YCOB

DESCRIPTION

Yttrium Calcium Oxide Borate, $YCa_4O(BO_3)_3$ (YCOB) crystal is a nonlinear crystal with nonlinear optical coefficients comparable to those of BBO and LBO crystals, with stable physical and chemical properties (no deliquescence) and good mechanical processing properties, and can be obtained in a short period by pulling method, which has become one of the most widely studied nonlinear optical crystals. YCOB crystals have become a research hotspot for frequency conversion devices because of their easy growth of large single crystals with high optical quality, wide transmission band, large phase matching range, high damage threshold, and no deliquescence. The biggest advantage of YCOB crystals is that they have excellent nonlinear optical absorption and can be prepared as large-diameter devices.

FEATURES

- High resistivity
- The anisotropy is small
- Small coefficient of thermal expansion
- High-temperature acceptability
- Less parameter luminescence
- The laser induced damage threshold is high

APPLICATIONS

- Piezoelectric acceleration sensor
- OPA (optical parametric amplification)
- OPO (optical parametric oscillator)
- OPCPA (Optical parametric chirp pulse amplification)
- SHG (second harmonic generation)
- THG (third harmonic generation)

PHYSICOCHEMICAL PROPERTIES

Crystal Structure	Monoclinic, Point Groupm
Lattice Constant	a=8.0770 Å, b=16.0194 Å , c=3.5308 Å , β=101.167º, Z=2
Melting Point	About1510ºC
Mohs Hardness	6~6.5
Density	3.31 g/cm^3
Thermal Conductivity	2.6 W/m/K (||X), 2.33 W/m/K (||Y), 3.1 W/m/K (||Z)

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EXPERIMENTAL VALUES OF EFFECTIVE SECOND-ORDER NONLINEAR OPTICAL EFFECTS IN YCOB CRYSTALS (SHG, TYPE I, 1.0642μm→0.5321μm)

Phase Matching Direction	deff [pm/V]
θ=90°, Φ=35.3° (XY plane)	0.39
θ=90°, Φ=35° (XY plane)	0.42
θ=31.7°, Φ=0° (XZ plane)	0.78
	1.03
θ=148.3°, Φ=0° (XZ plane)	1.36
	1.44
θ=65°, Φ=36.5°	1.14
θ=65.9°, Φ=36.5°	0.91
θ=66.3°, Φ=143.5°	1.45
θ=67°, Φ=143.5°	1.73
θ=66°, Φ=145°	1.8

In YCOB crystals, the properties of DEFF include reflectors and inversion symmetry. This means that the spatial distribution of DEFF can be completely described by selecting two independent quadrants, such as (0°<θ<90°, 0°<φ<90°) and (0°<θ<90°, 90°<φ< 80°). Thereafter, the DEFF value in each of the two quadrants in the (θ, φ) direction is equal to the DEFF value in the (180°-θ, 180°-φ) direction, and vice versa. For example, directions (θ=33°, φ=9°) and (θ=147°, φ=171°) have equal DEFF values.

EXPERIMENTAL VALUES OF SHG AND SFG INTERIOR ANGLE BANDWIDTHS OF YCOB PRINCIPAL PLANES

Interaction Wavelength	Φ_{pm} [deg]	θ_{pm} [deg]	$\Delta\varphi^{int}$[deg]	$\Delta\theta^{int}$[deg]
XY plane, θ =90◦				
SHG, o+o e				
1.0642 0.5321	35		0.09	
SHG, e+o e				
1.0642 0.5321	73.4		0.32	
SFG, o+o e				
1.0642+0.5321 0.3547	73.2		0.11	
YZ plane, φ =90◦				
SHG, e+o o				
1.0642 0.5321		58.7		0.74
SFG, e+e o				
1.0642+0.5321 0.3547		58.7		0.19
XZ plane, Φ=0◦,θ<vZ</v				
SHG, o+o e				
1.0642 0.5321		31.7		0.08

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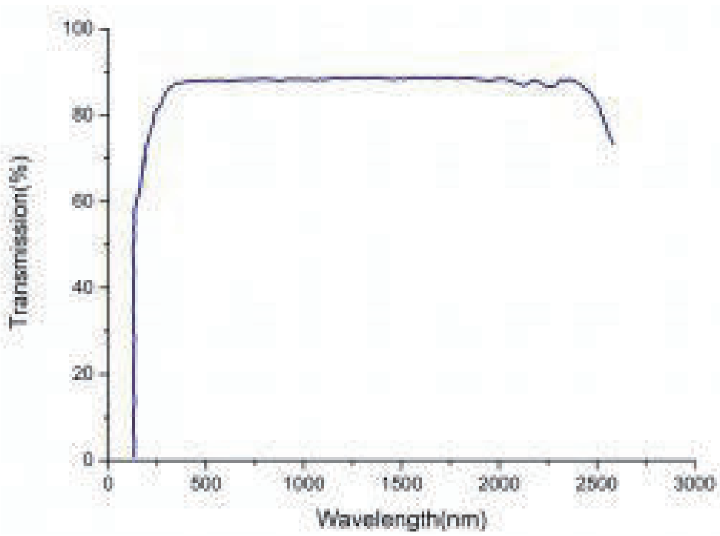
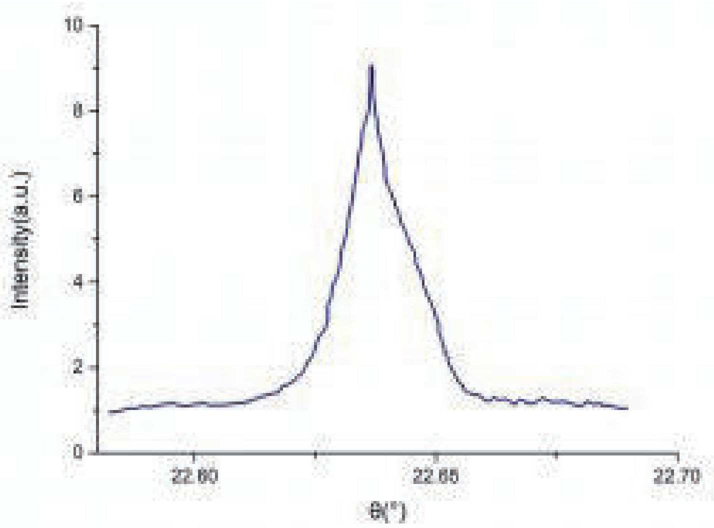
DESCRIPTION

