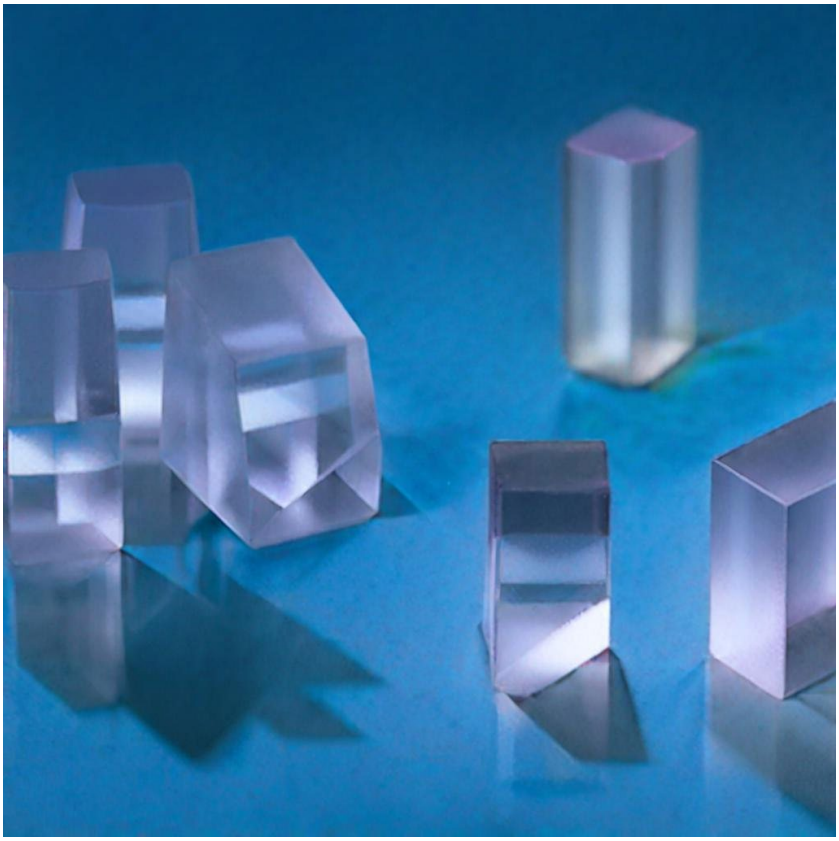
Photonics On Crystals

POC-OC-122435-Cr4+:YAG Crystal Datasheet

1 Main Features

- Exceptional thermal and chemical stability, resistant to UV degradation.
- High damage threshold (>500 MW/cm² at 1064 nm, 10 ns, 10 Hz).
- Wide transmission range (0.8 to 1.2 µm) suitable for Nd and Yb laser pumping.
- Reliable passive Q-switch operation with tunable output.
- Custom dimensions and initial transmission rates available for diverse applications.



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2. Material General Description

Cr^{4+}:YAG Crystal is an advanced material designed for passive Q-switching in solid-state lasers, such as Nd:YAG, Nd:YLF, and Nd:YVO_4. Its cubic garnet structure ensures durability, high thermal conductivity, and excellent damage threshold. Cr^{4+}:YAG can efficiently operate without active electronic components, reducing system complexity and cost.

Photonics On Crystals provides Cr^{4+}:YAG crystals with doping levels between 0.03 and 0.05 mol%. Available sizes range from 2 × 2 mm² to 14 × 14 mm² with lengths from 0.1 mm to 12 mm. Initial transmission can be tailored from 10% to 92% per customer requirements.

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3. General Applications and Examples

Cr^{4+}:YAG crystals are widely used for passive Q-switching, enabling compact laser designs for high-energy pulse generation. Examples include:

- **Laser Rangefinders**: Efficient passive Q-switch operation for compact systems.
- **LIDAR Systems**: Reliable short-pulse generation for high-resolution measurements.
- **Material Processing**: Pulsed laser ablation for precision cutting and welding.
- **Medical Lasers**: High-power pulse lasers for surgical and therapeutic applications.
- **Nonlinear Optics**: Intracavity SHG (Second Harmonic Generation) to produce green outputs at 532 nm or UV outputs at 355 nm.

