

DESCRIPTION

ZnGeP₂ (Zinc germanium phosphide) crystal has many good properties and is an mid-IR nonlinear crystal. The nonlinear susceptibility of ZnGeP₂ (ZGP) crystal is approximately 160 times large ($d_{36} \sim 75$ pm/V) as KDP. ZGP shows good optical transparency over the 0.74–12 mm and relatively high laser damage threshold, and is therefore well suited for producing near infrared tunable laser. ZGP is a very hopeful material for mid-infrared devices such as SHG, SFG, OPO, and OPG/OPA.

FEATURES

- Nonlinear coefficient is large
- The region of transmission is from 0.74 μm to 12 μm
- High relative damage threshold
- High thermal conductivity
- The region of transparency is wide
- Phase matching over a broad spectral region

APPLICATIONS

- Producing coherent radiation in sub-millimeter-range from 70.0 μm to 1000 μm – terahertz range
- Combining frequencies of CO₂– and CO-lasers radiation or other lasers that working in the transparency region of ZGP
- SHG of CO-laser
- Second, third, and fourth harmonic generation of CO₂ laser
- OPO(Optical parametric generation) with pumping at wavelengths of 2.05-2.94 μm and possibility to generate effectively 3-10 μm ranges



PARAMETER

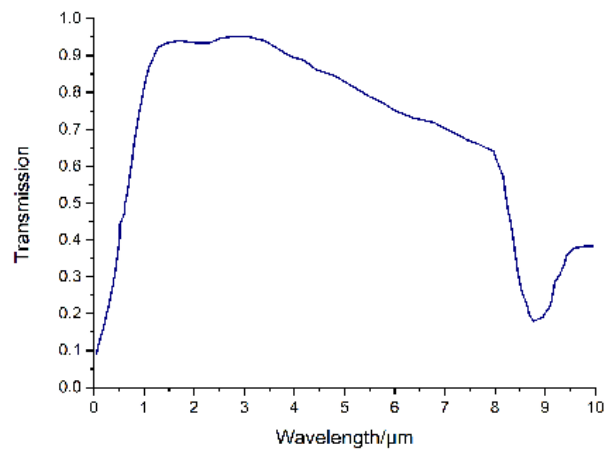
Chemical and Physical properties

Property	Value
Chemical Formula	ZnGeP ₂
Crystal Structure	Tetragonal, $\bar{4}2m$
Lattice Parameter	$a=b=5.467\text{\AA}$, $c=12.736\text{\AA}$
Mass Density	4.16 g/cm ³
Moh Hardness	5.5
Melting Point	About 1040°C
Thermal Conductivity	180 W/m/K
Thermal Expansion Coefficient	$\beta_{ }, 5 \times 10^{-6}/K$; $\beta_{\perp}, 7.8 \times 10^{-6}/K$
Birefringence	positive uniaxial

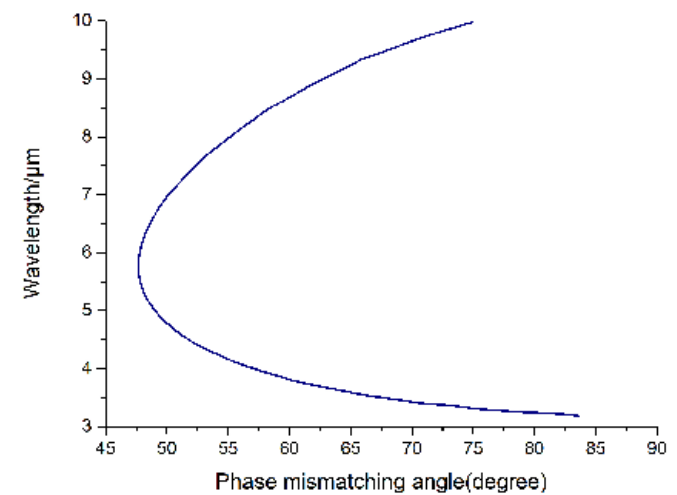
Nonlinear Optical Properties

Property	Value
SHG Phase Matchable Range	3177 - 10357nm (Type I)
	$d_{36}=75 \pm 8$ pm/V
NLO coefficients	Type I $d_{eoo}=d_{36} \sin 2\theta \cos 2\phi$
	Type II $d_{oee}=d_{eoo}=d_{36} \sin \theta \sin 2\phi$
Damage Threshold	
at 2.79 μm	30 GW/cm ² (150 ps)
at 10.6 μm	1 GW/cm ² (2 ns)

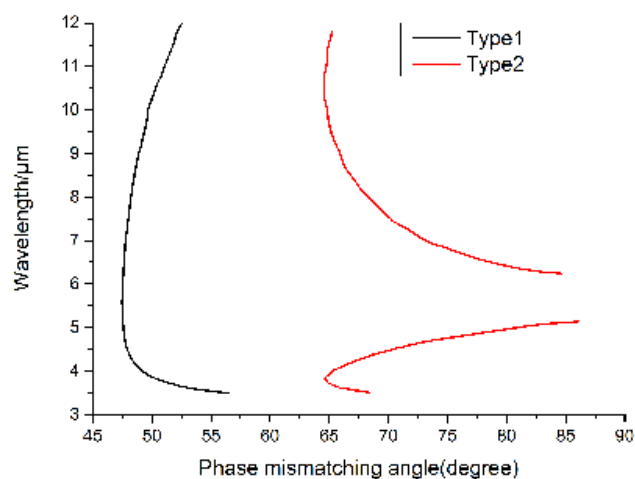
SPECTRA



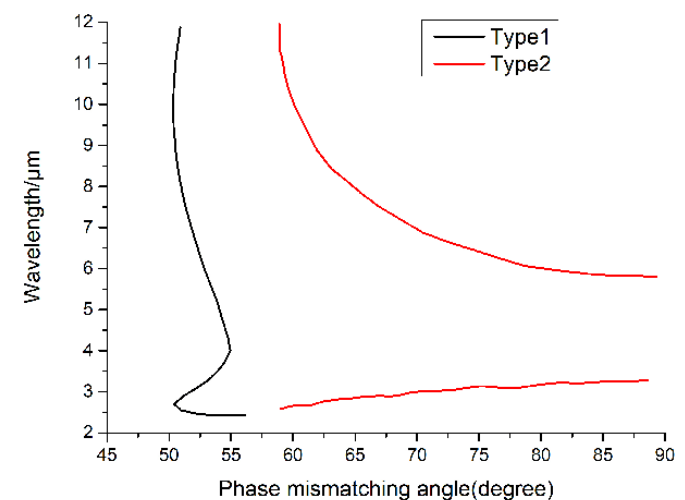
ZGP Transmission Spectrum



SHG curves of ZGP (Type I (eoo))



OPO tuning curves of ZGP with pump light of 2800 nm



OPO tuning curves of ZGP with pump light of 2090 nm

