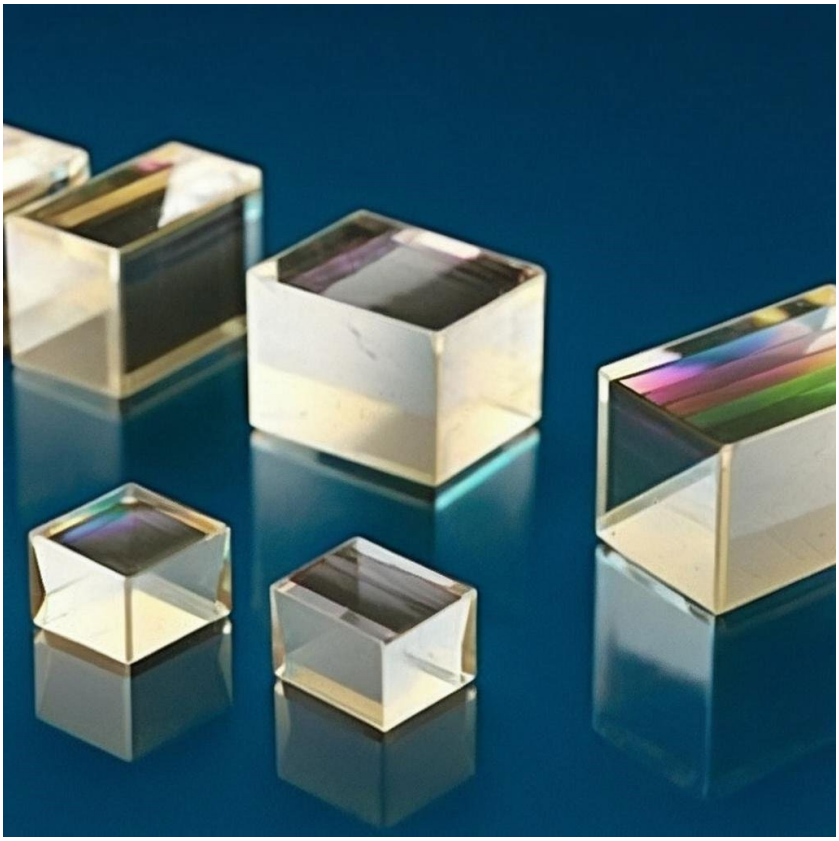
Photonics On Crystals

POC-OC-122465-TSAG Crystal Datasheet

1 Main Features

- Large Verdet constant (48 Rad·T^-1·m^-1 at 1064 nm), approximately 20-30% higher than TGG crystals.
- Low absorption (<3000 ppm/cm at 1064 nm), 30% less than TGG crystals.
- High power compliance with minimal thermally-induced birefringence.
- Superior thermal and mechanical properties.
- Ideal for compact magneto-optical devices such as isolators and Faraday rotators.



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2. Material General Description

Terbium Scandium Aluminum Garnet (TSAG) is an advanced magneto-optical crystal designed for next-generation fiber lasers and other optical devices. With a high Verdet constant and low absorption rate, TSAG excels in visible and infrared wavelength applications. These characteristics enable TSAG to support high power operations while minimizing optical losses and thermally-induced birefringence. TSAG is well-suited for compact magneto-optical devices like isolators and Faraday rotators, where space and thermal considerations are critical. TSAG also exhibits robust

thermal and mechanical stability, making it an ideal choice for high-power applications across the spectral range of 400–1600 nm.

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3. General Applications and Examples

TSAG crystals are widely used in:

- **Faraday Rotators and Isolators**: Key components in optical systems requiring polarization control, particularly for fiber lasers and high-power laser setups. TSAG provides improved efficiency and compact design.
- **Laser Systems**: Used as magneto-optical elements in laser cavity designs to ensure unidirectional light propagation and suppress feedback, critical in high-power fiber lasers.
- **High-Power Lasers**: Due to its high damage threshold (>1 GW/cm^2) and minimal optical loss (<0.1%/cm), TSAG supports applications requiring reliable and stable operation under extreme conditions.
- **Infrared Devices**: Supports wavelengths up to 1600 nm, making it suitable for optical isolators used in long-range communication systems.
- **Compact Optical Devices**: With its low thermal expansion and birefringence properties, TSAG enables the miniaturization of magneto-optical devices while maintaining high performance.

