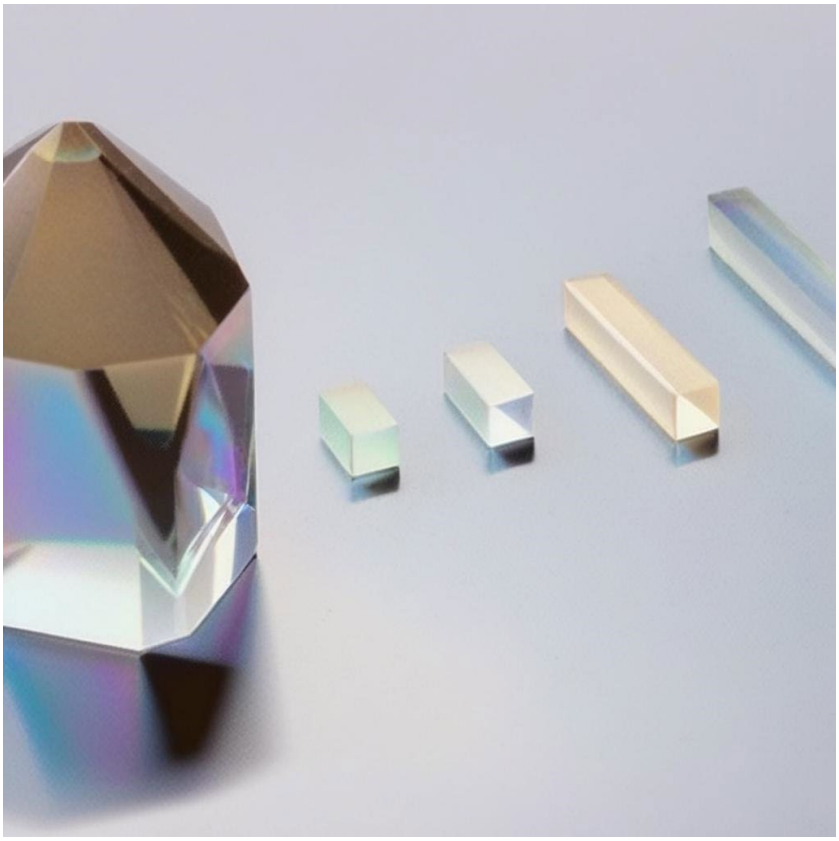
Photonics On Crystals

POC-OC-122424-AgGaS2 Crystal Datasheet

1. Main Features

1. **Wide Transparency Range**: Operates effectively between 0.5 µm and 13.2 µm, suitable for mid-infrared and far-infrared applications.
2. **High Nonlinear Optical Coefficients**: Supports SHG, OPO, and DFG processes with efficiency.
3. **Low Optical Absorption and Scattering**: Optimized for minimal energy loss during operation.
4. **High Damage Threshold**: Suitable for high-power lasers, with damage thresholds >10 MW/cm².
5. **Versatile Coatings Available**: Broadband AR coatings enhance performance in specific wavelength ranges.



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2. Material General Description

Silver Thiogallate ($AgGaS_2$) is a nonlinear optical crystal widely used in mid-infrared laser applications due to its broad transparency range of 0.5–13.2 µm. It exhibits high nonlinear optical coefficients and low optical absorption, making it ideal for frequency conversion processes such as second-harmonic generation (SHG), optical parametric oscillation (OPO), and difference frequency generation (DFG).

The crystal is particularly suited for CO_2 laser systems and Nd:YAG lasers, enabling mid-IR output in the range of 3–12 µm. Its high damage threshold and efficient thermal conductivity ensure stable operation in high-power and continuous-wave systems. $AgGaS_2$ is commonly used in laser spectroscopy, environmental sensing, and medical applications.

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3. General Applications and Examples

$AgGaS_2$ crystals are versatile and widely used in nonlinear optical applications. Below are some key examples:

1. Second-Harmonic Generation (SHG):

- Efficiently converts infrared wavelengths into shorter visible or near-infrared outputs.
- **Example**: Used in CO_2 lasers for generating 10.6 µm SHG light.

2. Optical Parametric Oscillators (OPO):

- Tunable output wavelengths in the 3–12 µm range for mid-IR laser systems.
- **Example**: $AgGaS_2$-based OPOs are applied in environmental gas sensing and spectroscopy.

3. Difference Frequency Generation (DFG):

- Combines two high-frequency inputs to produce mid-infrared wavelengths.
- **Example**: Ideal for generating mid-IR lasers used in industrial and scientific applications.

4. Tunable Laser Systems:

- Enables frequency mixing and wavelength tuning in Nd:YAG laser systems.
- **Example**: Used for high-precision spectroscopy and medical laser applications.

