Photonics On Crystals

POC-OC-122439-Er:Cr:YSGG Crystal Datasheet

1 Main Features

- **Low Laser Threshold**: The lowest threshold among common Erbium-doped crystals.
- **High Slope Efficiency**: Provides exceptional energy conversion efficiency.
- **Wide Pumping Range**: Supports CW, free-running, and Q-switched operation.
- **High Optical Quality**: Exhibits stable chemical properties and long fluorescence lifetime.
- **Intrinsic Crystal Disorder**: Enables broader pump linewidths and excellent tunability.

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2. Material General Description

The Er:Cr:YSGG (Erbium and Chromium-doped Yttrium Scandium Gallium Garnet) crystal is a high-performance laser crystal known for generating 2800 nm light in a critical water absorption band. It boasts high conversion efficiency, stable chemical durability, and a long fluorescence lifetime, making it one of the most promising laser media. The crystal operates efficiently under CW or pulsed laser conditions, making it versatile for dental lasers, environmental sensing, optical communication, and military applications. Due to its intrinsic structural properties, Er:Cr:YSGG has excellent tenability, increasing its appeal across diverse scientific and industrial domains.

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3. General Applications and Examples

Er:Cr:YSGG is extensively used in several advanced applications due to its high energy efficiency and versatility:

- **Medical Lasers**: Used in dental surgeries and hard tissue ablation. Its absorption peak aligns perfectly with water content in biological tissues, ensuring high precision and minimal collateral damage.
- **Environmental Sensing**: Suitable for remote water vapor sensing and environmental research, leveraging its 2800 nm emission for high absorption efficiency in water molecules.
- **Optical Communications**: Facilitates optical amplifications and secure wavelength transmission in specialized communication systems.
- **Military Applications**: Utilized in defense systems for remote target sensing, range finding, and LIDAR technologies due to its high power output and robust design.
- **Scientific Research**: Applied in spectroscopy and material analysis for studying molecular structures, leveraging its stable energy efficiency and precise wavelength range.

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4. Chemical, Physical, and Structural Properties

Property	Specification
Crystal Structure	Cubic, Garnet
Chemical Formula	Y3Sc2-xGaxGa3O12
Lattice Parameter	12.42 Å
Dopant Concentration	Cr: 0.5 × 10^20 (atoms/cm³), Er: 4 × 10^21 (atoms/cm³)
Growth Method	Czochralski
Density	5.67 g/cm³
Refractive Index	1.92 at 1000 nm
Thermal Expansion Coefficient	8.1 × 10^-6 K^{-1}
Thermal Conductivity	8 W/m/K
Mohs Hardness	8 Mohs
Thermo-optical Factor	12.3 × 10^-6 K^{-1}
Emission Cross-section	5.2 × 10^-20 cm^2
Fluorescence Lifetime	1400 µs

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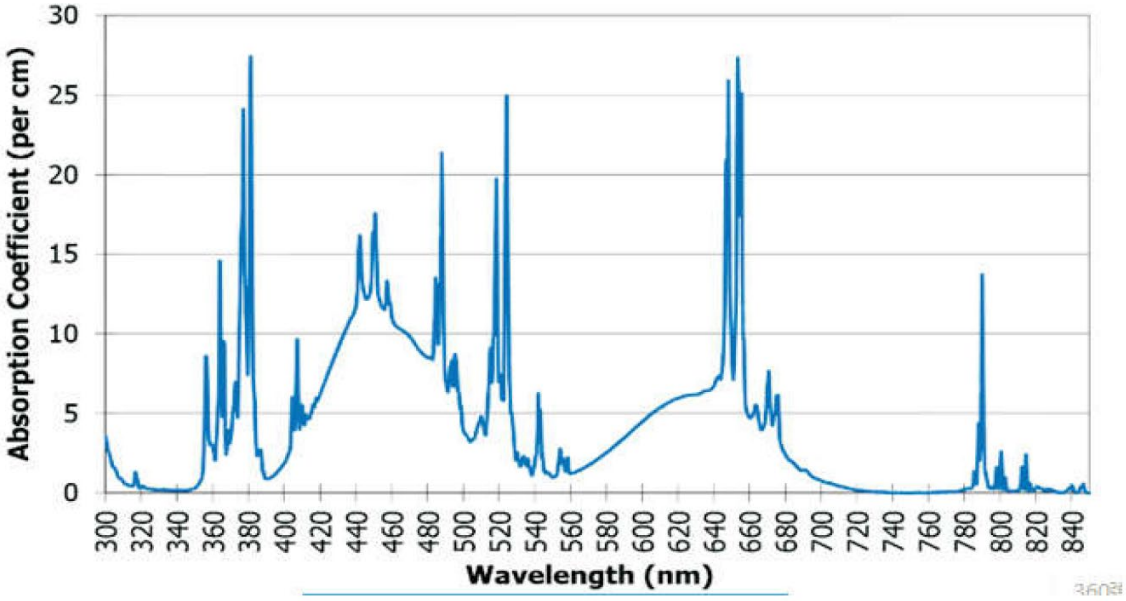
5. Optical, Laser, and Nonlinear Optical Properties

Parameter	Value
Laser Wavelength	2800 nm
Peak Absorption Cross-section	5.2 × 10^-20 cm^2
Fluorescence Lifetime	1400 µs
Thermo-optical Coefficient	12.3 × 10^-6 K^{-1}
Emission Linewidth	Broad and tunable
Pump Source	Diode-pumped via Cr or Er bands

Mode of Operation	CW, free-running, Q-switched

6. Spectrum Transmission Curves

- The absorption spectrum for Er:Cr:YSGG demonstrates strong peaks around 2800 nm, aligning well with water molecule absorption. Its broad tunability and strong fluorescence peaks enhance its utility in high-precision applications



7. Coating Specification

- **AR Coating**: Designed for 2800 nm with <0.2% reflectivity.
- **HR Coating**: Custom coatings available upon request for specific applications.

8. Standard Fabrication Specifications

Specification	Value
Rod Size	Diameter: 3–6 mm, Length: 50–120 mm
Surface Quality	10/5 per MIL-PRF-13830B
Flatness	< λ/8 @ 633 nm
Parallelism	<20 arc sec
Perpendicularity	<15 arc min
Chamfer	<0.2 mm × 45°
Coating Options	AR-coated or HR-coated upon request

9. POC Strength and Capabilities

Photonics On Crystals (POC) specializes in advanced laser crystal manufacturing, offering unmatched precision and quality assurance. Our Er:Cr:YSGG crystals are tailored for cutting-edge applications in medical, environmental, and defense fields. With a strong emphasis on customization and rigorous quality control, POC ensures its crystals exceed industry standards.

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10. Standard Products

Dimensions	Length	End Faces	Doping	Coating	Price (USD)
3 × 3 mm	10 mm	Brewster-angle cut	Cr, Er doped	Uncoated	$450
4 × 4 mm	20 mm	Right-angle cut	Cr, Er doped	AR-coated @2800 nm	$500
5 × 5 mm	30 mm	Brewster-angle cut	Cr, Er doped	HR-coated	$600
Customization	As needed	As needed	As requested	As requested	Request Quote

For additional details, customization, or pricing inquiries, please contact Photonics On Crystals (POC). Our team is dedicated to providing high-performance solutions for all your laser crystal needs.