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4. Chemical, Physical, and Structural Properties

Property	Value
Chemical Formula	Tb3Sc2Al3O12
Crystal Structure	Cubic, Space Group Ia3d
Lattice Parameter	a = 12.3 Å
Density	5.91 g/cm³
Melting Point	1970°C ± 10°C
Mohs Hardness	8.0
Verdet Constant	48 Rad·T^-1·m^-1 at 1064 nm
Absorption Loss	<0.1%/cm
Thermal Conductivity	7.4 W·m^-1·K^-1
Laser Damage Threshold	>1 GW/cm²
Refractive Index	1.95 at 1064 nm

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5. Optical, Laser, and Nonlinear Optical Properties

Property	Value
Transparency Range	400–1600 nm
Verdet Constant	48 Rad·T^-1·m^-1 at 1064 nm
Absorption Coefficient	<0.003 cm^-1
Extinction Ratio	>30 dB
Birefringence	Negligible
Laser-Induced Damage Threshold	>1 GW/cm²

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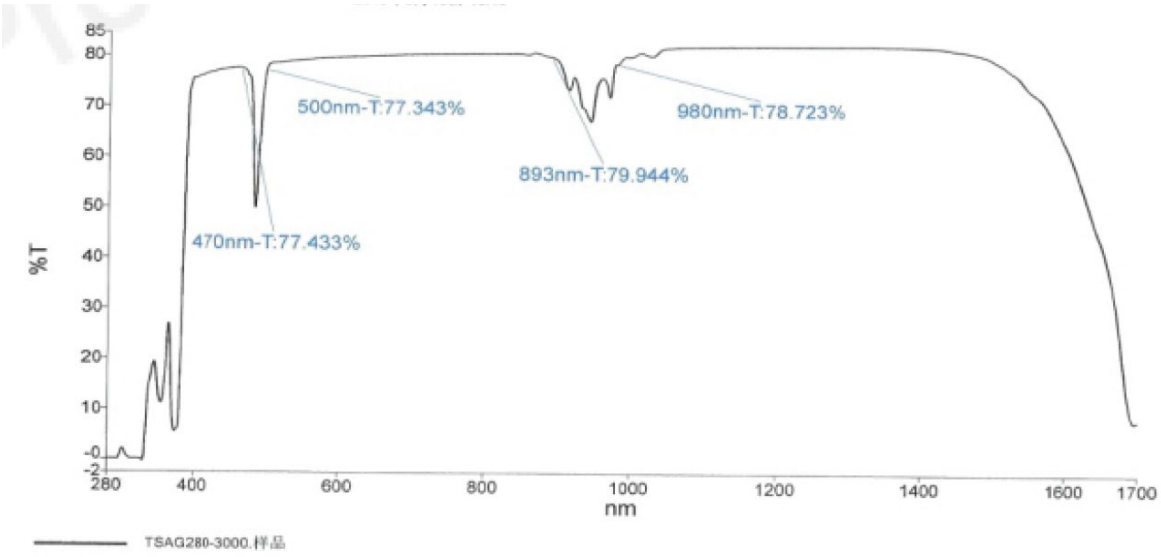
6. Spectrum Transmission Curve

Transmission characteristics are optimized for wavelengths between 400 nm and 1600 nm, ensuring minimal loss and high transmission efficiency for Faraday rotation and isolation applications. A detailed curve can be obtained on request.



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7. Coating Specifications

- **Standard AR Coatings**: <0.2% reflection at 1064 nm.
- Custom coatings available upon request for specific wavelengths or spectral ranges.

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8. Standard Fabrication Specifications

Specification	Value
Orientation	[111] within ±15'
Extinction Ratio	>30 dB

Diameter Tolerance	±0.1 mm
Length Tolerance	±0.2 mm
Surface Quality (Scratch/Dig)	10/5 to MIL-PRF-13830B
Flatness	<λ/8 @ 633 nm
Wavefront Distortion	<λ/8 @ 633 nm
Parallelism	20 arc sec
Perpendicularity	<5 arc min
Chamfer	0.2 mm × 45°

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9. POC Strength and Capabilities

Photonics On Crystals (POC) is a leading provider of high-performance optical crystals, specializing in custom fabrication and quality assurance. With decades of expertise in crystal growth and coating technologies, POC delivers precision-engineered solutions for laser systems, magneto-optical devices, and advanced photonics applications. Our state-of-the-art facilities and stringent quality control ensure the highest standards for industrial, medical, and research needs.

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10. Standard Products

Dimensions (mm)	**Coating**	**Price (USD)**
3 × 3 × 5	AR@1064 nm	350
5 × 5 × 10	AR@1064 nm	600
Custom Sizes	AR coatings upon request	Contact us