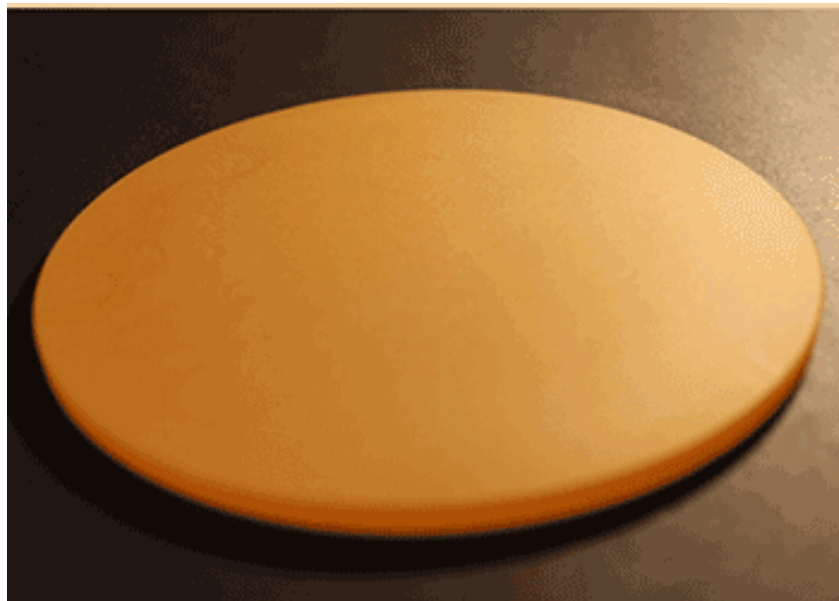


ZnS lenses

ZnS or Zinc Sulphide crystals grown by chemical vapor desposition (or CVD) exhibits exceptional fracture strength and hardness leading to its frequent choice for military applications or other harsh environments. This material is often used in the LWIR 7 to 14 microns region of thermal imaging. Its high resistance to rain erosion and high-speed dust and particulate abrasion makes it particularly suitable for exterior IR windows on aircraft frames.

Hangzhou Shalom EO provides the **ZnS lenses** of IR grade and Cleartran or multi-spectrum grade materials, the AR/AR coating is made to increase the transmission of the lenses.

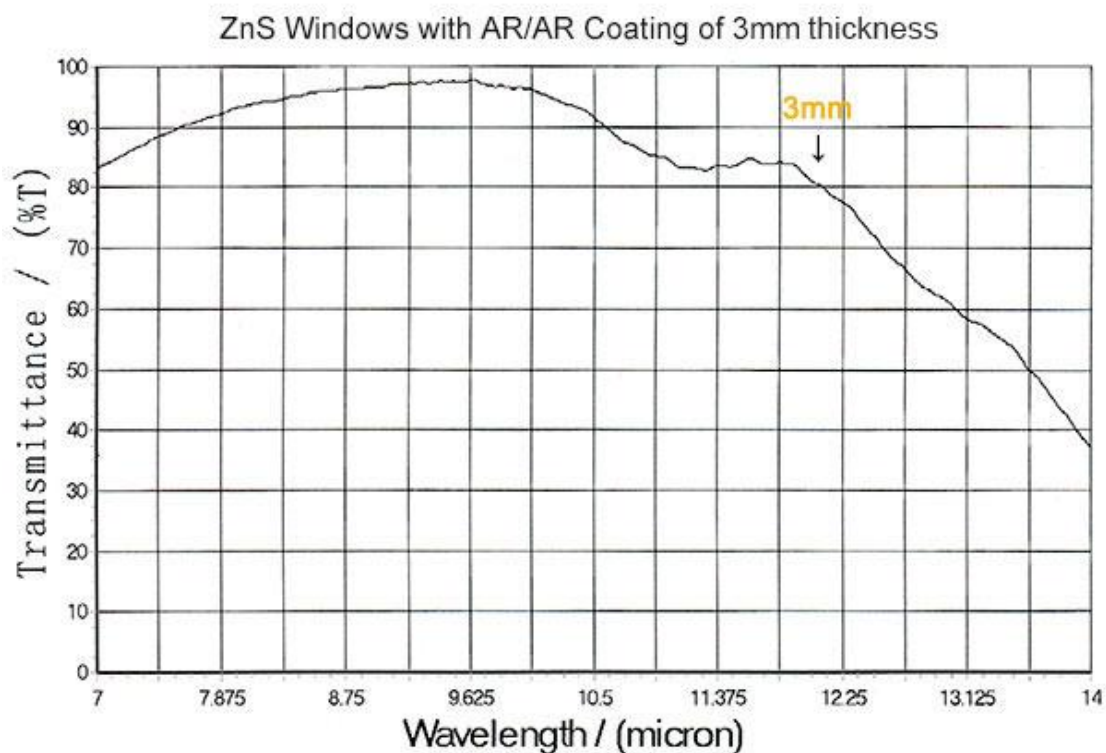


SPECIFICATIONS

| Specifications | |
|------------------------|-------------------------------------|
| Materials | CVD or Cleartran grade ZnS crystals |
| Diameter range | ~200mm |
| Diameter Tolerance | +0.0/-0.2mm |
| Thickness Tolerance | +/-0.2mm |
| Surface Quality | 60/40 S/D |
| Frings (N) | 3 |
| Irregularity (delta N) | 1 |
| Centration | 3' |
| Chamfer | 0.1-0.3mmx45 degree |
| Coatings | AR/AR@7-14micro |

Note: the domes of other specifications is available upon customer's request.

Transmission of AR coated CVD ZnS substrates at 7-14 micro



Basic Properties

| Physical and optical properties | |
|---------------------------------|---|
| Transmission Range : | 0.37 to 13.5 μm |
| Refractive Index : | 2.20084 at 10 μm |
| Reflection Loss : | 24.7% at 10 μm (2 surfaces) |
| Absorption Coefficient : | 0.0006 cm^{-1} at 3.8 μm |
| Reststrahlen Peak : | 30.5 μm |
| dn/dT : | $+38.7 \times 10^{-6} / ^\circ\text{C}$ at 3.39 μm |
| $dn/d\mu = 0$: | n/a |
| Density : | 4.09 g/cc |
| Melting Point : | 1827 $^\circ\text{C}$ (See notes below) |
| Thermal Conductivity : | 27.2 W m $^{-1}$ K $^{-1}$ at 298K |
| Thermal Expansion : | $6.5 \times 10^{-6} / ^\circ\text{C}$ at 273K |
| Hardness : | Knoop 160 with 50g indenter |
| Specific Heat Capacity : | 515 J Kg $^{-1}$ K $^{-1}$ |
| Dielectric Constant : | 88 |
| Youngs Modulus (E) : | 74.5 GPa |
| Shear Modulus (G) : | n/a |
| Bulk Modulus (K) : | n/a |
| Elastic Coefficients : | Not Available |
| Apparent Elastic Limit : | 68.9 MPa (10,000 psi) |
| Poisson Ratio : | 0.28 |
| Solubility : | 65×10^{-6} g/100g water |
| Molecular Weight : | 97.43 |
| Class/Structure : | HIP polycrystalline cubic, ZnS, F42m |