

## A Comparison of Glazing Materials Used in Framing

Leslie Paisley

**G**lazing with glass or plastic sheeting is an essential component for framing and exhibiting artwork. Glazing materials protect sensitive surfaces from abrasion, airborne pollutants and dust. In addition, glazing buffers artwork from fluctuations in temperature and relative humidity. Clear, inert glazing materials also protect objects in handling as well as provide security for small objects.

Glazing can also be used to protect works of art or documents from some of the harmful effects of light. Both natural and artificial light sources emit energy in the ultraviolet and infrared ranges (“invisible”), in addition to visible light. As wavelength decreases [1], the intensity of light increases logarithmically, and can cause photochemical damage to organic materials.

- Colors fade or darken
- Structural changes (e.g. embrittlement) occur due to the breakdown of molecular bonds. [2]

Damage and deterioration are factors of the quantity, quality, intensity and duration of light exposure.

**Artificial light sources** Incandescent lamps produce less UV radiation than daylight or fluorescent lamps. Regular window glass blocks out some UV light, but ultraviolet filtered glazing should be used to frame artwork. All fluorescent lighting fixtures should be provided with a diffuser plate or tube cover to filter out up to about 99% of the UV radiation. [3] Some situations allow for a glazing material that is not UV filtered as long as the light is filtered elsewhere within the case, windows or bulbs.

Table 1 Comparison of Glass v. Plastic Advantage ✓ / Disadvantage ✗

|  | <b>Glass</b>  | <b>Plastic</b>  |
|--|---|---|
| <i>Electrostatic Properties</i>            | ✓ Picks up little electrostatic charge (suitable for pastel chalk and charcoal drawings)  | ✗ Retains powerful electrostatic charge (not suitable for pastel, chalk and charcoal drawings). Exception: Optium™ acrylic.   |
| <i>Scratch/Solvent Resistance</i>          | ✓ Very resistant to abrasion and solvents. Exception: most coated glass   | ✗ Must be cleaned carefully to prevent scratching. Can be altered by some solvents.   |
| <i>Defects</i>                             | ✓ Few defects. Exception: most laminates, except Luxar  | ✗ Black specks are common.  |
| <i>Rigidity</i>                            | ✓ Rigid, even in 2mm thickness accommodated by most frames. Tends not to respond to changes in relative humidity (RH).  | ✗ Absorbs moisture and warps. Differential temperature and/or RH on inner and outer surfaces may cause bowing toward the higher temp/RH (returns to normal configuration as differentials(s) return to zero.) Especially problematic on oversized artwork; can lead to popping out of frame; must be stored properly; <i>Note: Polycarbonate is less responsive to moisture than acrylic.</i> |
| <i>Reflectance</i>                         | ✓ Some treated glass is to reduce reflection. Conservation framing requires air space between artwork and glazing; standard non-glare glass (etched on one side) will not allow proper viewing. | ✗ The majority are currently not available with reflection reduction properties suitable for artwork. Exception: Only Optium™ is available with anti-reflection properties suitable for artwork.  |
| <i>Heat Resistance Temp and rh Factors</i> | ✓ Heat resistant. Better moisture barrier.  | ✗ Thermoplastics are combustible at sufficiently high temperatures. Polycarbonates are less flammable than acrylic. More moisture permeable.  |
| <i>Insulation</i>                          | ✗ Some thermal conduction; condensation may occur on the inside surface of glazing nearest the artwork.   | ✓ Better thermal insulator; condensation is less likely to occur inside the frame.  |
| <i>Weight</i>                              | ✗ Heavy, especially laminated glass. Large pieces require sturdy frames and hanging materials. More vulnerable to damage from handling.   | ✓ Lightweight. Lighter hanging equipment is possible, and breakage during handling is reduced. 3mm acrylic is 50% lighter than glass. Requires sturdy frame for large sizes to prevent bowing.  |
| <i>Breakage</i>                            | ✗ Breaks easily; old glass is particularly brittle. For transit, masking or other low tack tape should be applied in a grid pattern over the glass to minimize glass splinters from breakage.   | ✓ Less likely to break, more shatter resistant. Should breakage occur, the fragments are less sharp than with glass. Polycarbonate has the best impact resistance.  |

**Natural light** Remember that no matter what type of glazing is used, no artwork should be exposed to direct sunlight.

There are many types of glazing materials to choose from. Selecting the appropriate material can be confusing. Factors to consider when making your selection include weight, risk of breakage, glare, color, qual-

ity of illumination and cost. The following tables are offered to aid in making decisions for your collection. Table 1 is a comparison of glass and thermoplastics, including acrylic and polycarbonate, as glazing material. Table 2 lists the properties of glass products used for framing fine art. Table 3 lists the properties of thermoplastics used for framing fine art.

