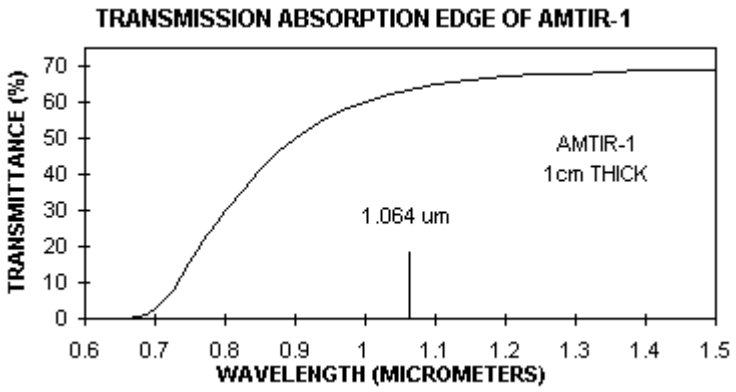
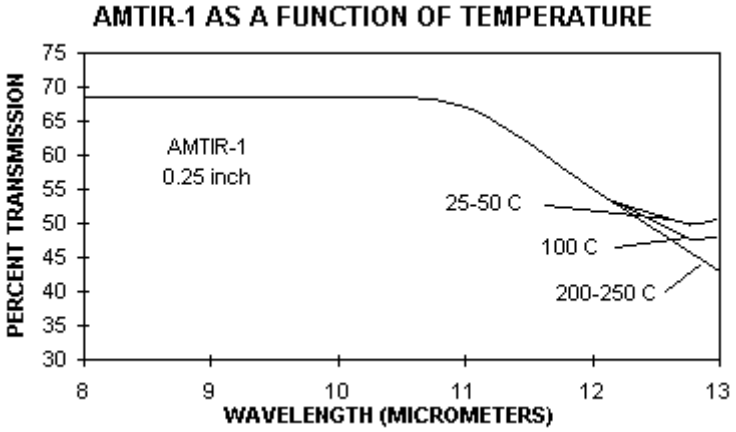
# AMTIR-1

The name **AMTIR** is an acronym for amorphous material transmitting infrared radiation. The glass is melt formed and can be cast or slumped into most any size or shape. The material offers high optical homogeneity at low cost Plates up to 12" X 18" are currently available. The upper use temperature is 300°C with no free carrier absorption as is found in crystalline materials. The 8-12μ m dispersion of 113 is an ideal value for pairing with germanium for a color corrected lens design. The low thermal change in refractive index (72 X 1O $^{-6}$/°C) is a definite aid to Systems designers in trying to avoid thermal defocusing. The glass transmits some red light making it possible to use as a window material covering both atmospheric windows (3-5μ m and 8-l2μ m) as well as the yag laser wavelength at 1.064 μ m.

