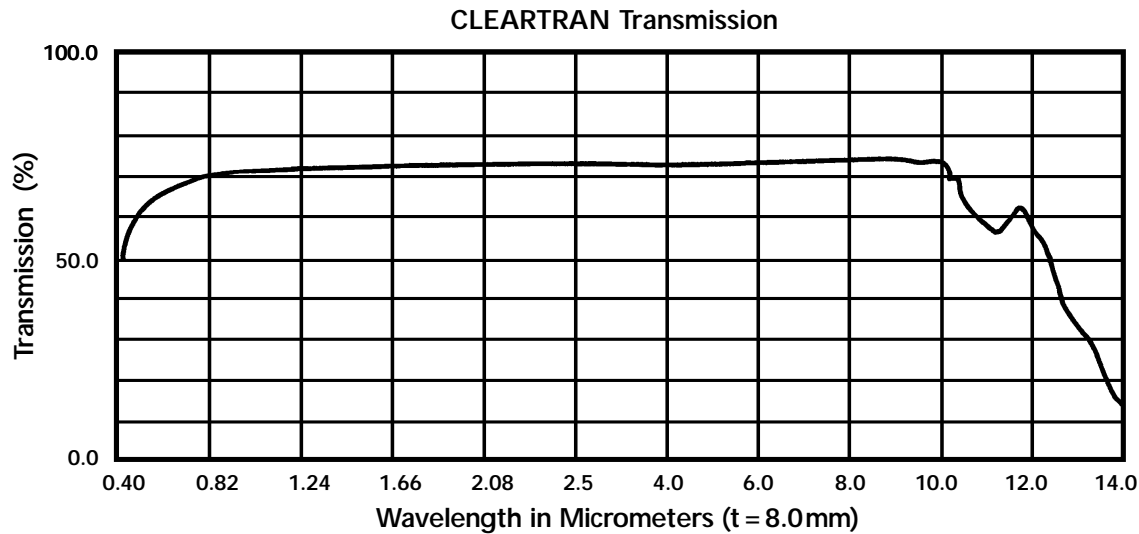


**CLEARTRAN®**



**Application**

Advanced Materials' CLEARTRAN (water clear zinc sulfide) is a form of CVD ZINC SULFIDE® that is modified by a post-deposition hot isostatic process. This process removes zinc hydrides from the crystal lattice, normalizes crystal structure and purifies the material, all contributing to single crystal like transmittance in the visible through far infrared ranges (0.35-14μm).

CLEARTRAN, with its low absorption and scatter throughout its broad transmitting range and high optical quality, is particularly well-suited for multi-spectral applications that require a single aperture for beam path for several wavebands. For example, CLEARTRAN is the material of choice for systems (such as tank windows) that have a visible camera, mid-and long-wave detectors and laser rangefinders to designate targets. Additionally, CLEARTRAN has been supplied as external windows for military systems and as thick apertures for specialized sensor applications.

CLEARTRAN is chemically inert, non-hygroscopic, highly pure, theoretically dense and easily machined.

Custom diameters, rectangles, CNC-profiled blanks, generated lens blanks, prisms and near-net shape domes can be made to your specifications. Sheet material is also available.

Advanced Materials' CLEARTRAN is also available as an evaporative source material. It is supplied in specified lump sizes (2-20mm) which to minimize surface contamination are hand selected to be free from saw cut, abraded or polished edges.

**Optical Properties**

10% transmission limits (t=6mm)	0.37 - 14 μm
Index of refraction inhomogeneity (Δn/n) (ppm @ 0.6328 μm)	<20
Thermo-optic coefficient, dn/dT(298-358K) (avg. values)	
(K <sup>-1</sup> @ 0.6328 μm)	5.43 x 10 <sup>-5</sup>
(K <sup>-1</sup> @ 1.15 μm)	4.21 x 10 <sup>-5</sup>
(K <sup>-1</sup> @ 3.39 μm)	3.87 x 10 <sup>-5</sup>
Bulk absorption coefficient	
(cm <sup>-1</sup> @ 1.3 μm)	6.0 x 10 <sup>-4</sup>
(cm <sup>-1</sup> @ 2.7 μm)	1.0 x 10 <sup>-3</sup>
(cm <sup>-1</sup> @ 3.8 μm)	6.0 x 10 <sup>-4</sup>
(cm <sup>-1</sup> @ 9.27 μm)	6.0 x 10 <sup>-3</sup>
(cm <sup>-1</sup> @ 10.6 μm)	2.0 x 10 <sup>-1</sup>
Forward Scatter (@ 0.6328 μm)	≤ 7% cm <sup>-1</sup>