**Table 2 Properties of Glass Products Used for Framing Art**

|  | <b>Color</b>                    | <b>Safety</b>                               | <b>Ultraviolet Absorption</b>                    | <b>Cleaning Guidelines</b>  | <b>Special notes</b>  |
|--|---------------------------------|---|--|---|---|
| AMIRAN TN® (laminated)   | Clear (low iron)                | Breaks but does not shatter against artwork | Filters 99%                                      | Cleans easily with detergent, water and soft cloth. Avoid strong acid, alkaline or abrasive cleaners. | Anti-reflective. Can contain imperfections. Often longer order time, in our experience, than other available laminates.   |
| LUXAR® Classic (laminated)                                     | Greenish and thicker (low iron) | Breaks but does not shatter against artwork | Filters 99.5%                                    | Difficult to clean  | Anti-Reflective. May be less expensive than other laminates. Made and laminated at same factory, therefore less apt to have flecks.   |
| Tru Vue® Museum Security Glass (laminated)                     | Clear (low iron)                | Breaks but does not shatter against artwork | Blocks out virtually all UV at 300-380 nm (.97%) | Cleans easily with detergent, water and soft cloth. Avoid strong acid, alkaline or abrasive cleaners. | Anti-reflective. Used for paintings not normally glazed for viewing. Often contains black flecks. Skilled cutting required.   |
| Guardian® InspirationUV™ (not laminated)                       | Clear (low iron)                | As brittle as window glass                  | Coating blocks 98% of UV                         | Cleans easily with detergent, water and soft cloth. Avoid strong acid, alkaline or abrasive cleaners. | Anti-reflective. Equivalent to Tru Vue Conservation Clear. Film is applied to protect coated side for transit. Position the coated side toward the art to prevent scratching and reduce distortion. |
| Tru Vue® Conservation Series 2.5mm float glass (not laminated) | Avoid non-glare                 | No protection against breakage              | Coating blocks 97% of UV at 300-380nm            | Coating is sensitive; use ammonia-free glass cleaner  | Depends on type of product: check with manufacturer for details on each type. Some are single-sided. Position coated side toward art to protect the coating.  |
| Window Glass   | Clear/ green tinge              | Breaks easily                               | Minimal protection, .40% at .093"                | Cleans easily; abrasion-resistant   | Heavy <sup>4</sup> in large sizes. With each layer of glass, there is increased filtration. <sup>5</sup>  |

The information in this report was taken from published data provided by the manufacturers and from conversations with suppliers in 2005-2007. The product specifications have not been independently tested by WACC and are subject to change. WACC does not endorse any specific products listed.

[1] From around 500 nanometers downward. (The wave-

lengths of the electromagnetic spectrum are measured in units called nanometers. One nanometer equals one billionth of a meter, or approximately 39 billionths of an inch.)

[2] From Atohaas technical leaflet, "Plexiglas Acrylic Sheet: General Information and Physical Properties," PLA-66, December 1992.

[3] From the Tru Vue technical leaflet, "Tru Vue Conservation Glass."

**Table 3 Properties of Thermoplastics Used for Framing Art**

|  | <b>Color</b>   | <b>Safety</b>   | <b>Ultraviolet Absorption</b>   | <b>Cleaning Guidelines</b>   | <b>Special notes</b>  |
|--|--|---|---|--|---|
| Acrylite® OP-2<br>Acrylite® OP-3<br>(acrylic)                                      | Clear (grayish)                                      | Breakage resistant  | Both OP-2 and OP-3 filter 98%. UV absorbers are in the resin used. OP-2 is cell cast. | Liquid detergent and water solution with non-abrasive cleaning cloth.  | OP-3 is slightly less expensive due to fabrication. UV protection is in the sheet, not in the coating.            |
| Lexan® 9034<br>(polycarbonate)   | Clear, but yellows from UV exposure.                 | Extremely resistant to breakage   | Absorbs virtually all UV radiation.   | Liquid detergent and water solution with non-abrasive cleaning cloth. Scratches more readily than acrylic.     | Yellows faster than acrylic. More difficult to cut.   |
| Margard® MR5000<br>(polycarbonate)   | Clear (grayish)<br>The coating slows down yellowing. | Extremely resistant to breakage   | Absorbs virtually all UV radiation  | Liquid detergent and water solution with non-abrasive cleaning cloth. Coating reduces scratching.              | May yellow faster than acrylics; need to specify MR5000; will be more expensive than Plexiglas.                   |
| Plexiglas®-G<br>Plexiglas® UF-3<br>Plexiglas® UF-4<br>Plexiglas® UF-5<br>(acrylic) | G: Clear<br>UF-3: yellow tinge<br>UF-4: clear        | All have good chemical and breakage resistance.                                 | G: negligible<br>UF-3: 99%<br>UF-4: under 99%<br>UF-5: 99%                            | Use non-abrasive cloth, avoid alcohol. Novus or Brilliance is OK.  | G: less expensive<br>UF-3: greatest UV absorbing properties of all three Plexiglas formulations used on fine art. |
| Tru Vue® Optium™<br>Acrylic and Optium™<br>Museum Acrylic™                         | Clear  | Both have good chemical and breakage resistance. Optium comes in 3mm and 4.5mm. | Optium: filters 93%<br>Museum: filters 98%  | Use microfiber cloth. Avoid acrylic cleaners. Must clean after removal of masking film to remove plasticizers. | Maximum size 41 x 71". Coated on both sides (no "right" side). Offers static dispersion. 6mm is available.        |
| Spartech® UF96<br>(acrylic)  | Clear  | Breakage resistant  | Absorbs virtually all UV radiation.   | Use non-abrasive cloth, avoid alcohol. Novus or Brilliance is OK.  | 1/4" thickness is used for oversized artwork as large as 6' x 10'.  |

**Notes to Chart 3 above:**

1) Because thermoplastics can sag, larger framed artwork which must travel should be transported vertically.

