

Why is this material ideal for Mid-IR Optics?

- ✓ Wide transmission range (0.5 – 25 μ m)
- ✓ Low refractive index temperature co-efficient (dN/dT)
- ✓ Low dispersion
- ✓ Versatile glass composition and properties

In-Comparison with Ge, ZnSe & other IR materials

- ✓ Advantageous in resource utilization
- ✓ Lower manufacturing and processing costs
- ✓ Lower consumption of scarce resources Ge
- ✓ Lenses can be manufactured in batches using precision moulding technology than single point diamond turning for Ge, ZnSe and other IR materials

Precision Moulding Technology and Chalcogenide Glass

- ✓ Can make Glass into flat, spherical and aspherical optical lenses
- ✓ Has higher production efficiency
- ✓ Lower production costs
- ✓ Manufacturing of Chalcogenide glass lenses is done in batches.

Available Sizes

- ✓ Diameter/Dimension : 10 – 100mm
- ✓ Thickness : 2 – 30mm

Customization

- ✓ We can provide material with specifications other than available as per customer requirements.

WOE currently produce 5 Types of Infrared Chalcogenides

Grade	Glass Composition
WIRG02	Ge ₃₃ As ₁₂ Se ₅₅
WIRG03	Ge ₂₂ As ₂₀ Se ₅₈
WIRG04	Ge ₁₀ As ₄₀ Se ₅₀
WIRG05	Ge ₂₈ Sb ₁₂ Se ₆₀
WIRG06	As ₄₀ Se ₆₀
WIRG07	Ge ₃₀ Se ₁₃ As ₃₂ Te ₂₅



Features	
Composition (mol%)	Ge ₃₃ As ₁₂ Se ₅₅
Density (g/cm ³)	4.41
Thermal Expansion (10 ⁻⁶ /K)	12.1
Thermal Conductivity (W/(m.K))	0.24
Specific Heat (J/g.K)	0.33
Hardness/GPa	1.41
Bending Strength/MPa	19
Young's Modulus/GPa	21.5
Shear Modulus/GPa	8.90
Transition Temperature (°C)	368
Transmittance @ 10μm	68.2%
Dispersion @ 10μm	111

Wavelength (μm)	Refractive Index (@ 20°C)	Temperature Coefficient of Refractive Index -50~80(10 ⁻⁶ /K)
2	2.5297	72.6
3	2.5180	69.3
4	2.5133	68.2
5	2.5103	67.7
6	2.5078	67.4
7	2.5053	67.1
8	2.5027	67.0
9	2.4999	66.8
10	2.4967	66.6
11	2.4932	66.5
12	2.4892	66.3



Features

Composition (mol%)	$\text{Ge}_{22}\text{As}_{20}\text{Se}_{58}$
Density (g/cm^3)	4.40
Thermal Expansion ($10^{-6}/\text{K}$)	17
Thermal Conductivity ($\text{W}/(\text{m}\cdot\text{K})$)	0.28
Young's Modulus/GPa	17.89
Torsion Modulus/GPa	6.98
Transition Temperature ($^{\circ}\text{C}$)	282
Transmittance @ $10\mu\text{m}$	68%
Temperature Coefficient of Refractive Index @ $10.6\mu\text{m}/(10^{-6}\text{K}^{-1})$	55

Wavelength (μm)	Refractive Index (@ 20°C)
2	2.5276
3	2.5148
4	2.5120
5	2.51
6	2.5047
7	2.5024
8	2.4999
9	2.4973
10	2.4944
11	2.4911
12	2.4874



Features	
Composition (mol%)	Ge ₁₀ As ₄₀ Se ₅₀
Density (g/cm ³)	4.47
Thermal Expansion (10 ⁻⁶ /K)	20.4
Thermal Conductivity (W/(m.K))	0.18
Specific Heat (J/g.K)	0.3
Hardness/GPa	1.12
Bending Strength/MPa	18
Young's Modulus/GPa	20.5
Shear Modulus/GPa	8.5
Transition Temperature (°C)	225
Transmittance @ 10μm	66.4%
Dispersion @ 10μm	179

Wavelength (μm)	Refractive Index (@ 20°C)	Temperature Coefficient of Refractive Index -50~80(10 ⁻⁶ /K)
2	2.6412	31.5
3	2.6274	25.6
4	2.6221	22.9
5	2.6192	21.5
6	2.6170	20.96
7	2.6150	20.1
8	2.6131	19.8
9	2.6111	19.5
10	2.6089	19.3
11	2.6066	19.2
12	2.6040	19.0



Features	
Composition (mol%)	Ge ₂₈ As ₁₂ Se ₆₀
Density (g/cm ³)	4.66
Thermal Expansion (10 ⁻⁶ /K)	14.0
Thermal Conductivity (W/(m.K))	0.25
Specific Heat (J/g.K)	0.33
Hardness/GPa	1.13
Bending Strength/MPa	18
Young's Modulus/GPa	22.1
Shear Modulus/GPa	8.5
Transition Temperature (°C)	285
Transmittance @ 10μm	66.5%
Dispersion @ 10μm	108

Wavelength (μm)	Refractive Index (@ 20°C)	Temperature Coefficient of Refractive Index -50~80(10 ⁻⁶ /K)
2	2.6433	71.4
3	2.6287	67.2
4	2.6228	64.4
5	2.6192	62.6
6	2.6163	61.4
7	2.6134	60.5
8	2.6105	59.9
9	2.6073	59.4
10	2.6038	59
11	2.5998	58.7
12	2.5955	58.4



Features	
Composition (mol%)	As ₄₀ Se ₆₀
Density (g/cm ³)	4.63
Thermal Expansion (10 ⁻⁶ /K)	20.7
Thermal Conductivity (W/(m.K))	0.24
Specific Heat (J/g.K)	0.36
Hardness/GPa	1.04
Bending Strength/MPa	17
Young's Modulus/GPa	18.3
Shear Modulus/GPa	8.0
Transition Temperature (°C)	185
Transmittance @ 10μm	63.4%
Dispersion @ 10μm	159

Wavelength (μm)	Refractive Index (@ 20°C)	Temperature Coefficient of Refractive Index -50~80(10 ⁻⁶ /K)
2	2.8198	41.8
3	2.8016	36.2
4	2.7947	34.3
5	2.7909	33.0
6	2.7880	33.5
7	2.7855	32.7
8	2.7830	32.4
9	2.7805	32.3
10	2.7778	32.2
11	2.7749	32.1
12	2.7717	32.0



Features	
Composition (mol%)	Ge ₃₀ Se ₁₃ As ₃₂ Te ₂₅
Density (g/cm ³)	4.84
Thermal Expansion (10 ⁻⁶ /K)	13.4
Thermal Conductivity (W/(m.K))	0.22
Specific Heat (J/g.K)	0.32
Hardness/GPa	1.36
Bending Strength/MPa	18
Young's Modulus/GPa	22
Shear Modulus/GPa	7.9
Transition Temperature (°C)	275
Transmittance @ 10μm	63.1%
Dispersion @ 10μm	164

Wavelength (μm)	Refractive Index (@ 20°C)	Temperature Coefficient of Refractive Index -50~80(10 ⁻⁶ /K)
2	2.8322	110.8
3	2.8111	105.9
4	2.8034	104.5
5	2.7993	103.8
6	2.7965	103.4
7	2.7941	103.2
8	2.7918	103.0
9	2.7894	102.8
10	2.7869	102.6
11	2.7842	102.5
12	2.7811	102.3