5. Infrared Spectroscopy:

- Provides mid-IR light sources for material characterization and biomedical research.
- **Example**: Used in advanced spectroscopy setups to identify chemical compositions.

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4. Chemical and Structural Properties

Property	**Value**
Chemical Formula	$AgGaS_2$
Crystal Structure	Tetragonal, 42m
Lattice Parameters	a = 5.742 Å, c = 10.26 Å
Density	4.7 g/cm³
Mohs Hardness	3.35
Melting Point	997 °C

Transparency Range	0.5 µm–13.2 µm
Nonlinear Coefficients	d_eff = 12.5 pm/V at 10.6 µm
Thermal Conductivity	1.4 W/m·K
Refractive Indices (10.6 µm)	n_o = 2.3471, n_e = 2.2916

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5. Optical and Nonlinear Optical Properties

Property	**Value**
Nonlinear Process	SHG, DFG, OPO
Refractive Indices	n_o = 2.3471, n_e = 2.2916 at 10.6 µm
Absorption Coefficient	<0.05 cm^{-1} at 1.064 µm; <0.02 cm^{-1} at 10.6 µm
Damage Threshold	>10 MW/cm^2 (150 ns pulses at 10.6 µm)
Sellmeier Equations	$n^2 = 5.79419 + 0.23116/(\lambda^2 - 0.06882) - 2.4534\lambda$
	$n^2 = 5.54120 + 0.22041/(\lambda^2 - 0.09824) - 2.5240\lambda$

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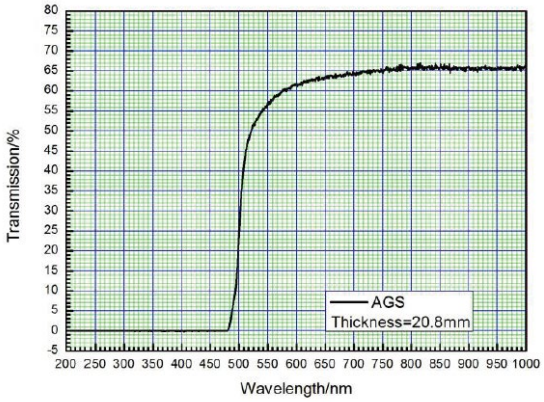
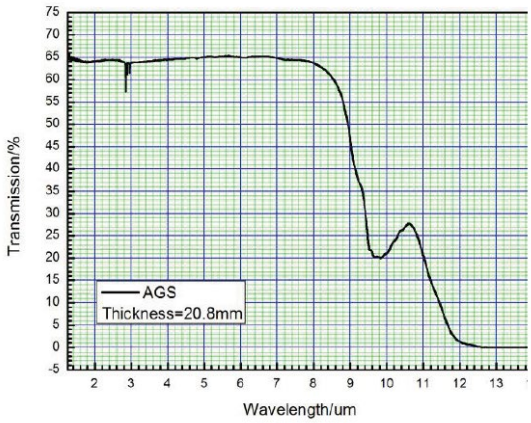
6. Spectrum Transmission Curves

The transmission curve of $AgGaS_2$ shows high transparency across its operating range of 0.5–13.2 µm. Key characteristics include:

- **Peak Transmission**: 0.6–12 µm.
- **Absorption Points**: Slightly reduced transmission at lower and higher wavelength boundaries.





(*Note*: Graphical representations can be provided upon request from POC's technical team.)

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7. Coating Specification

Coating Type	Specifications
Broadband AR Coating	BBAR at 1.2–2.6 µm and 2.6–11 µm
Custom Coatings	Available upon request

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8. Standard Fabrication Specifications

Specification	Value
Dimensions	5 × 5 × 1 mm (standard)
Surface Flatness	Lambda/6 @ 632.8 nm
Parallelism	< 30 arc seconds
Perpendicularity	< 10 arc minutes
Surface Quality	60-40 Scratch-Dig

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9. POC Strength and Capabilities

Photonics On Crystals (POC) is a global leader in the production and customization of nonlinear optical crystals. With cutting-edge facilities, POC offers:

- Tailored solutions for spectroscopy, industrial lasers, and medical applications.
- Expertise in optical coatings and precision machining.
- Comprehensive support and rapid prototyping capabilities.

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10. Standard Products

Product Code	Dimensions (mm)	Coating	Price (USD)
AGGS-01	5 × 5 × 1	BBAR @ 1.2–2.6 µm	Request Quote
AGGS-02	8 × 8 × 1	BBAR @ 2.6–11 µm	Request Quote
AGGS-03	10 × 10 × 2	Customizable	Request Quote
Custom-AGGS	Customizable	Customizable	Request Quote