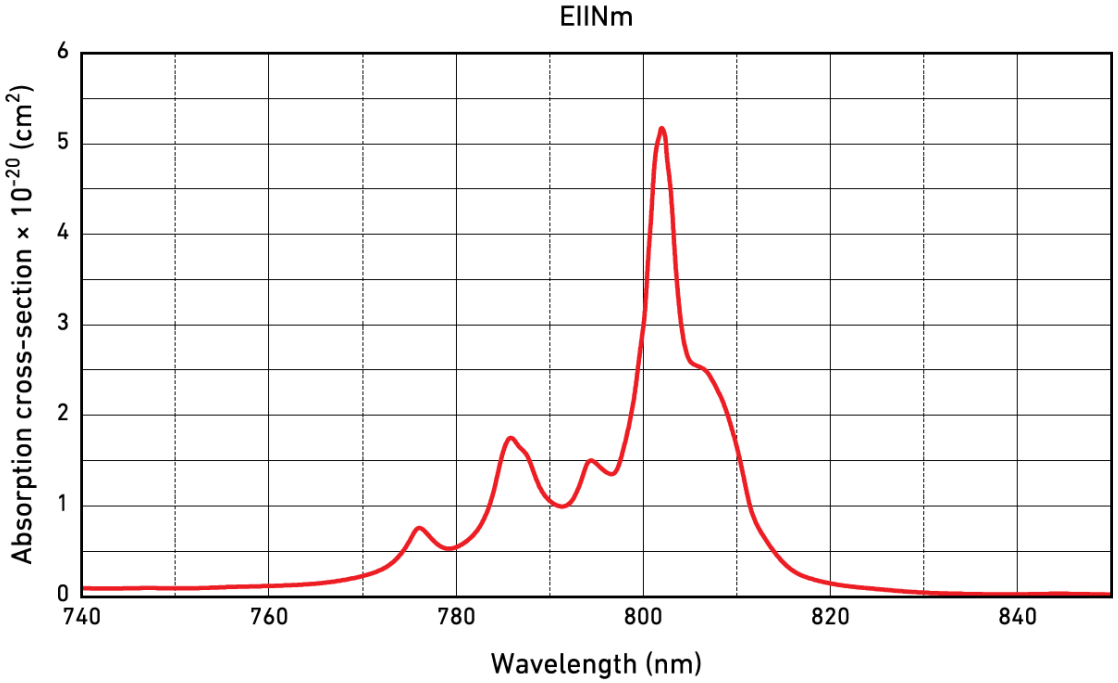
5. Optical, Laser, or Nonlinear Optical Properties

Optical Property	**Value**
Absorption Peak Wavelength	802 nm
Absorption Bandwidth	~5.5 nm
Absorption Cross-Section	5.2×10^{-20} cm²
Emission Wavelength	1910 nm
Emission Cross-Section	1.15×10^{-20} cm²
Fluorescence Lifetime	17 µs

Typical Doping Level	~5 at.%

6. Spectrum Transmission Curves

Tm:KYW crystals exhibit broad absorption and emission bands peaking at 802 nm (absorption) and 1910 nm (emission). The wide spectral bandwidth supports their efficient lasing performance, especially for femtosecond pulse generation. The absorption curve demonstrates strong peaks in alignment with diode-pumping wavelengths, ensuring optimal energy transfer efficiency.



7. Coating Specification

- AR coating on both faces: R < 0.2% at 802 nm, 1900-2000 nm.
- Custom coating configurations available upon request for specific laser systems.

8. Standard Fabrication Specifications

Parameter	Specification
Orientation	Np-cut
Clear Aperture	>90%
Face Dimensions Tolerance	±0.1 mm
Length Tolerance	±0.1 mm
Parallelism Error	<20 arcsec

Perpendicularity Error	<10 arcmin
Surface Quality	20-10 S-D
Surface Flatness	λ/10 @ 632.8 nm
Protective Chamfers	<0.1 mm × 45°
Laser Induced Damage Threshold (LIDT)	>10 J/cm² @ 1900 nm, 10 ns
Mount	Unmounted

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9. POC Strength and Capabilities

Photonics On Crystals (POC) has established itself as a leading provider of custom optical crystals, catering to a global clientele across medical, industrial, and scientific sectors. With a focus on high precision, POC offers:

- Expertise in tailoring doping levels for application-specific needs.
- Advanced coating technologies for optimal laser performance.
- A wide inventory of standard and customizable crystal dimensions.
- Support for high-power laser systems with precision-cut crystals.

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10. Standard Products

Face Dimensions	Length	End Faces	Doping	Coatings	Price (USD)
3 x 3 mm	2 mm	Brewster-angle cut	5%	Uncoated	Request
3 x 3 mm	2 mm	Right-angle cut	5%	AR@802 nm + 1900-2000 nm	Request
Customizable	Custom	Custom	Custom	Custom coating options available	Request

For additional customization options, please contact POC.