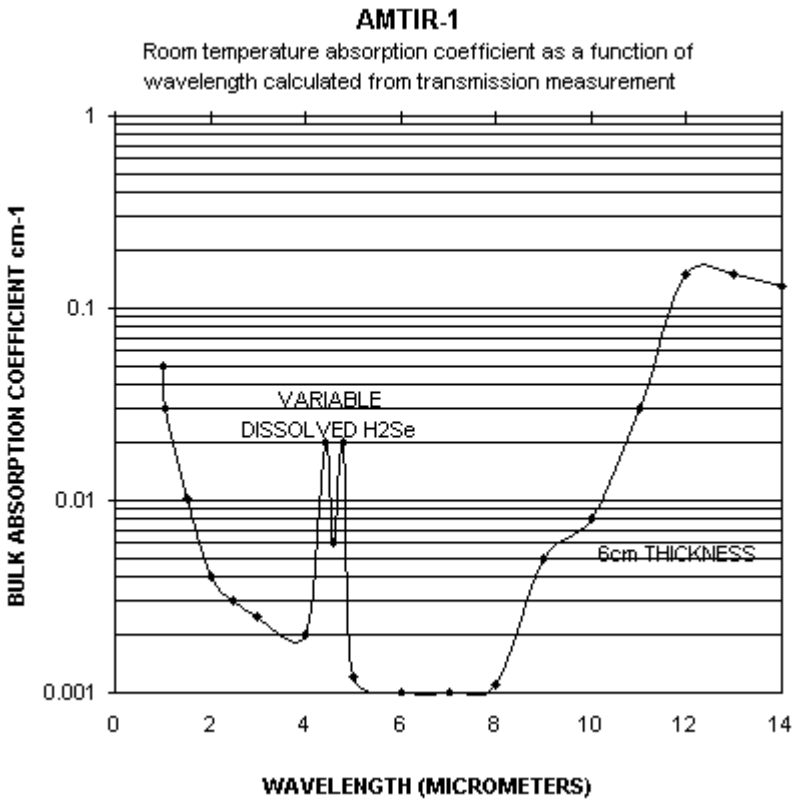
# GENERAL PROPERTIES OF AMTIR-1

| | |
|---|---|
| Composition | $Ge_{33}As_{12}Se_{55}$ Glass |
| Density | 4.4 gms/cm$^3$ |
| Thermal Expansion | 12 X 10$^{-6}$/°C |
| Hardness (Knoop) | 170 |
| Rupture Modulus | 2700 psi |
| Young's Modulus | 3.2 X 10$^6$ psi |
| Shear Modulus | 1.3 X 10$^6$ psi |
| Poisson's Ratio | 0.27 |
| Thermal Conductivity | 6 cal / cm sec°K X 10$^{-4}$ |
| Specific Heat | 0.07 cal / gm °K |
| Upper Use Temperature | 300°C |
| Resistivity | 2 X 10$^{12}$ Ω cm @ 100Hz |
| Glass Transition Temperture | 362°C |
| Annealing Temperture | 370°C |




| **AMTIR-1 THERMAL CHANGE IN REFRACTIVE INDEX 25-65ºC** | | **DISPERSION** |
|---|---|---|
| Wavelength µm | $\Delta N / \Delta T \times 10^6$/ºC | 3-5 µm 210 |
| 1.15 | 101 | 8-12 µm 113 |
| 3.39 | 77 | |
| 10.6 | 72 | |




| REFRACTIVE INDEX AND ABSORPTION COEFFICIENT FOR AMTIR-1 (Measured) | | |
|---|---|---|
| **WAVELENGTH um** | **REFRACTIVE INDEX 25 C** | **ABSORPTION COEFF cm-1** |
| 1.0 | 2.5977 | 0.069 |
| 1.064 | 2.5862 | 0.066 |
| 1.5 | 2.5466 | 0.03 |
| 2.0 | 2.5306 | 0.03 |
| 2.4 | 2.5250 | 0.01 |
| 3.0 | 2.5192 | 0.01 |
| 4.0 | 2.5146 | 0.01 |
| 5.0 | 2.5117 | 0.02 |
| 6.0 | 2.5092 | 0.01 |
| 7.0 | 2.5068 | 0.01 |
| 8.0 | 2.5042 | 0.01 |
| 9.0 | 2.5013 | 0.01 |
| 10.0 | 2.4981 | 0.01 |
| 11.0 | 2.4946 | 0.03 |

| | | |
|---|---|---|
| 12.0 | 2.4905 | 0.15 |
| 13.0 | 2.4860 | 0.15 |
| 14.0 | 2.4825 | 0.13 |

| CORROSION RESISTANCE | | |
|---|---|---|
| **MEDIUM** | **EXPOSURE TIME** | **CHANGE** |
| Air, 300º C | 1 Week | No Change |
| Dilute Hcl | 1 Week | No Change |
| Dilute $H_2$ $SO_4$ | 1 Week | No Change |
| Dilute $HNO_3$ | 1 Week | No Change |
| Alkalis (conc) | 1 Week | Dissolves |
| Kerosene | 1 Week | No Change |
| Water | 1 Week | No Change |
| Seawater | 4 Month | No Change |

Precise refractive index values are obtained by performing minimum deviation measurements on prisms fabricated from standard production plates. Values 3-14 µm are 1990 results. Batch-to-batch variation has been shown to be less than ± 0.0010. Measured optical homogeneity for a 162mm diameter plate 26mm thick was ± 20 X $10^{-6}$ or $\Delta N/N = 8 \times 10^{-6}$ . (B.M. Ranat of Pilkington and Bill Spurlock of Exotic Materials, 1990)