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Zinc Selenide (ZnSe)

Zinc Selenide (ZnSe) is a popular material in infrared applications. Very wide transmission spectrum, covering the range from 0.6 µm to 22 µm and the high quality of material obtained by CVD (Chemical Vapour Deposition), make it useful for the production of optical elements (windows, lenses, mirrors) for infrared applications (thermal imaging, FLIR, medical systems, high power IR lasers). Zinc Selenide is produced by synthesis from **Zinc vapou**r and **H_2Se** gas, forming as sheets on Graphite susceptors. Zinc Selenide is microcrystalline in structure, the grain size being controlled to produce maximum strength. Single crystal ZnSe is available, but is not common but has been reported as having lower absorption and thus more effective for CO_2 optics. This chemically vapour deposited material has wide usage in high power CO_2 laser systems because of its low absorption coefficient and high resistance to thermal shock.

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

Zinc Selenide (ZnSe) is a **relatively soft** material that scratches easily and it is not recommended in harsh environments because its Knoop Hardness is only 120. When handling, apply uniform pressure and wear Latex finger cots or gloves to prevent contamination.

Properties of Zinc Selenide:

Parameter	Value
Transmission Range :	0.6 to 21.0 µm
Refractive Index :	2.4028 at 10.6 µm
Reflection Loss :	29.1% at 10.6 µm (2 surfaces)
Absorption Coefficient :	0.0005 cm^{-1} at 10.6 µm
Reststrahlen Peak :	45.7 µm
dn/dT :	+61 x 10^{-6}/°C at 10.6 µm at 298K
dn/dµ = 0 :	5.5 µm
Density :	5.27 g/cc
Melting Point :	1525°C
Thermal Conductivity :	18 W m^{-1} K^{-1} at 298K
Thermal Expansion :	7.1 x 10^{-6} /°C at 273K
Hardness :	Knoop 120 with 50g indenter
Specific Heat Capacity :	339 J Kg^{-1} K^{-1}
Dielectric Constant :	n/a
Youngs Modulus (E) :	67.2 GPa

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Shear Modulus (G) :	n/a
Bulk Modulus (K) :	40 GPa
Elastic Coefficients :	Not Available
Apparent Elastic Limit :	55.1 MPa (8000 psi)
Poisson Ratio :	0.28
Solubility :	0.001g/100g water
Molecular Weight :	144.33
Class/Structure :	HIP polycrystalline cubic, ZnS, F43m

Refractive Index:
No = Ordinary Ray

µm	No	µm	No	µm	No	µm	No	µm	No	µm	No
0.54	2.6754	0.58	2.6312	0.62	2.5994	8.2	2.4163	8.6	2.4143	9.0	2.4122
0.66	2.5755	0.7	2.5568	0.74	2.5418	9.4	2.4100	9.8	2.4077	10.2	2.4053
0.78	2.5295	0.82	2.5193	0.86	2.5107	10.6	2.4028	11.0	2.4001	11.4	2.3974
0.90	2.5034	0.94	2.4971	0.98	2.4916	11.8	2.3945	12.2	2.3915	12.6	2.3883
1.0	2.4892	1.4	2.4609	1.8	2.4496	13.0	2.3850	13.4	2.3816	13.8	2.3781
2.2	2.4437	2.6	2.4401	3.0	2.4376	14.2	2.3744	14.6	2.3705	15.0	2.3665
3.4	2.4356	3.8	2.4339	4.2	2.4324	15.4	2.3623	15.8	2.3579	16.2	2.3534
4.6	2.4309	5.0	2.4295	5.4	2.4281	16.6	2.3487	17.0	2.3438	17.4	2.3387
5.8	2.4266	6.2	2.4251	6.6	2.4235	17.8	2.3333	18.2	2.3278		
7.0	2.4218	7.4	2.4201	7.8	2.4183						

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Notes

Special care should be taken when handling Zinc Selenide as it is a toxic material. Always wear rubber or plastic gloves to avoid risk of contamination.