Er:Yb:YAB - Erbium, Ytterbium Co-doped Yttrium Aluminum Borate ($Er:Yb:YAl_3(BO_3)_4$)

Introduction

At present, Er^{3+} / Yb^{3+} Co-doped Yttrium Aluminum Borate ($Er:Yb:YAl_3(BO_3)_4$, Er:Yb:YAB) crystal has been considered as an excellent 1.55 μm laser material, because it has high thermal conductivity, high Er^{3+}/Yb^{3+} energy transfer efficiency and weak upconversion loss. Compared with Er^{3+}/Yb^{3+} co-doped phosphato glass, $Er:Yb:YAl_3(BO_3)_4$ crystal can achieve 1530 nm continuous laser output with high (maximum) power and high slope efficiency. Due to the strong penetration ability to smoke, excellent transparency in atmosphere and high sensitivity for the room-temperature Ge as well as InGaAs photodiodes, eye-safe 1.55 μm laser can be widely used in many applications, such as LiDAR laser ranging, three-dimensional imaging and target recognition.

Table 1. Basic Properties

Chemical Formula	$Er:Yb:YAl_3(BO_3)_4$
Crystal Structure	D^3_7 - R32, a = b = 9.293 Å, c = 7.245 Å
Atomic Density	0.55×10^{20} cm^{-3} (1at.% Yb^{3+} or Er^{3+})
Mohs Hardness	7.5 Mohs
Density	3.7 g/cm^3
Refractive Index	1.75 (n_o); 1.68 (n_e) @1550 nm
Thermal Expansion Coefficient	⊥c: 2.0×10^{-6} K^{-1} // c: 9.7×10^{-6} K^{-1} (25 at.% Yb^{3+})
	⊥c: 1.2×10^{-6} K^{-1} // c: 8.5×10^{-6} K^{-1} (10 at.% Yb^{3+})
Conductivity	4.7 W/m/K

Table 2. Performance Parameter Table

	$Er:Yb:YAl_3(BO_3)_4$	Er^{3+}/Yb^{3+} co-doped phosphate glass
Pumping Wavelength	976 nm	976 nm
Peak Absorption Cross-section	3×10^{-20} cm^2 (σ polarization)	1×10^{-20} cm^2
FWHM of Absorption Band	19 nm	10 nm
Peak Fluorescence Wavelength	1530 nm	1533 nm
Central Wavelength of Luminescence	470 nm	470 nm
Peak Emission Cross-section	2×10^{-20} cm^2 (σ polarization)	0.8×10^{-20} cm^2
Fluorescence Lifetime	0.3 ms	8 ms
Refraction Index	1.75 (n_o)	1.54
Conductivity	4.7 W/m/K	0.8 W/m/K
Maximum Output Power	＞1 W	350 mW
Maximum Slope Efficiency	＞30%	＞30 %
Lasing Wavelength	1520-1600 nm	1528-1565 nm

Specifications of Er:Yb:YAB crystal from CASTECH

Table 3. Specifications

Dopant Concentration	Er^{3+}: 0.1~3 at.%, Yb^{3+}: 5~30 at.%
Cross-section	(1 × 1) ~ (15 × 15) mm^2
Thickness	0.5~10 mm
Dimension Tolerance	±0.1 mm
Surface Quality (Scratch / Dig)	10/5 to MIL-PRF-13830B
Transmitted Wavefront Distortion	λ/8 @633 nm
Flatness	λ/6 @633 nm
Parallelism	≦30 arc sec
Coating	AR- or HR- coating

*** We can also provide you $Er:Yb:GdAl_3(BO_3)_4$ and $Er:Yb:LuAl_3(BO_3)_4$ with similar tech specs above.**