

# CVD-ZnS (Zinc Sulphide)

Zinc Sulphide is produced by synthesis from zinc vapour and H<sub>2</sub>S gas (chemical vapor desposition (CVD) process), forming as sheets on graphite substrates.

CVD-ZnS exhibits exceptional fracture strength, hardness and chemical inactivity leading to its frequent choice for military applications or other harsh environments.

Tydex produces optical componenst from both CVD-ZnS grades - IR grade (IR-ZnS) and multicspectral (water-clear) grade (MS-ZnS).

IR-ZnS is often used in the 8 to 12 microns region. Its high resistance to rain erosion and high-speed dust and particulate abrasion makes it particularly suitable for exterior IR windows for varios demanding applications.

MS-ZnS is treated by a hot isostatic press (HIP) process. Under intense heat and pressure, defects within the crystalline lattice are virtually eliminated, leaving a water-clear material with minimal scatter and high transmission characteristics from 0.4 to 12 microns.

## Physical and Chemical Properties of ZnS

Parameter	IR-ZnS	MS-ZnS	
Density @ 300 K, g/cm <sup>3</sup>	4.09		
Melting point, K	1830		
Thermal Conductivity @ 298 K, J/(K x m x s)	19.0	27.2	
Heat Capacity @ 298 K, J/ (g x K)	0.112	0.124	
Thermal Expansion Coefficient, 1/K @ 298 K	7.85		
Hardness (Knoop, indentor 50 g), kg/mm <sup>2</sup>	200-230	160	
Youngs Modulus (E), GPa	74.5		
Poisson's Ratio	0.29	0.28	
Modulus of Rupture, MPa	@ 298 K	103.4	68.9
	@ 933 K	160	160
Solubility	insoluble in water		

## Optical Properties

Thermo-optic Coefficient, (dn/dT)@298 K, 1/K	@0.633 μm	6.4×10 <sup>-5</sup>	5.4×10 <sup>-5</sup>
	@1.15 μm	4.2×10 <sup>-5</sup>	5.0×10 <sup>-5</sup>
	@3.39 μm	4.6×10 <sup>-5</sup>	4.6×10 <sup>-5</sup>
	@10.6 μm	6.6×10 <sup>-5</sup>	4.6×10 <sup>-5</sup>
Reflection loss @ 10.6 μm (2 surfaces), %	24.7		
Index of Reflection Homogeneity (dn/n)@0.633 μm	5.0×10 <sup>-5</sup>		

## Refractive Index

λ, μm	n	
	IR-ZnS	MS-ZnS
0.5	2.4190	2.4130
0.5461	2.3910	2.3884
0.7	2.3320	2.3310
1.0	2.2920	2.29160
3.0	2.2570	2.2577
4.0	2.2520	2.2523
5.0	2.2460	2.2466
8.0	2.2233	2.2233
9.0	2.2120	2.2129
10.0	2.2005	2.2008
11.8	2.1730	2.1730
12.0	2.1710	2.1710
13.0	2.1525	2.1525

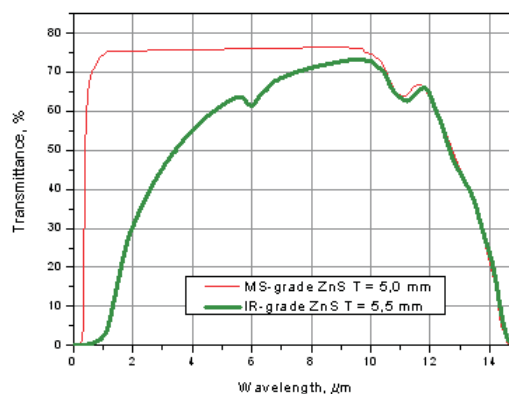


Fig. 1. Transmission spectra of CVD - ZnS windows of both grades. Thicknesses are specified in mm.

Tydex offers optics from CVD-ZnS with the following limations in overall dimentions:

- diameters: 2-200mm;
- maximal thickness: 12mm (for meniscus shapes should be discussed additionally)

Please pay attention that this article is only for your information. We do not supply CVD-ZnS in blanks or as raw material. Our standard products are finished (polished, coated) parts.

Please link the following chapter to get more detailed information about ZnS optics: ZnS optics.



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