



# PROFESSIONAL PLASTICS

## Homalite H-911 Sheet (made from CR39® Monomer) Material Description & Data Sheet

CR-39® monomer is the dominant material for eyeglass lenses. Homalite casts CR-39® monomer into sheet form known by the trade name **H-911**. **Homalite H-911** is a clear, hard, almost colorless, thermally set plastic, possessing surfaces comparable in smoothness, luster and chemical resistance to polished plate glass.

### CHARACTERISTICS OF H-911:

#### Chemical and solvent resistance:

H-911 is resistant to the effects of virtually all solvents including acetone, benzene and gasoline, and to most chemicals other than highly oxidizing acids.

#### Resistance to abrasion:

Abrasion resistance, as measured by a modified Taber method, may be 30 to 40 times that of acrylic plastics. H-911 approximates the abrasion resistance of glass as measured by the falling emery abrasion test. In certain industrial applications it outperforms both glass and other plastics. Resistance to scratching by high-speed particles is especially good.

#### Impact resistance:

At normal temperatures H-911 has approximately the same impact resistance as cast acrylic. Impact strength at very low temperatures is unusually good.

#### Resistance to pitting:

H-911 is more resistant than glass to pitting by small hot flying particles, and is many times more resistant to welding sparks.

#### Stability of optical properties:

H-911 material maintains optical properties through a variety of difficult environments and conditions of use. Age, stress or contact with solvents will not cause them to check or craze. Photoelasticity is excellent; strain does not produce any loss of optical properties.

#### Clarity:

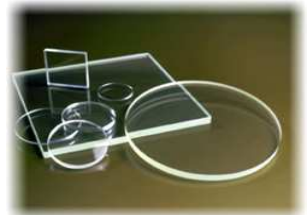
In light transmission, H-911 is approximately equal to optical glass. Its index of refraction is only slightly lower than that of crown glass.

#### Heat Resistance:

Because H-911 is a thermosetting plastic it has good properties of heat resistance and dimensional stability. In tests it has shown distortion of only 30 to 65 mils at 130°, a temperature at which acrylics are melted. It has a burning rate of only one-fourth that of cast acrylic materials.

#### Resistance to gamma irradiation:

The transmission loss of H-911 is only 5% after 100 million roentgens exposure compared to 45% transmittance loss for acrylics subjected to the same exposure. Many glasses discolor even more rapidly than acrylics when subject to radiation. H-911 withstands about 50 times as much radiation as acrylic materials before its physical properties are reduced by 50%.



| Environmental Consideration | RECOMMENDED USES |
|-----------------------------|------------------|
| -                           | <b>H-911</b>     |
| HARSH LIGHTING              | X                |
| STRONG CHEMICALS            | X                |
| MOLTEN SPATTER              | X                |
| RADIATION                   | X                |
| HIGH HEAT                   | X                |
| STERILIZATION               |                  |
| STEAM                       | X                |
| CHEMICALS                   | X                |
| IMPLOSION RESISTANCE        | X                |
| SELF EXTINGUISHING          |                  |
| SCRATCH RESISTANCE          | X                |
| EMI/RFI COATING             | X                |
| MIRROR COATING              | X                |
| SILK SCREENING              | X                |

## Applications for H-911:

The following is a partial list of applications using Homalite H-911. H-911 is used in a variety of applications which would benefit from its unique properties. Designers and specifiers should regard this list only as an indication of the kinds of applications in which H-911 plastic has been found to be advantageous.

### Electronic Display Windows

Medical Equipment & Process Control Equipment

Ruggedized PCs for applications such as police vehicles, marine use and outdoor heavy equipment.

\* Available with a gloss finish or a **low-reflectance finish**. (see details below)

**Glazing** - Crane enclosures, Glazing subject to hydrofluoric acid attack

**Instrumentation** - Dial and gauge covers

**Nuclear Labs** - Window panels, Glove box panels, Viewing windows

Homalite H-911 is available in **sheet stock** or as finished parts cut-to-size. Most finished parts are laser-machined.

