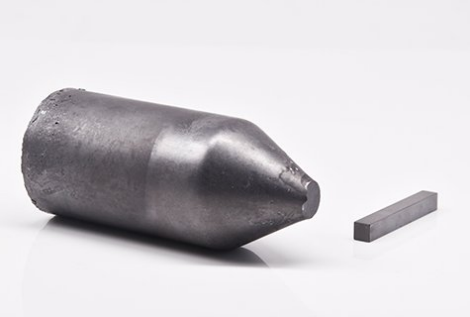
AGSe (AgGaSe2) Nonlinear Crystal for Mid-IR OPO and CO2 SHG, 0.73–18 µm

Model WQ-NLC-AGSE · waveqvanta.com/products/agse-aggase2-nonlinear-crystal

AGSe (silver gallium selenide, AgGaSe2) is a mid-infrared nonlinear crystal with band edges at 0.73 and 18 µm and a useful transmission range of 0.9–16 µm. Its broad phase-matching capability supports OPOs driven by several pump lasers: tuning over 2.5–12 µm has been obtained with a 2.05 µm Ho:YLF pump, and non-critical phase matching gives 1.9–5.5 µm output with 1.4–1.55 µm pumping. AGSe is also used for frequency doubling of CO2 lasers, and WaveQuanta supplies it with custom cuts and coatings.



Key features

- Transparency range 0.73–18 µm; useful transmission 0.9–16 µm
- Nonlinear coefficient d36 = 39.5 pm/V at 10.6 µm
- Absorption below 0.05 cm^{-1} at 1.064 µm and below 0.02 cm^{-1} at 10.6 µm
- Non-critical phase matching for 1.9–5.5 µm output with 1.4–1.55 µm pumping
- OPO tuning over 2.5–12 µm with a 2.05 µm Ho:YLF pump
- Flatness λ/8 @ 633 nm, parallelism better than 30 arc sec
- Standard apertures 5 × 5 mm and 8 × 8 mm, lengths 1–30 mm; custom sizes on request

Specifications

Chemical Formula	AgGaSe2
Crystal Structure	Tetragonal
Cell Parameters	a = 5.992 Å, c = 10.886 Å
Melting Point	851 °C
Density	5.700 g/cm^3
Mohs Hardness	3–3.5
Transparency Range	0.73–18.0 µm
Useful Transmission Range	0.9–16 µm
Refractive Indices (no / ne)	2.7010 / 2.6792 @ 1.064 µm; 2.6134 / 2.5808 @ 5.3 µm; 2.5912 / 2.5579 @ 10.6 µm
Thermo-Optic Coefficients	dno/dT = 15.0 $\times 10^{-5}$ /°C; dne/dT = 15.0 $\times 10^{-5}$ /°C
Absorption Coefficient	< 0.05 cm^{-1} @ 1.064 µm; < 0.02 cm^{-1} @ 10.6 µm
Nonlinear Coefficient @ 10.6 µm	d36 = 39.5 pm/V
Electro-Optic Coefficients	γ41(T) = 4.5 pm/V; γ63(T) = 3.9 pm/V
Relative Dielectric Constant @ 25 MHz	ε11(S) = 10.5; ε11(T) = 12.0
Damage Threshold @ ~10 ns, 1.064 µm	20–30 MW/cm^2 (surface)
Thermal Expansion Coefficient	∥c: -8.1×10^{-6} /°C; ⊥c: $+19.8 \times 10^{-6}$ /°C
Thermal Conductivity	1.0 W/(m·K)
Standard Cross Sections	5 × 5 mm, 8 × 8 mm
Length Range	1–30 mm
Dimension Tolerance	(W ±0.1 mm) × (H ±0.1 mm) × (L +1/−0.5 mm)

Clear Aperture	> 90% of central area
Flatness	λ/8 @ 633 nm (T ≥ 1 mm)
Surface Quality	30-20 scratch/dig before coating; 60-40 after coating
Parallelism	Better than 30 arc sec
Perpendicularity	10 arc min
Orientation Accuracy	< 30 arc sec

Dispersion (Sellmeier) equations

$no^2 = 4.6453 + 2.2057 / (1 - 0.1879/\lambda^2) + 1.8577 / (1 - 1600/\lambda^2)$
$ne^2 = 5.2912 + 1.3970 / (1 - 0.2845/\lambda^2) + 1.9282 / (1 - 1600/\lambda^2)$
λ in μm

Standard sizes

Size	Cut / orientation	Surface / coating	Mount
5 × 5 × 1 / 5 mm	θ = 51°, φ = 45°	S1: AR @ 1.7–2.6 μm; S2: AR @ 5–16 μm	—
5 × 5 × 1 mm	θ = 55°, φ = 0°	S1: AR @ 1.7–2.6 μm; S2: AR @ 5–16 μm	—
5 × 5 × 6 mm	θ = 51°, φ = 45°	S1: HT @ 1.4–4.5 μm; S2: uncoated	—
5 × 6 × 0.5 / 1 mm	θ = 45°, φ = 45°	AR/AR @ 1.7–2.8 + 6–14 μm	—
9.5 × 8 × 12 mm	θ = 49°, φ = 45°	AR/AR @ 1.7–2.8 + 6–14 μm	—
9.5 × 8 × 12 mm	θ = 55°, φ = 45°, Type I	AR/AR @ 1.7–2.8 + 6–14 μm	—
5 × 5 × 0.5 mm	θ = 45°, φ = 45°	Polished, uncoated	—
5 × 5 × 1 mm	θ = 53.3°, φ = 0°	Polished, uncoated	—
5 × 5 × 1 mm	θ = 65°, φ = 0°	Polished, uncoated	—
5 × 5 × 1.5 mm	θ = 52°, φ = 45°	Polished, uncoated	—
5 × 5 × 1.5 mm	θ = 58.8°, φ = 0°	Polished, uncoated	—
5 × 5 × 2 mm	θ = 53.1°, φ = 45°	Polished, uncoated	—
5 × 5 × 5 mm	θ = 51°, φ = 45°	Polished, uncoated	—
6 × 6 × 1.6 mm	θ = 41.9°, φ = 45°	Polished, uncoated	—
8 × 8 × 1.5 mm	θ = 53.1°, φ = 45°	Polished, uncoated	—
5 × 5 × 1.5 mm	θ = 45°, φ = 45°	Blank (unpolished)	—
5 × 5 × 1.9 / 7 mm	θ = 51°, φ = 45°	Blank (unpolished)	—
5 × 5 × 2 mm	θ = 53.1°, φ = 45°	Blank (unpolished)	—
5 × 5 × 6 mm	θ = 52°, φ = 0°	Blank (unpolished)	—
5 × 5 × 6.35 mm	θ = 51.2°, φ = 45°	Blank (unpolished)	—
5 × 5 × 8.5 mm	θ = 55°, φ = 0°	Blank (unpolished)	—
5 × 5 × 12 mm	θ = 47.1°, φ = 45°	Blank (unpolished)	—
8 × 8 × 12.7 mm	θ = 58°, φ = 45°	Blank (unpolished)	—

Typical applications

- Second harmonic generation of CO and CO2 lasers
- Mid-IR OPOs pumped at 1.4–1.55 μm or at 2.05 μm
- Difference-frequency generation into the mid- and long-wave infrared
- Sum- and difference-frequency mixing in the mid-IR