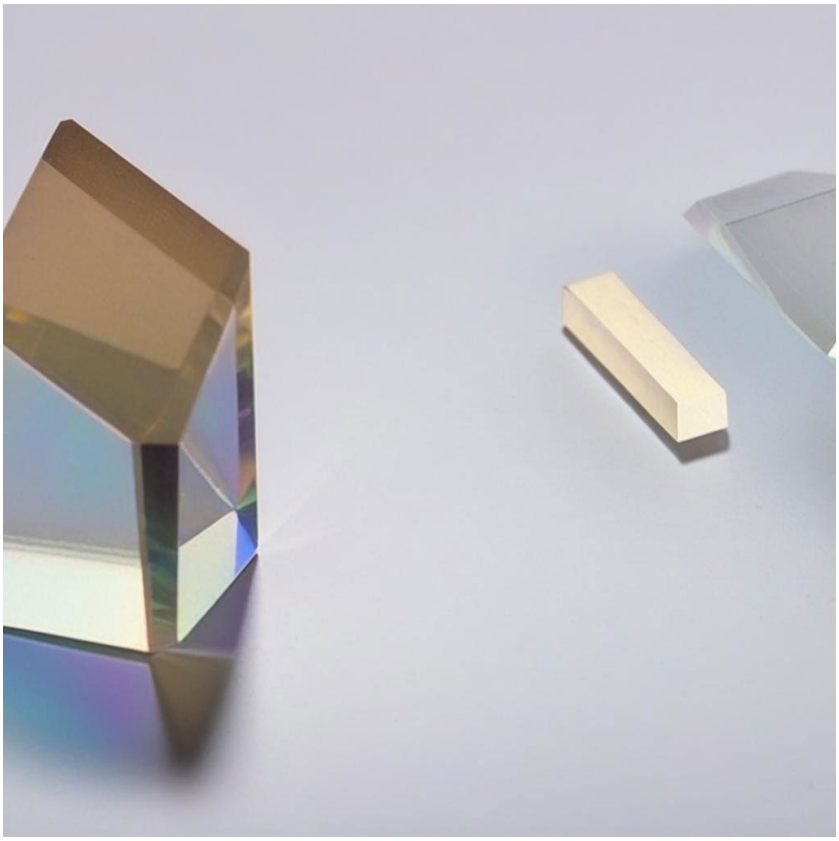
Photonics On Crystals

POC-OC-122466-YVO4 Crystal Datasheet

1 Main Features

- High transmittance range from 0.4 to 5 µm.
- Large birefringence and excellent optical properties for polarizing components.
- Superior temperature stability and mechanical strength.
- Positive uniaxial crystal with low deliquescence.
- Suitable substitute for Calcite ($CaCO_3$) and Rutile (TiO_2) in optical isolators and circulators.



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2. Material General Description

Yttrium Orthovanadate (YVO_4) is a positive uniaxial crystal grown using the Czochralski method. Known for its exceptional thermal stability and mechanical durability, YVO_4 crystals are widely used in optical applications requiring high transmittance and birefringence. The crystal exhibits low hygroscopicity and is highly resistant to deliquescence, making it suitable for long-term use in humid environments. With its optical transparency extending from the visible to mid-infrared spectrum (0.4–5 µm), YVO_4 is an excellent synthetic alternative to naturally occurring birefringent materials like Calcite and Rutile. Its robust optical properties, combined with its stability, make it ideal for manufacturing optical isolators, beam displacers, and circulators.

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3. General Applications and Examples

YVO_4 crystals find extensive applications in:

1. **Fiber-optic isolators and circulators**:
    - Used to manage optical signals in fiber-optic communication systems by reducing signal interference and back reflections.
2. **Beam displacers**:
    - Employed in optical systems to achieve polarization splitting for high-precision laser applications.
3. **Interleavers**:
    - Common in wavelength-division multiplexing (WDM) systems for improving spectral resolution.
4. **Polarizing optics**:
    - Ideal for polarizing components due to its high birefringence and stability across a wide wavelength range.
5. **Laser systems**:
    - Integrated into laser cavities for wavelength stabilization and polarization control.
6. **Optical instrumentation**:
    - Utilized in high-performance metrology and scientific instrumentation requiring precision optical components.

Examples include optical circulators in telecommunication systems, beam displacers for spectroscopy, and polarizers in advanced imaging systems.

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4. Chemical, Physical, or Structural Properties

Parameter	**Value**
Crystal structure	Zircon tetragonal, space group D_4h
Lattice constants	a = b = 7.12 Å, c = 6.29 Å
Density	4.22 g/cm³
Mohs hardness	5 (glass-like)
Thermal expansion coefficient	$\alpha_a = 4.43 \times 10^{-6}$/K, $\alpha^c = 11.37 \times 10^{-6}$/K
Thermal conductivity	a-axis: 5.23 W/m·K, c-axis: 5.10 W/m·K
Refractive indices	$n_e = 2.1554$ (at 1550 nm), $n_o = 1.9447$
Birefringence (n_e - n_o)	0.2039 (at 1550 nm)

Transparency range	0.4 to 5 µm
Hygroscopic susceptibility	Non-hygroscopic

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5. Optical, Laser, or Nonlinear Optical Properties

Parameter	Value
Refractive indices	n_e = 2.1554 (at 1550 nm), n_o = 1.9447
Birefringence (n_e - n_o)	0.2039 (at 1550 nm)
Walk-off angle at 45°	5.69°
Transparency range	0.4 to 5 µm
Sellmeier equation	$n^2 = A + (B/(\lambda^2-C))$, parameters provided

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6. Spectrum Transmission Curves

- The transmission curve exhibits a high transmittance range between 0.4 µm and 5 µm. The data is consistent with low absorption losses, ensuring excellent optical clarity for applications such as polarizers and circulators.

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7. Coating Specification

- Anti-reflective (AR) coating: R < 0.2% @ 1550 nm or 1310 nm.
- Other custom coatings are available upon request.

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8. Standard Fabrication Specifications

Specification	Value
Aperture	1.0 x 1.0 mm² to 4 x 4 mm²
Dimension tolerance	±0.1 mm
Wedge angle tolerance	±0.1°
Optical axis orientation	±0.5°
Parallelism	≤ 20 arc sec
Flatness	λ/4 @ 633 nm
Surface quality (scratch/dig)	20/10 to MIL-PRF-13830B
Chamfer	0.2 mm x 45°

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9. POC Strength and Capabilities

Photonics On Crystals (POC) has extensive expertise in the design, manufacturing, and customization of high-performance optical crystals like YVO_4. With advanced crystal growth techniques and strict quality control, POC ensures consistent production of reliable optical components for global markets. Key strengths include:

1. **Customization**: Tailored solutions for diverse optical applications.
2. **Precision Engineering**: Adherence to the highest industry standards for optical clarity and mechanical durability.
3. **Global Reach**: Serving diverse industries, including telecommunications, laser manufacturing, and research instrumentation.
4. **Technical Support**: Dedicated team for pre- and post-sales support to ensure customer satisfaction.

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10. Standard Products

Face Dimensions	Length	End Faces	Doping	Coatings	Price (USD)
1.0 x 1.0 mm^2	5 mm	Brewster-angle cut	0%	AR@1550 nm	$200
2.0 x 2.0 mm^2	10 mm	Right-angle cut	0%	AR@1550 nm and 1310 nm	$250
3.0 x 3.0 mm^2	15 mm	Brewster-angle cut	0%	AR@1550 nm	$300
Custom Dimensions	-	Upon Request	-	Upon Request	Upon Request

For custom orders, please contact **Photonics On Crystals** for tailored solutions.