**Thicknesses Range from .031" to .500"**. Thicker material (up to 1") is available for glazing applications.

\* Homalite will furnish thicknesses over .500" as cut-to-size only. **Sheets over .500" thick are fabricated using a lamination method and has excellent optical properties but cannot be machined.**

| PROPERTY                                      | ASTM TEST METHOD                                      | VALUE   |
|---|---|---------|
| <b>CHARACTERISTICS</b>                        | Excellent optics Best scratch and chemical resistance |         |
|   | L-P-516A, Class G3                                    |         |
|   | MIL-P-77C, Class G3                                   |         |
|   | P-8257A, Class G3                                     |         |
|   | LA-499-Class G3                                       |         |
| <b>SPECIFICATIONS</b>                         | UL 94HB (1)   |         |
| <b>Optical</b>                                |   |         |
| Transmittance, %                              | D 1003 - 61   | 90-92   |
| Effect of Sunlight                            | —   | NIL     |
| Haze %  | —   | 2-Jan   |
| Refractive Index                              | D 542   | 1.5     |
| <b>Physical and Mechanical</b>                |   |         |
| Density (g/cm <sup>3</sup> )                  | D 792   | 1.31    |
| Tensile Strength, break (10 <sup>3</sup> psi) | D 638   | 6-May   |
| Tensile Modulus (10 <sup>5</sup> psi)         | D 638   | 3       |
| Flexural Yield Strength (10 <sup>3</sup> psi) | D 790   | 7.5-8.5 |
| Flexural Modulus (10 <sup>5</sup> psi)        | D 790   | 2.5-3.3 |
| Compressive Strength (10 <sup>3</sup> psi)    | D 695   | 22.5    |
| Compressive Modulus (10 <sup>5</sup> psi)     | D 695   | 2.3-3.0 |
| Izod Impact                                   |   |         |
| Notched, 25°C (ft lb/in.)                     | D 256   | 0.2-0.4 |
| Unnotched, 25°C (ft lb.in.)                   | D 256 (modified)                                      | 3-Feb   |

|   |            |                                  |
|---|------------|----------------------------------|
| Gardner Impact, (#2 hammer, standard base, 1/2 in., ft lb)  | —          | 0.63                             |
| Hardness  | -          | -                                |
| Rockwell  | D 785      | M95-M100                         |
| Barcol (15-soc value)   | —          | 25-28                            |
| Shore D   | —          | 88-89                            |
| Abrasion  | -          | -                                |
| (x polymethylmethacrylate)  | -          | -                                |
| Taber   | D 1044     | 15-20                            |
| Bayer   | F 735      | 7-May                            |
| Mold Shrinkage (% volume)   | —          | 13-Dec                           |
| Poisson's Ratio (1/2 in.)   | —          | 0.395:1                          |
| <b>Thermal</b>  | -          | -                                |
| Conductivity (Btu in./hr ft <sup>2</sup> °F)  | C 177      | 1.45                             |
| Specific Heat (Btu/lb °F)   | C 351      | 0.55                             |
| Expansion   | -          | -                                |
| (Linear Coefficient/°C)   | -          | -                                |
| -40 to 25°C   | D 696      | 8.1 x 10 <sup>-5</sup>           |
| 25 to 75°C  | D 696      | 11.4 x 10 <sup>-5</sup>          |
| 75 to 125°C   | D 696      | 14.3 x 10 <sup>-5</sup>          |
| Heat Distortion,  | -          | -                                |
| 264 psi (°C/10 mil)   | D 648      | 55-65                            |
| (mils at 130°C)   | D 648      | 36-50                            |
| Glass Transition Temperature (°C)   | [Estimate] | 85                               |
| Flammability  |            |                                  |
| The follow seven ratings are not intended to reflect hazards of this material under actual fire conditions. | -          | -                                |
| Burn Rate (in./min.)  | -          | -                                |
| 1.3-2.9 mm thickness  | D 635      | <1                               |
| 0.05 mm thickness   | D 635      | 25                               |
| <sup>1</sup> Underwriters Laboratories Standard 94 HB (1/8 in. thick, in./min.)                             | —          | 0.7                              |
| Flash ignition Temperature (°F)   | D 1929     | 710                              |
| Self ignition Temperature (°F)  | D 1929     | 720                              |
| Products of Burning   | —          | CO <sub>2</sub> H <sub>2</sub> O |
| (incomplete combustion)   | -          | propane                          |
| Smoke Density Rating (%)  | D 2843     | 26.3                             |
| Maximum Smoke Density (%)   | D2843      | 39.3                             |
| Maximum Operating Temperature (°C)  | -          | -                                |
| Continuous Service  | —          | 100                              |
| One Time, One-hour Duration   | —          | 150                              |
| <b>Chemical</b>   | -          | -                                |
| Percent Weight Gain (7 days immersion, 25°C)  | -          | -                                |
| Distilled Water   | -          | 0.7                              |
| 30% H <sub>2</sub> SO <sub>4</sub>  | -          | 0.5                              |
| 3% H <sub>2</sub> SO <sub>4</sub>   | -          | 0.7                              |
| 10% HNO <sub>3</sub>  | -          | 0.7                              |
| 10% HCL   | -          | 0.4                              |
| 10% NH <sub>4</sub> OH  | -          | 0.8                              |
| 10% NaOH  | -          | 0.6                              |
| 2% Na <sub>2</sub> CO <sub>2</sub>  | -          | 0.6                              |
| 1% NaCL   | -          | 0.6                              |