2) In general, polycarbonates are less flammable than acrylic, but all thermoplastics are more flammable than glass.

**Notes to Chart 2 on facing page:**

Glass is generally chosen for unbound media such as pastel and charcoal and for sensitive paintings that require glazing. Glazing should be carefully chosen for the intended use and installation. Be advised that regular non-glare glass products diffuse and reflect light, but do not sufficiently block UV radiation and are generally not clear. They cannot be considered for conservation use. Anti reflective glass however is clear and usually contains some degree of UV filtration. Anti-reflective glass can become virtually invisible when viewed in a vertical orientation and in controlled gallery lighting. In areas where paintings may be exposed to some indirect natural light (from a skylight or down a hallway to the gallery), the resulting surface color may not be acceptable. See "Glossary of Glazing Terms" on the WACC Web site. [4] Laminates are all heavier than single lites. [5] 54% filtration for the second piece; 61% for the third piece.

**Table 4 Product Sources Table**

| <b>Product</b>   | <b>Manufacturer</b>                                 | <b>WACC's Supplier</b>          |
|--|---|---------------------------------|
| AMIRAN® glass  | Schott NA, Inc.                                     | Maryland Glass                  |
| Acrylite® OP2  | CYRO Industries                                     | Maryland Glass                  |
| Guardian® Inspiration UV™  | Guardian Industries                                 | Maryland Glass<br>Small Corp.   |
| Lexan® and Margard® polycarbonate sheet  | GE Plastics   | Modern Plastics                 |
| Luxar® Classic laminated ed glass  | Europtec  | McGrory Glass<br>Maryland Glass |
| Plexiglas®   | Altuglas International<br>(bought from Rohm & Haas) | Don Mar<br>Freeman Plastics     |
| Spartech® UF96   | Spartech Polycast                                   | Maryland Glass<br>Small Corp    |
| Tru Vue®<br>▶ Conservation Clear glass<br>▶ Museum Security™ glass<br>▶ Optium™ Museum acrylic | Tru Vue Inc.  | Don Mar<br>Maryland Glass       |

**Supplier Addresses**

**Don Mar Frame & Molding**

175 Highland Ave.  
Seekonk, MA 02771  
800-556-7428 (MA)  
800-556-7428 (CT)  
800-207-0360 (NJ)  
[www.donmarcreations.com](http://www.donmarcreations.com)

**Maryland Glass & Mirror Co.**

1834 So. Charles St.  
Baltimore, MD 21230  
800- 352-3380  
[www.mdglass.net](http://www.mdglass.net)  
Matt Daubke

**McGrory Glass, Inc.**

100 Commerce Dr.  
Aston, PA 19014  
800-220-3749  
[www.mcgrory-glass.com](http://www.mcgrory-glass.com)

**Modern Plastics**

Corporate Headquarters:  
P.O. Box 3974  
Bridgeport, CT 06605  
800-243-9696  
Massachusetts:  
710 Berkshire Avenue  
Springfield, MA 01109-1007  
800-628-4458  
[www.modernplastics.com](http://www.modernplastics.com)

**Ernie Robertson**

**Preservation Glazing, Inc.**

910-692-4283  
910-692-8855  
910-724-1026 fax  
[ernrob@earthlink.net](mailto:ernrob@earthlink.net)  
Schott North America, Inc.  
Elmsford, NY 10523  
914-831-2200  
[www.us.schott.com](http://www.us.schott.com)

**Small Corp.**

P.O. Box 948  
Greenfield, MA 01302  
413-772-0889 x 101  
800-392-9500  
[www.smallcorp.com](http://www.smallcorp.com)  
Small Corp only sells cast acrylics, 1/4" regular Plexiglas up to 108 x 162".  
Call for quote.

A complete list of suppliers, manufacturers and fabricators is at [www.williamstownart.org](http://www.williamstownart.org).



◀ **LESLIE PAISLEY** has been the chief paper conservator at WACC since 1989. She apprentice-trained with Christa Gaehde from 1977-1982 before receiving her Certificate of Advanced Studies at the Center for Conservation and Technical Studies at the Fogg Art Museum, Harvard University, in 1983. Prior to joining WACC, she was senior paper conservator at the Pacific Regional Art Conservation Center in Honolulu, Hawaii.