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4. Chemical, Physical, and Structural Properties

Property	Specification
Chemical Formula	$Cr^{4+}:Y_3Al_5O_{12}$
Crystal Structure	Cubic Garnet
Dopant Concentration	0.03–0.05 mol%
Mohs Hardness	8.5
Refractive Index	1.82 at 1064 nm
Damage Threshold	>500 MW/cm² at 1064 nm
Melting Point	1970°C

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5. Optical and Laser Properties

Property	Value
Transmission Range	950–1200 nm
Refractive Index (1064 nm)	1.82
Damage Threshold	>500 MW/cm²
Ground-State Absorption (σ_a)	4.4×10^{-19} cm² at 1064 nm
Emission Cross-Section (σ_e)	8.2×10^{-20} cm² at 1064 nm
Recovery Time (τ)	3.4 µs

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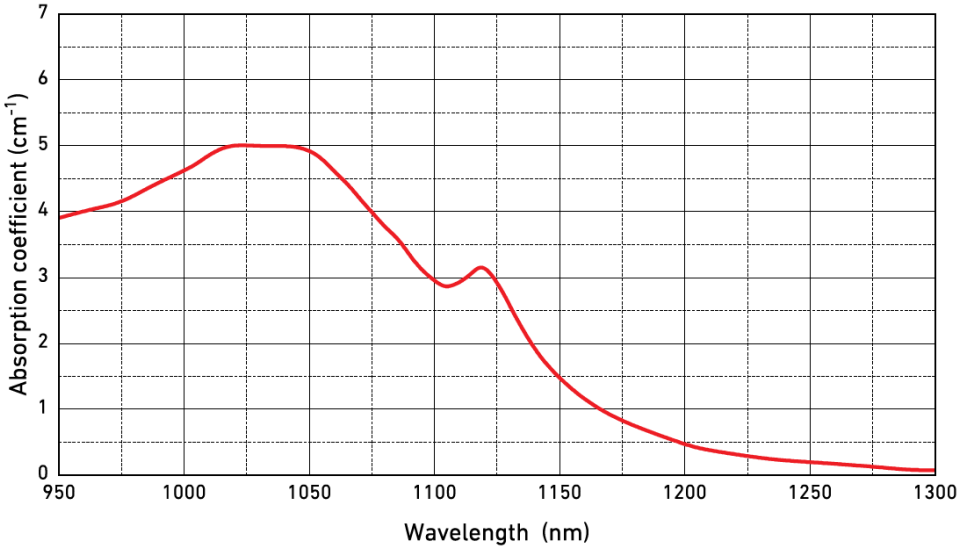
6. Spectrum Transmission Curves

Cr^{4+}:YAG exhibits a wide absorption band extending from 950 to 1200 nm with prominent peaks around 1020–1070 nm. The material is optimized for high-energy Nd and Yb laser pumping.



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7. Coating Specification

Coating Type	Reflection (R)
AR Coating (1064 nm)	<0.2%
Dual AR Coating	Optimized for 1064 and 1070 nm

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8. Standard Fabrication Specifications

Specification	Value
Dimensions	3 × 3 mm² to 20 × 20 mm²
Length	0.1 mm to 12 mm
Dimensional Tolerance	±0.05 mm
Surface Flatness	< λ/10 @ 632 nm
Parallelism	<20 arc seconds
Perpendicularity	<15 arc minutes
Surface Quality (Scratch/Dig)	20–10

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9. POC Strength and Capabilities

Photonics On Crystals specializes in high-precision crystal fabrication, offering customization of initial transmission, dimensions, and coatings to meet unique laser system requirements. POC ensures rigorous quality control, including AR coatings for superior optical performance and high damage thresholds.

10. Standard Products

Face Dimensions	Initial Transmission	Coating	SKU	Price (USD)
6 × 6 mm²	10%	AR @1064 nm	7201	$220
6 × 6 mm²	50%	AR @1064 nm	7202	$230
6 × 6 mm²	90%	AR @1064 nm	7203	$240
3 × 3 mm²	50%	Dual AR Coating	7210	$210
Custom Dimensions	Custom	Custom Coating	Custom	Request Quote

For inquiries and customized requirements, contact Photonics On Crystals (POC).