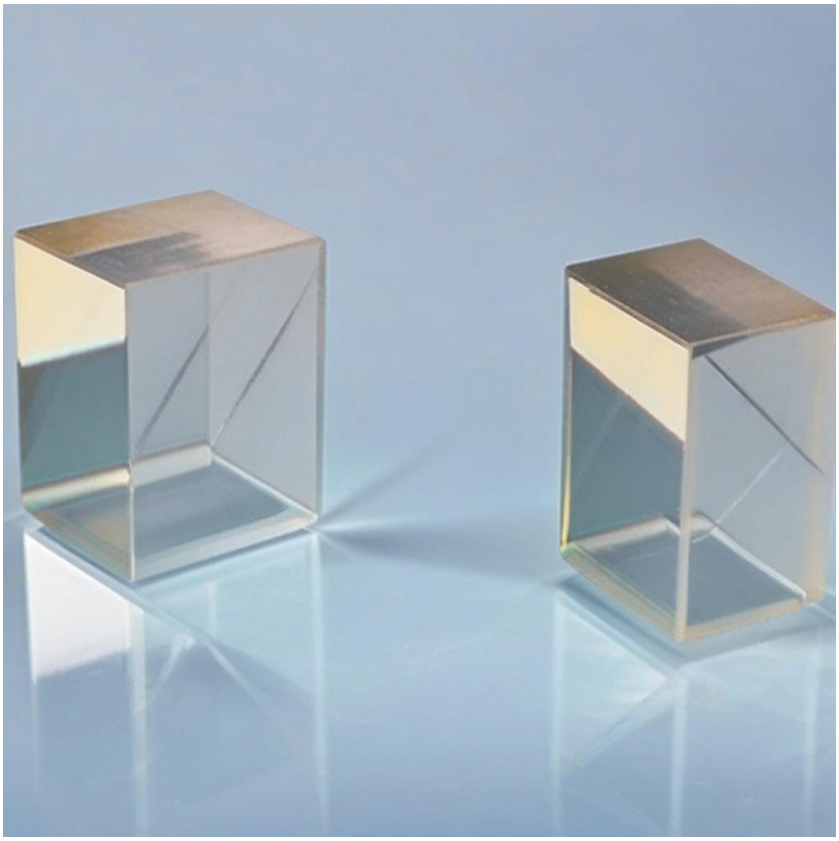
Photonics On Crystals

POC-OC-122451-Tm:Ho:KYW Crystal Datasheet

1 Main Features

- Large and broad polarized absorption and emission bands for enhanced versatility.
- High-efficiency energy transfer from Tm^{3+} to Ho^{3+} ions.
- High dopant concentration tolerance with minimal concentration quenching.
- Efficient laser operation at 2 µm wavelength region, ideal for low-threshold operations.
- Custom crystals available upon request for unique applications.



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2. Material General Description

Tm:Ho:KYW (Thulium, Holmium co-doped Potassium Yttrium Tungstate) crystals are highly efficient laser gain mediums operating in the mid-infrared range (~2 µm). These crystals are characterized by broad polarized absorption and emission bands, making them suitable for applications requiring precise wavelength tunability. The co-doping of Tm^{3+} and Ho^{3+} ions facilitates efficient energy transfer, enabling enhanced laser performance. The monoclinic crystal structure ensures high thermal stability, while the superior spectroscopic and mechanical properties make it a preferred choice for advanced laser systems.

Tm:Ho:KYW crystals have become critical for remote sensing, medical treatments, and industrial applications due to their robustness and consistent output at eye-safe wavelengths.

3. General Applications and Examples

1. **Remote Sensing and LIDAR**: Tm:Ho:KYW lasers are widely used in LIDAR systems for atmospheric monitoring, pollution detection, and geographical mapping.
2. **Medical Applications**: The 2 µm emission wavelength is highly absorbed by water and tissue, making it ideal for surgical and therapeutic procedures.
3. **Mid-Infrared Optical Parametric Oscillators (OPOs)**: Used as a pump source for mid-IR lasers, enabling precise and tunable wavelength generation for scientific and industrial purposes.
4. **Industrial Processing**: Utilized for material processing, such as welding and cutting, due to its ability to concentrate high energy over small areas.
5. **Defense and Security**: Eye-safe lasers in the 2 µm range are critical for secure communication and target designation systems.

