Yb:KGW

DESCRIPTION

Yb^{3+}: $KGd(WO_4)_2$ (Yb:KGW) is one of the most promising laser active materials. Yb:KGW crystal is expected to replace Nd:YAG crystal and Yb:YAG crystal in high power diode pumped laser system. Yb:KGW also has great potential for high power, short pulse time femtosecond lasers and their wide application.

Yb^{3+}:KGW has large absorption coefficient, low quantum defect, high absorption and emission cross section.

The simple two-level electronic structure of the Yb ion avoids undesired loss processes such as upconversion, excited state absorption, and concentration quenching. Compared to the commonly used Nd:YAG crystal, Yb:KGW crystal has a much larger absorption bandwidth, 3 or 4 times longer emission lifetime in similar hosts with enhanced storage capacity, lower quantum defect and is more suitable for diode pumping than the traditional Nd-doped systems. The smaller Stokes shift reduces heating and increases the laser efficiency. In comparison with other Yb doped laser crystals such as Yb:YAG and Yb:YCOB crystals, Yb:KGW has a much higher (13-17 times) cross-section of absorption, lower quantum defect (~4%), a cross-section of emission that is 9 times higher than Yb: YCOB, and an emission band that is broader than Yb:YAG, a high nonlinear coefficient of refraction, and the highest slope efficiency (87%).

FEATURES

- The width of absorption line is wide, and the pump wavelength of LD pump source with phase matching can be obtained without strict temperature control
- The quantum defect is low, and the pump wavelength is very close to the laser output wavelength, which will lead to a large intrinsic laser slope efficiency, and the quantum efficiency is up to about 90% theoretically
- Because the pumped energy level is close to the upper laser level, the thermal load in the material without radiation relaxation is low, which is only one third of that of the same laser material doped with neodymium
- No excitation state absorption and upconversion, high light conversion efficiency
- Long fluorescence life, more than three times that of the same neodymium-doped laser material, is conducive to energy storage

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APPLICATIONS

- Femtosecond Yb:KGW laser applicated in nonlinear microscopy
- Yb:KGW Oscillators
- Regenerative Amplifiers

PARAMETERS

OPTICAL AND THERMAL PROPERTIES

Thermal conductivity	K_a=2.6 W/mK, K_b=3.8 W/mK, K_c=3.4 W/mK
Thermal optical coefficient @1064 nm	$dn_p/dT=-15.7 * 10^{-6}\ K^{-1}$
	$dn_m/dT=-11.8 * 10^{-6}\ K^{-1}$
	$dn_g/dT=-17.3 * 10^{-6}\ K^{-1}$
Thermal expansion	$\alpha_a=4X10^{-6}$ /°C
	$\alpha_b=3.6X10^{-6}$ /°C
	$\alpha_c=8.5X10^{-6}$ /°C
Melting temperature	1075 °C
Absorbtion cross section	$1.2X10^{-19}\ cm^2$
Stimulated emission cross section (E||a)	$2.6X10^{-20}\ cm^2$
Laser wavelength	1023-1060 nm
Lasing threshold	35 mW
Stark levels energy (in cm^{-1}) of the 2F5/2 manifolds of Yb^{3+} @ 77 K	10682, 10471, 10188
Stark levels energy (in cm^{-1}) of the 2F7/2 manifolds of Yb^{3+} @ 77K	535, 385, 163, 0
optical damage threshold, GW/cm^2	20

PHYSICAL AND CHEMICAL PROPERTIES

Chemical formula	potassium gadolinium tungastate
Crystal structure	monoclinic double tungstates
Density	7.27 g/cm^3
Transmission range	0.35-5.5 μm
Mohs hardness	4 to 5
Refractive indices at 1060 nm	n_g = 2.037, n_p = 1.986, n_m=2.033

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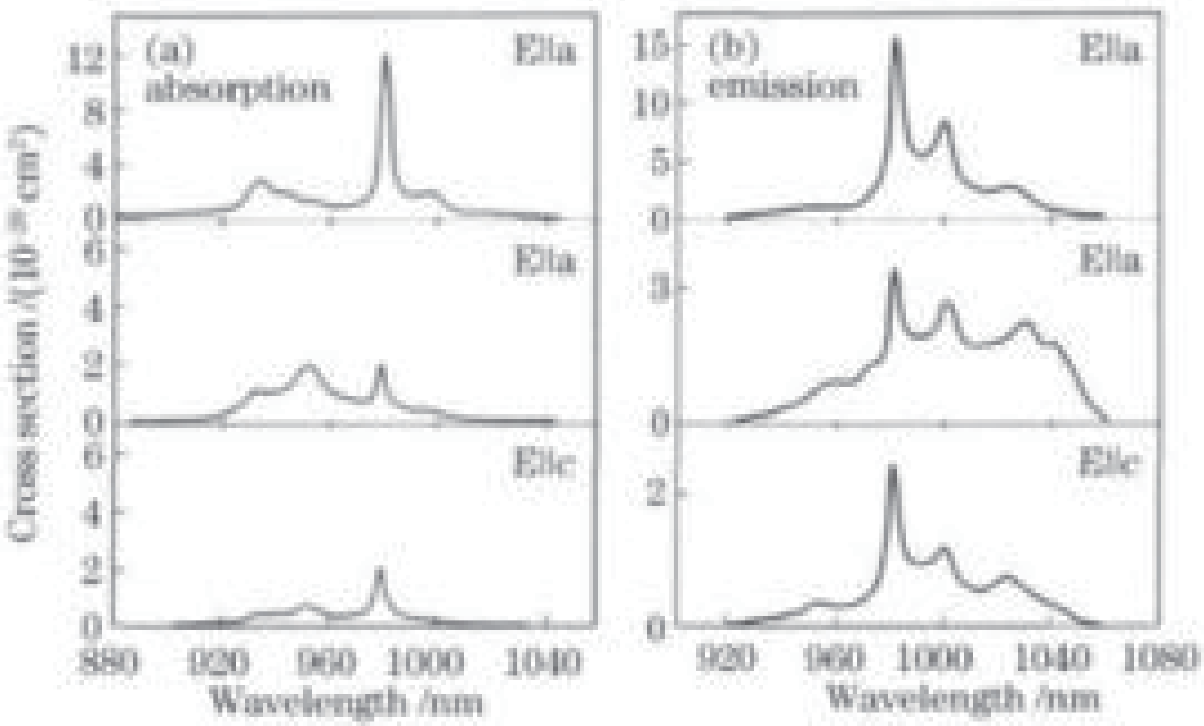
SPECTROSCOPIC PROPERTIES

Absorption peak wavelength, lpump, [nm]	981.2
Absorption linewidth, Dlpump, [nm]	3.7
Peak absorption cross-section, spump, [cm^2]	1.2×10^{-19}
Peak absorption coefficient, [cm^{-1}]	26
Emission wavelength, lse, [nm]	1023
Emission linewidth, Dlse, [nm]	20
Peak emission cross-section, sse, [cm^2]	2.8×10^{-20}
Quantum effect, lpump/lse, [nm]	0.959
Fluorescence lifetime, tem, [ms]	0.6

SPECTRA



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