

Yb:KGW - Ytterbium Doped Potassium Gadolinium Tungstate (Yb:KGd(WO₄)₂)

Introduction

Ytterbium doped Potassium Gadolinium Tungstate (Yb:KGd(WO₄)₂ or Yb:KGW) is an excellent laser gain material which has important advantages over the widely used Nd³⁺ doped materials. Its broad spectral emission band 1023-1060 nm allows the generation of short (ps or fs) laser pulses. Its wide absorption spectrum at 980 nm and high absorption of pump radiation allow an efficient use of diode laser pumping. Compared with YAG used as hosts for Yb³⁺, KGW has the advantage of larger absorption cross section, which decreases the minimum pump intensity necessary to achieve transparency in the quasi-two-level system of ytterbium.

CASTECH's Yb: KGW is featured by

- High absorption coefficient @ 981nm
- High stimulated emission cross section
- Low laser threshold
- Extremely low quantum defect
- Broad polarized output at 1023–1060 nm
- High slope efficiency with diode pumping
- High Yb doping concentration

Table 1. Basic Properties

Crystal Structure	Monoclinic
Point Group	C2/c
Lattice Parameter	a = 8.09 Å, b = 10.43 Å, c = 7.588Å, β = 94.4°
Refractive Index, at 1067 nm	n _g = 2.033, n _p = 2.037, n _m = 1.986
Melting Point	1075 °C
Mohs Hardness	5 Mohs
Density	7.27 g/cm ³
Thermal Conductivity at 373 K	K _[100] = 2.6 W/m/K, K _[010] = 3.8 W/m/K; K _[001] = 3.4 W/m/K
Thermal Expansion Coefficients at 373 K	α _[100] = 4 × 10 ⁻⁶ /K, α _[010] = 1.6 × 10 ⁻⁶ /K, α _[001] = 8.5 × 10 ⁻⁶ /K
Lasing Wavelength	1023-1060 nm
Absorption Band	981 nm (FWHM 3.7 nm)
Fluorescent Lifetime	600 μs (5% doping)

Table 2. Specifications

Orientation	[010]
Standard Dopant Concentration	Yb: 5 at.%
Maximum Length	50 mm
Dimensional Tolerances	Diameter: ± 0.1 mm Length: ± 0.5 mm
Surface Quality (Scratch/Dig)	20/10 to MIL-PRF-13830B
Flatness	$\lambda/6$ @633 nm
Parallelism	20 arc sec
Perpendicularity	≤ 15 arc min
Coating	AR-1030/980 nm, R < 0.2% @1030 nm, R < 0.5% @980 nm. Other coatings are available upon request.