**Physical Properties**

Crystal structure	cubic
Grain size (diameter)	20 - 35μm
Density (g cm <sup>-3</sup> @ 298 K)	4.09
Resistivity (Ωcm)	>10 <sup>13</sup>
Chemical purity (%)	99.9996
For dielectric constant data, please request the Dielectric Properties bulletin.	



## Mechanical Properties

Hardness:	Knoop, 50 gm load (kg mm <sup>-2</sup> )	160
	Vickers, 1kg load (kg mm <sup>-2</sup> )	150
Flexural Strength (modulus of rupture)	4 pt. loading (psi)	10 x 10 <sup>3</sup>
	4 pt. loading (MPa)	60
	Disc Bursting (MPa)	50
	Fracture toughness (critical stress intensity factor, K <sub>1c</sub> values) (MPa√m, Vickers, 1 Kg)	1.0
Young's modulus (elastic modulus)	(psi)	10.8 x 10 <sup>6</sup>
	(GPa)	74.5
	Poisson's ratio	0.28
Rain erosion resistance will depend on the environment		

## Pulse Laser Damage

Pulse Laser Damage @ 10.6 μm, pulse width 15 μs

Angle of Incidence	Conditions		Results	
	Fluence (Jcm <sup>-2</sup> )	Pulses (20Hz)	Plasma At Surface	Surface Damage
Normal	20	5	no	no damage
Brewster	20	20	no	no damage
Brewster	25	5	no	no damage
Brewster	25	10	no	rear surface damage
Brewster	25	20	yes	surface crazed

## Thermal Properties

Coefficient of Thermal Expansion	(K <sup>-1</sup> @ 273 K)	6.3 x 10 <sup>-6</sup>
	(K <sup>-1</sup> @ 373 K)	7.0 x 10 <sup>-6</sup>
	(K <sup>-1</sup> @ 473 K)	7.5 x 10 <sup>-6</sup>
	(K <sup>-1</sup> @ 208-573 K)	6.5 x 10 <sup>-6</sup>
Thermal conductivity	(JK <sup>-1</sup> m <sup>-1</sup> s <sup>-1</sup> @ 298 K)	27.2
	Heat capacity	(Jg <sup>-1</sup> K <sup>-1</sup> @ 273K)
	(Jg <sup>-1</sup> K <sup>-1</sup> @ 323 K)	0.527
	(Jg <sup>-1</sup> K <sup>-1</sup> @ 373 K)	0.527
Thermal Diffusivity (m <sup>2</sup> s <sup>-1</sup> )		1.3 x 10 <sup>-5</sup>
Maximum operating temperature will depend on the environment.		

## Indices of Refraction (n) of CLEARTRAN ZnS

as a function of wavelength at room temperature (20°C)

Wavelength (μm)	n	Wavelength (μm)	n
0.4047	2.54515	1.1287	2.28485
0.4358	2.48918	1.5296	2.27191
0.4678	2.44915	2.0581	2.26442
0.4800	2.43691	3.000	2.25772
0.5086	2.41279	3.500	2.25498
0.5461	2.38838	4.000	2.25231
0.5876	2.36789	4.500	2.24955
0.6438	2.34731	5.000	2.24661
0.6678	2.34033	8.000	2.22334
0.7065	2.33073	9.000	2.21290
0.7800	2.31669	10.000	2.20084
0.7948	2.31438	11.250	2.18317
0.8521	2.30659	12.000	2.17101
0.8943	2.30183	13.000	2.15252
1.0140	2.29165		

For more information, visit our website at [www.cvdmaterials.com](http://www.cvdmaterials.com)

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