# Yb:KGW AND Yb:KYW CRYSTALS LASER LINES AND HARMONICS

Yb:KGW and Yb:KYW crystals have broad emission bandwidths and are used as lasing materials to generate ultrashort (~100 – 200 fs) high power pulses. Direct pump of Yb:KGW/KYW crystals with laser diodes operating at 981 nm supports compact laser systems. Yb:KGW/KYW laser generates pulses at 1023 – 1060 nm wavelength range. Also Yb:KGW and Yb:KYW can be used as ultrashort pulse amplifiers.

We believe that Yb:KGW and Yb:KYW are some of the best materials for high power thin disk lasers generating femtosecond pulses.

## Features

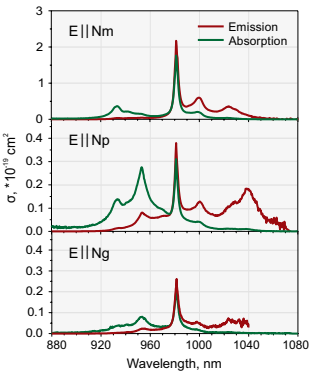
- High absorption coefficient at 981 nm
- High stimulated emission cross section
- Low laser threshold
- Extremely low quantum defect $\lambda_{pump} / \lambda_{se}$
- Broad polarized output at 1023–1060 nm
- High slope efficiency with diode pumping (~ 60%)
- High Yb doping concentration

## Custom manufacturing capabilities

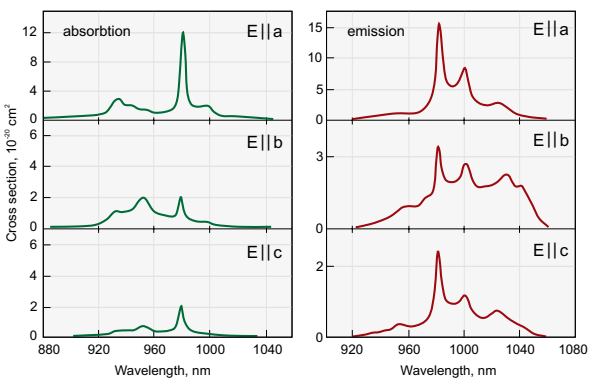
- Various shapes (slabs, rods, cubes, disks)
- Different dopant levels
- Diversified coatings
- Attractive prices for introductory quantities to OEMs

## Properties of Yb:KGW and Yb:KYW

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




Absorption and stimulated emission cross sections of Yb:KYW




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