|   |       |       |
|---|-------|-------|
| 3% H <sub>2</sub> O <sub>2</sub>  | -     | 0.7   |
| 95% Ethyl Alcohol   | -     | 0.1   |
| 50% Ethyl Alcohol   | -     | 0.5   |
| Acetone   | -     | 0.5   |
| Ethyl Acetate   | -     | 0.3   |
| Carbon Tetrachloride  | -     | 0.6   |
| Chloroform  | -     | 1.5   |
| 5% Acetic Acid  | -     | 0.6   |
| Gasoline  | -     | 0.1   |
| Oleic Acid  | -     | 0.2   |
| Benzene   | -     | 0.7   |
| Toluene   | -     | 0.6   |
| Oxygen Permeability (21.7°C) (cm <sup>3</sup> (STP) cm/cm <sup>3</sup> sec)   |       |       |
| (cm Hg)1 x 10"  | -     | 0.17  |
| Oxygen Transmission Rate (cc/m <sup>3</sup> /day) 21.5 mil thickness, 24°C, 100% O <sub>2</sub>   | -     | 2.9   |
| Water Vapor Transmission Rate (g/m <sup>3</sup> /day) 21.5 mil thickness. 22°C, 100% R.H.   | -     | 2.5   |
| <b>Electrical</b>   | -     | -     |
| Dielectric Constant, (10 <sup>3</sup> cycles/sec)   | D 150 | 4.2   |
| Dielectric Strength, Short Time 1/8" thickness, (volts/mil)   | D 149 | 380   |
| Dielectric Strength, Step-by-Step, 1/8" thickness, (volts/mil)  | D 149 | 320   |
| Dissipation/Power Factor, (10 <sup>3</sup> cycles/sec)  | D 150 | 0.01  |
| (2) Surface Resistance (10 <sup>11</sup> ohms)  | D 257 | >1000 |
| Arc Resistance, (sec)   | D 495 | 249   |
|   |       |       |
| (1) Underwriter's Laboratories, Inc. Flammability Classification File # 53966   |       |       |
| (2) Measured with electrodes 10 inches apart at 500 VDC   |       |       |
| Homalite, Inc., assumes no obligation or liability for any information furnished by it, or results obtained with respect to these products. All such advice is given and accepted at the buyer's risk. Users should be governed by their own tests, made under conditions representative of those to which the product will be subjected in actual service. |       |       |
| *CR-39 is a registered trademark of PPG Industries.   |       |       |

### Low-Reflective Finishes

Homalite material which is used as a filter/window in front of a display is often specified with a low-reflectance finish. These surface finishes minimize glare by reducing specular reflection. Unlike other filters, the low glare surface of Homalite filters is cast into the material. This surface is not a lamination or coating so it cannot separate, chip, peel or rub off. Two low-reflectance surfaces are available:

**LR72** - The most light-diffusing surface. For mounting as close as possible to the light source. This finish provides a high level of light diffusion and is also characterized by its ability to provide resolution of 12 point, 1/8 inch high (pica) print or larger characters when the filter source is at a parallel to the plane of the light source at a distance of no greater than 1/2 inch from the source. Characters should be viewed perpendicular to the surface of the filter in ambient light (100 foot-candles.)

**LR92** - This finish provides a lesser degree of light diffusion but higher resolution than LR 72 described above. Typically 12 point 1/8 inch high print or characters can be resolved through the part when it is placed parallel to the plane of the light source at a distance of no greater than 2 inches from the source. Characters should be viewed perpendicular to the surface of the filter at ambient light.

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