

Zinc Sulphide FLIR (ZnS)

MATERIALS DATA

Zinc Sulphide is produced by synthesis from Zinc vapour and H₂S gas, forming as sheets on a graphite substrate. Zinc Sulphide is microcrystalline in structure, the grain size being controlled to produce maximum strength. Forward Looking Infra-Red (FLIR) grade, which is pale yellow and translucent in the visible, is used as deposited without further treatment. It is stronger than multispectral grade. Single crystal ZnS is available, but is not common.

APPLICATIONS: ZnS FLIR is used for IR windows and lenses in the thermal band (8 to 14µm) as a tough front optic in thermal imaging systems, particularly those subjected to harsh environments.

| | |
|------------------------|--|
| Transmission Range | 1.0 to 13µm |
| Refractive Index | 2.192 at 10.6µm |
| Reflection Loss | 24.6% at 10.6µm (2 surfaces) |
| Absorption Coefficient | 0.02 cm ⁻¹ at 3.8µm |
| Reststrahlen Peak | 30.5µm |
| dn/dT | +43 x 10 ⁻⁶ K ⁻¹ at 3.39µm |
| dn/dµ = 0 | n/a |
| Density | 4.08 g/cc |
| Melting Point | 1827°C *See notes below |
| Thermal Conductivity | 16.7 W m ⁻¹ K ⁻¹ at 296K |
| Thermal Expansion | 6.6 x 10 ⁻⁶ K ⁻¹ at 273K |
| Hardness | Knoop 160 with 50g indenter |
| Specific Heat Capacity | 469 J Kg ⁻¹ K ⁻¹ |
| Dielectric Constant | n/a |
| Youngs Modulus (E) | 74.5 GPa |
| Shear Modulus (G) | n/a |
| Bulk Modulus (K) | n/a |
| Elastic Coefficients | Not Available |
| Apparent Elastic Limit | 103.4 MPa (15,000 psi) |
| Poisson Ratio | 0.29 |
| Solubility | 65 x 10 ⁻⁶ g/100g water |
| Molecular Weight | 97.43 |
| Class/Structure | Polycrystalline cubic, ZnS, F43m |

** Zinc Sulphide oxidises significantly at 300°C, exhibits plastic deformation at about 500°C and dissociates about 700°C. For safety, Zinc Sulphide windows should not be used above 250°C in normal atmosphere.*



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| μm | No | μm | No | μm | No |
|---------------|-------|---------------|-------|---------------|-------|
| 0.42 | 2.516 | 0.46 | 2.458 | 0.50 | 2.419 |
| 0.54 | 2.391 | 0.58 | 2.371 | 0.62 | 2.355 |
| 0.66 | 2.342 | 0.70 | 2.332 | 0.74 | 2.323 |
| 0.78 | 2.316 | 0.82 | 2.31 | 0.86 | 2.305 |
| 0.90 | 2.301 | 0.94 | 2.297 | 0.98 | 2.294 |
| 1.00 | 2.292 | 1.40 | 2.275 | 1.80 | 2.267 |
| 2.20 | 2.263 | 2.60 | 2.26 | 3.00 | 2.257 |
| 3.40 | 2.255 | 3.80 | 2.253 | 4.20 | 2.251 |
| 4.60 | 2.248 | 5.00 | 2.246 | 5.40 | 2.244 |
| 5.80 | 2.241 | 6.20 | 2.238 | 6.60 | 2.235 |
| 7.00 | 2.232 | 7.40 | 2.228 | 7.80 | 2.225 |
| 8.20 | 2.221 | 8.60 | 2.217 | 9.00 | 2.212 |
| 9.40 | 2.208 | 9.80 | 2.203 | 10.2 | 2.198 |
| 10.6 | 2.192 | 11.0 | 2.186 | 11.4 | 2.18 |
| 11.8 | 2.173 | 12.2 | 2.167 | 12.6 | 2.159 |
| 13.0 | 2.152 | 13.4 | 2.143 | 13.8 | 2.135 |
| 14.2 | 2.126 | 14.6 | 2.116 | 15.0 | 2.106 |
| 15.4 | 2.095 | 15.8 | 2.084 | 16.2 | 2.072 |
| 16.6 | 2.059 | 17.0 | 2.045 | 17.4 | 2.03 |
| 17.8 | 2.015 | 18.2 | 1.998 | | |