Interaction Wavelength[μm]	Φexp[deg]
XY plane, θ=90°	
SHG, o+o → e	
1064 → 532	35
738 → 369	77.3
SHG, type Ⅰ, along Y	
724 → 362	90
SFG, o+o → e	
1064+532 → 355	75.2
SHG, type Ⅱ, along Y	
1030 → 515	90
SFG, e+o → e	
1908+1064 → 683	81.2

SPECTRA





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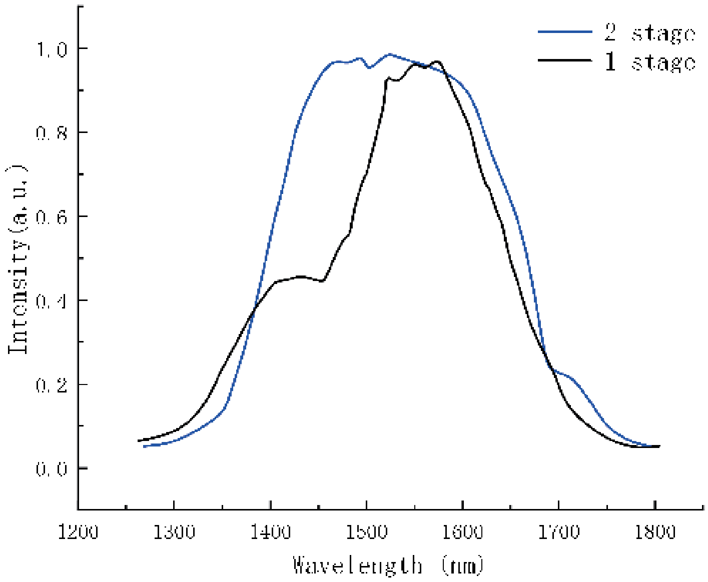
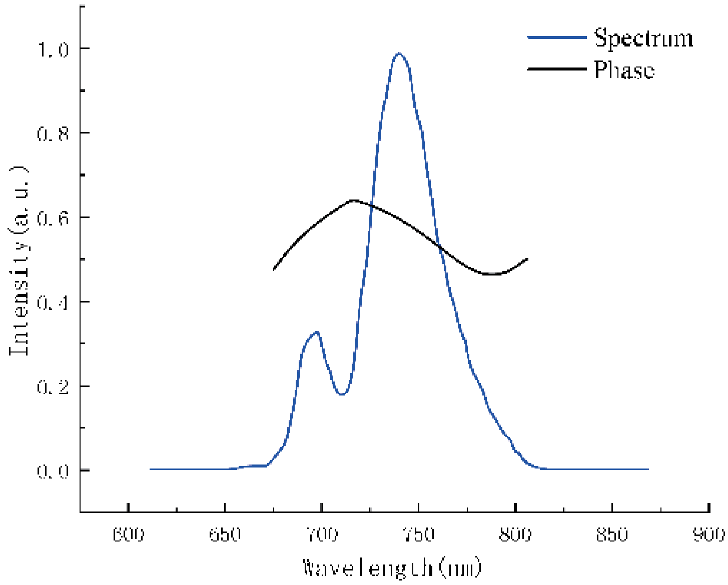
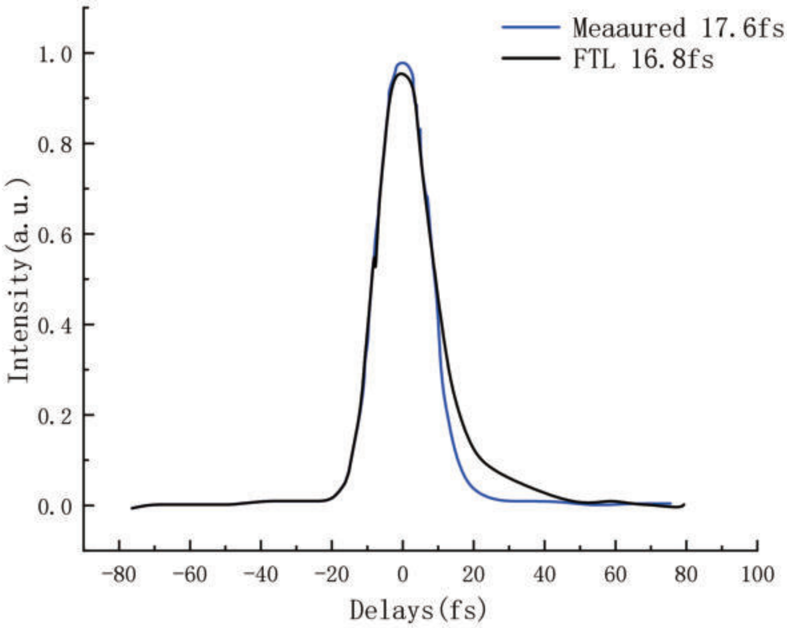
SPECTRA







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