4. Chemical, Physical, and Structural Properties

Parameter	Value
Chemical Formula	Tm, Ho:KYW ($K(Y,W)O_4$)
Crystal Structure	Monoclinic
Density	3.95 g/cm³
Mohs Hardness	6.5
Thermal Conductivity	3.3 W/m·K
Thermal Expansion Coefficient	10.5×10^{-6} /°C (a-axis)
Typical Doping Level	5 at.% (Tm^{3+}), 1 at.% (Ho^{3+})
Lattice Constants	a = 7.2 Å, b = 10.3 Å, c = 7.5 Å

5. Optical, Laser, or Nonlinear Optical Properties

Parameter	Value
Laser Wavelength	2060 nm
Absorption Peak Wavelength	802 nm
Absorption Cross Section	7.6×10^{-20} cm²
Emission Cross Section	4.7×10^{-20} cm²
Absorption Bandwidth at Peak	~4 nm

Lifetime of T_1 Energy Level	1.8 ms
Refractive Index (@1040 nm)	n_e = 2.05, n_o = 1.97

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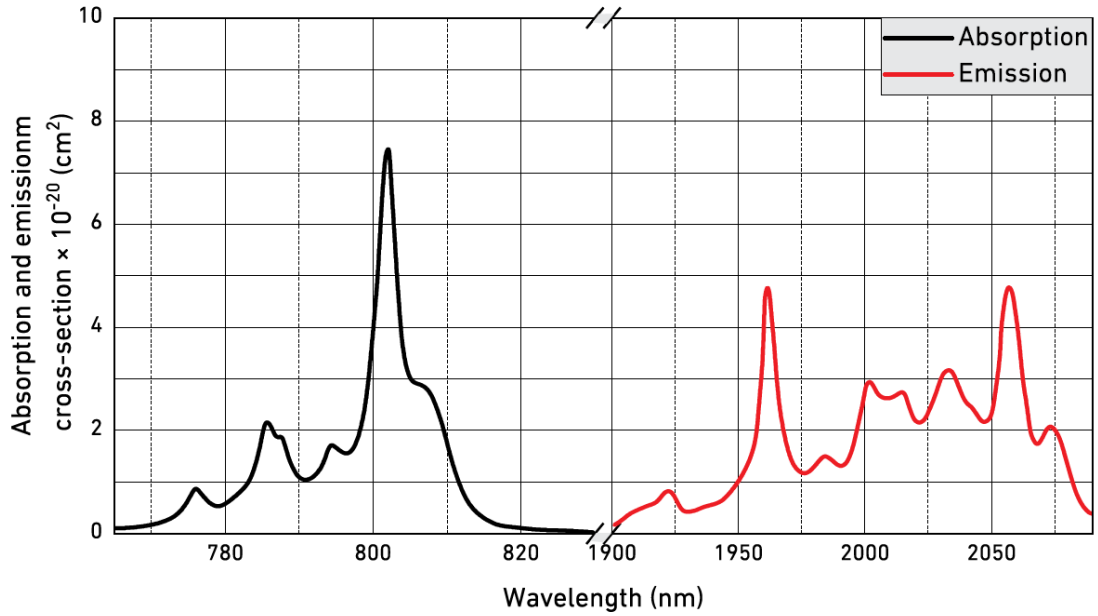
6. Spectrum Transmission Curves

Refer to the transmission chart for absorption and emission properties across key wavelengths, highlighting peak values at 802 nm (absorption) and 2060 nm (emission). If additional data is required, please contact POC for technical reports.



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7. Coating Specifications

- AR Coatings: AR@802 nm ± 10 nm + AR@1900-2100 nm on both faces for minimal reflectivity and high transmission efficiency.
- Custom coating options available upon request.

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8. Standard Fabrication Specifications

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

Perpendicularity Error	<10 arcmin
Surface Flatness	λ/10 @ 632.8 nm
Surface Quality	20-10 S-D
Protective Chamfers	<0.1 mm at 45°

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9. POC Strength and Capabilities

Photonics On Crystals (POC) specializes in providing high-quality laser crystals tailored to meet diverse industrial and scientific needs. Our advanced production techniques ensure:

- **Precision Engineering**: Adhering to strict dimensional tolerances for optimal performance.
- **Customization Expertise**: Ability to tailor doping concentrations, coatings, and dimensions for specialized applications.
- **Research and Innovation**: Continuous investment in research to develop cutting-edge materials like Tm:Ho:KYW for next-generation laser systems.

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10. Standard Products and Customization Options

Face Dimensions	Length	End Faces	Doping	Coatings	Price (USD)
5 x 5 mm	2 mm	Brewster-angle cut	1%	Uncoated	620
5 x 5 mm	2 mm	Right-angle cut	1%	AR@802 nm + AR@2100 nm	750
8 x 8 mm	2 mm	Brewster-angle cut	1%	Uncoated	620
8 x 8 mm	2 mm	Right-angle cut	1%	AR@802 nm + AR@2100 nm	750
Customization	**Custom**	**Custom options**	**Custom**	**Available upon request**	**Request Quote**