# Photonics On Crystals

## POC-OC-122453-Yb:YAB Crystal Datasheet

**1 Main Features**

- Self-doubling laser crystal with nonlinear optical properties.
- Excellent thermal conductivity and high mechanical strength.
- Broad absorption bandwidth near 976 nm and strong emission cross-section.
- Low quantum defect suitable for high-efficiency laser systems.
- Customizable dimensions and coatings available upon request.

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**2. Material General Description**

The Yb:YAB (Ytterbium-doped Yttrium Aluminum Borate) crystal is a versatile laser medium featuring self-doubling properties, combining both lasing and nonlinear optical functions. As a uniaxial negative crystal, it enables efficient frequency conversion from infrared to visible regions. Its high Yb doping concentration allows strong emission with minimal quenching, providing exceptional optical performance. Yb:YAB crystals are known for their robust mechanical strength, high thermal conductivity, and stable chemical properties, making them ideal for high-power and compact laser systems. These qualities make the Yb:YAB crystal suitable for applications requiring strong nonlinear optical effects and reliable operation.

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**3. General Applications and Examples**

1. **High-Power Continuous-Wave (CW) Lasers**: Yb:YAB crystals serve as an effective medium for generating CW laser outputs, used in industrial processing, material cutting, and laser marking systems.
2. **Mode-Locked Femtosecond Lasers**: The broad absorption bandwidth allows the production of ultrashort laser pulses, typically utilized in scientific research, spectroscopy, and optical imaging.
3. **Frequency Conversion Systems**: As a self-doubling crystal, Yb:YAB is widely applied in frequency doubling and optical parametric oscillation (OPO) systems for applications like green and visible light generation.
4. **Medical Lasers**: Yb:YAB crystals are employed in precision surgeries and dermatological treatments due to their reliable and consistent laser output.
5. **Scientific Instruments**: With its nonlinear optical capabilities, Yb:YAB is integral in advanced imaging techniques and research-grade laser systems.

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**4. Chemical, Physical, and Structural Properties**

| Parameter | Specification |
|---|---|
| Crystal Structure | Trigonal |
| Chemical Formula | Yb:YAl3(BO3)4 |
| Density | 3.84 g/cm³ |
| Mohs Hardness | 7.5 |
| Thermal Conductivity | 6 W/m·K |
| Refractive Index at 632.8 nm | no = 1.7757, ne = 1.7015 |
| Thermal Expansion Coefficient | 2 × 10^-6 /K |
| Typical Doping Level | 10 at.% Yb |
| Absorption Bandwidth at Peak | 20 nm |

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**5. Optical, Laser, or Nonlinear Optical Properties**

| Parameter | Specification |
|---|---|
| Absorption Peak Wavelength | 976 nm |
| Emission Wavelength | 1040 nm |
| Emission Cross-Section | 0.5 × 10^-20 cm² |
| Lifetime of Yb Energy Level | 680 µs |

| | |
|---|---|
| Absorption Cross-Section | 3.8 × 10^-20 cm² |
| dn/dT (Refractive Index Change w/Temp) | 1.4 × 10^-6 /K |

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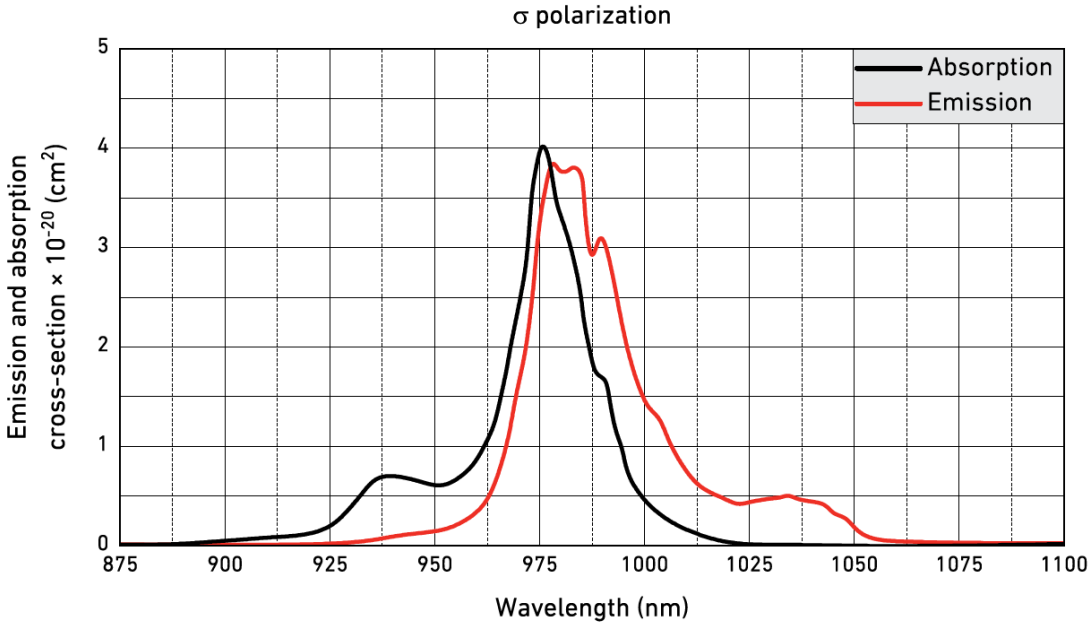
**6. Spectrum Transmission Curves**

The Yb:YAB crystal exhibits peak absorption at 976 nm and emission at 1040 nm, as shown in the emission and absorption spectra above. Its broad absorption bandwidth allows for versatile pumping options, making it a preferred material for high-power applications.

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**7. Coating Specification**

- Anti-Reflection Coatings:
  - AR@1030 nm and 1060 nm on both faces.
  - Optional coatings for specific applications, including AR@520-976-1040 nm.

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**8. Standard Fabrication Specifications**

| **Parameter** | **Specification** |
|---|---|
| Orientation | c-cut |
| Face Dimension Tolerance | ±0.01 mm |
| Length Tolerance | ±0.1 mm |
| Parallelism Error | <20 arcsec |

| | |
|---|---|
| Perpendicularity Error | <10 arcmin |
| Protective Chamfers | <0.1 mm at 45° |
| Surface Flatness | λ/10 @ 632.8 nm |
| Laser-Induced Damage Threshold | >10 J/cm² @ 1040 nm, 10 ns |

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**9. POC Strength and Capabilities**

Photonics On Crystals (POC) is renowned for producing high-quality laser crystals tailored to industry and scientific needs. With a focus on precision fabrication, strict quality control, and customization, POC delivers solutions optimized for cutting-edge technologies. Our Yb:YAB crystals represent our commitment to innovation and excellence in laser material manufacturing.

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**10. Standard Products**

| Face Dimensions | Length | End Faces | Orientation | Doping | Coatings | Price |
|---|---|---|---|---|---|---|
| 3 x 3 mm | 2 mm | Right-angle cut | c-cut | 10% | AR/AR@960-1060 nm | Request |
| 3 x 3 mm | 2 mm | Brewster-angle cut | c-cut | 10% | Uncoated | Request |
| 3 x 3 mm | 2 mm | Right-angle cut | θ = 31°, ϕ = 0° | 10% | AR/AR@520-976-1040 nm | Request |

Additional custom dimensions, coatings, and doping levels are available upon request. Contact POC for tailored solutions to meet your specific needs.