

## Yb:KGW / Yb:KYW – Yb-DOPED POTASSIUM GADOLINIUM TUNGSTATE

### Features

- High absorption coefficient @ 981 nm
- High stimulated emission cross section
- Low laser threshold
- Extremely low quantum defect  $\lambda_{\text{pump}}/\lambda_{\text{se}}$
- Broad polarized output at 1023–1060 nm
- High slope efficiency with diode pumping (~ 60%)
- High Yb doping concentration

### Applications

- Yb:KGW and Yb:KYW thin (100–150  $\mu\text{m}$ ) crystals are used as lasing materials to generate ultrashort (hundreds of fsec) high power (>22 W) pulses. Standard pumping @ 981 nm, output: 1023–1060 nm
- Yb:KGW and Yb:KYW can be used as ultrashort pulses amplifiers
- Yb:KGW and Yb:KYW are some of the best materials for high power thin disk lasers

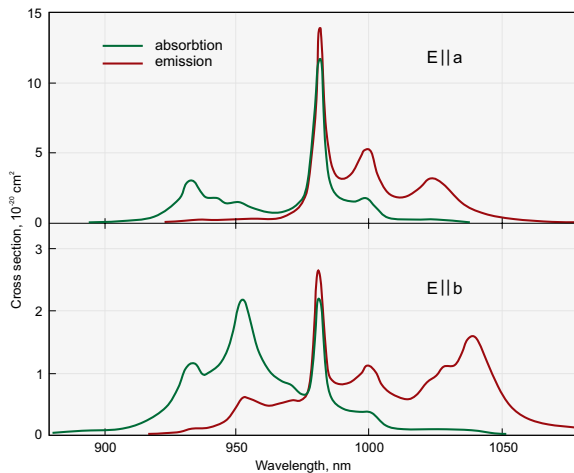
Yb-Doped Potassium Gadolinium Tungstate (**Yb:KGd(WO<sub>4</sub>)<sub>2</sub>**) and Yb-doped Potassium Itrium Tungstate (**Yb:KY(WO<sub>4</sub>)<sub>2</sub>**) single crystals are the laser crystals for diode or laser pumped solid-state laser applications.

### Custom manufacturing capabilities

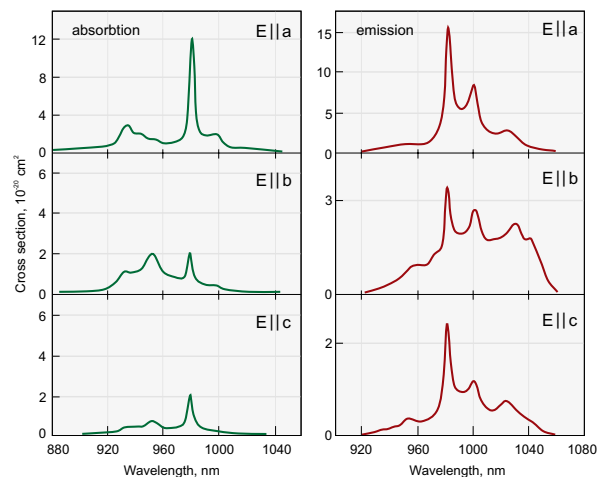
- Various shapes (slabs, rods, cubes)
- Different dopant levels
- Diversified coatings

### Properties of Yb:KGW and Yb:KYW

Name	Yb:KGW	Yb:KYW
Yb <sup>3+</sup> concentration	0.5–5%	0.5–100%
Crystal structure	monoclinic	monoclinic
Point group	C2/c	C2/c
Lattice parameters	a=8.095 Å, b=10.43 Å, c=7.588 Å, $\beta=94.43^\circ$	a=8.05 Å, b=10.35 Å, c=7.54 Å, $\beta=94^\circ$
Thermal expansion	$\alpha_a=4 \times 10^{-6}/^\circ\text{C}$ , $\alpha_b=3.6 \times 10^{-6}/^\circ\text{C}$ , $\alpha_c=8.5 \times 10^{-6}/^\circ\text{C}$	—
Thermal conductivity	$K_a=2.6 \text{ W/mK}$ , $K_b=3.8 \text{ W/mK}$ , $K_c=3.4 \text{ W/mK}$	—
Density	7.27 g/cm <sup>3</sup>	6.61 g/cm <sup>3</sup>
Mohs' hardness	4–5	4–5
Melting temperature	1075 °C	—
Transmission range	0.35–5.5 $\mu\text{m}$	0.35–5.5 $\mu\text{m}$
Refractive indices ( $\lambda=1.06 \mu\text{m}$ )	$n_g=2.037$ , $n_p=1.986$ , $n_m=2.033$	—
Thermo-optic coefficients @ 1064 nm	$\partial n_p/\partial T = -15.7 \times 10^{-6} \text{ K}^{-1}$ $\partial n_m/\partial T = -11.8 \times 10^{-6} \text{ K}^{-1}$ $\partial n_g/\partial T = -17.3 \times 10^{-6} \text{ K}^{-1}$	For 20% Yb:KYW $\partial n_p/\partial T = -13.08 \times 10^{-6} \text{ K}^{-1}$ $\partial n_m/\partial T = -7.61 \times 10^{-6} \text{ K}^{-1}$ $\partial n_g/\partial T = -11.83 \times 10^{-6} \text{ K}^{-1}$
Laser wavelength	1023–1060 nm	1025–1058 nm
Fluorescence lifetime	0.3 ms	0.3 ms
Stimulated emission cross section (E  a)	$2.6 \times 10^{-20} \text{ cm}^2$	$3 \times 10^{-20} \text{ cm}^2$
Absorption peak and bandwidth	$\alpha_a=26 \text{ cm}^{-1}$ , $\lambda=981 \text{ nm}$ , $\Delta\lambda=3.7 \text{ nm}$	$\alpha_a=40 \text{ cm}^{-1}$ , $\lambda=981 \text{ nm}$ , $\Delta\lambda=3.5 \text{ nm}$
Absorption cross section	$1.2 \times 10^{-19} \text{ cm}^2$	$1.33 \times 10^{-19} \text{ cm}^2$
Lasing threshold	35 mW	70 mW
Stark levels energy (in cm <sup>-1</sup> ) of the <sup>2</sup> F <sub>5/2</sub> manifolds of Yb <sup>3+</sup> @ 77K	10682, 10471, 10188	10695, 10476, 10187
Stark levels energy (in cm <sup>-1</sup> ) of the <sup>2</sup> F <sub>7/2</sub> manifolds of Yb <sup>3+</sup> @ 77K	535, 385, 163, 0	568, 407, 169, 0



Absorption and emission spectra of Yb(5%):KYW



Absorption and emission spectra of Yb(5%):KGW