



Conserve O Gram

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Safe Plastics And Fabrics For Exhibit And Storage

Introduction

Always use archival or conservation quality materials for your collection. “Archival” or “conservation” quality refers to materials that are physically durable and chemically stable. Several types of plastics and fabrics fall into this category. Such items are said to be “inert,” as they do not release degradation products that can be harmful to collections. Use these materials whenever possible to ensure the safety and stability of museum collections in storage, exhibit, and transport. To choose a suitable material, consider the following factors:

1. Nature of the storage material

- Consider its:
 - physical and chemical properties
 - texture
 - permeability/breathability
 - durability
- Does it carry a static charge that could attract dust and other abrasives?
- Does its composition allow for long-term or short-term use?
- Is it appropriate in an exhibit setting or better for storage or shipping only?

2. Nature of the object

- Consider the physical and chemical composition of the object to be stored or displayed.
- What is the object made of?
- What is its texture, size, and condition?
 - Some objects may have rough sur-

faces that snag on certain protective supplies.

- Others may have structural or compositional weaknesses that require specific supportive materials.

3. Nature of the storage/exhibit environment

- Consider all of the environmental factors including relative humidity (RH), temperature and light exposure.
- If the RH is high or fluctuates, would it be better to use a breathable textile instead of plastic?
- If the temperature fluctuates, does it affect RH and condensation in that area?
- How is the ventilation and particulate build-up?
- Would plastic protect better than fabric in a dusty environment?
- Will the storage or exhibit materials be exposed to light and/or UV radiation? If so, this might cause:
 - fading
 - deterioration
 - off-gassing

Note: Some plastics and textiles emit harmful degradation products when exposed to UV radiation, heat, and solvents.

4. Nature of the purpose

- Consider the purpose:
 - Exhibit: which requires aestheti-

- cally pleasing or non-visible materials?
- Storage: will it be long or short term?
 - Transport: for protection in shipping? This may require extra precautions to avoid breakage, but may not require long-term exposure to the packing material.
 - Consider each situation and object on a case-by-case basis.
 - In some cases, non-archival quality materials may be a more cost-effective and appropriate solution (such as during transport) when their exposure to the object is minimal and of short duration.

Plastics and Foams

Plastics are synthetic materials constructed principally from carbon, silicon, hydrogen, nitrogen, oxygen and chloride. The sources for these elements are usually oil, coal and natural gas. During manufacturing, these familiar elements are recombined through chemical reactions to form new substances. This means that there are a variety of plastics suitable for museum use. Although many plastics appear similar, the process and chemicals used in manufacture vary.

For collections, never use plastics with fillers, plasticizers or other additives. These can release harmful degradation products over time. Also, avoid plastics that have chlorine or sulfur containing compounds. Such plastics can off-gas volatile acids and harm collections. Do not use any of the following plastics for long-term storage or exhibit purposes:

- PVC (polyvinyl chloride)
- PVDC (polyvinylidene)
- PVA (polyvinyl acetate), found in adhesives and paints
- acidic polyesters
- polyurethane foams
- chloroprene (e.g. Neoprene®)
- urea formaldehyde panels (such as Gator Foam®)

Instead, use safer plastic alternatives such as:

- polyethylene (PE)
- polypropylene (PP)
- polystyrene
- acrylic
- inert polyester films and sheeting

The following chart lists plastics that are commonly used for museum storage, exhibit, and packing purposes. Most are of archival quality, except those listed for short-term use.

<i>Material</i>	<i>Description</i>	<i>Uses</i>	<i>Types</i>	<i>Remarks</i>
Mylar® or Melinex®	Pure polyester, transparent film.	Provides a protective layer for objects, paper and textiles. Good for encapsulation of documents and photos in paper conservation.	Available in different thicknesses. Made in cut sheets, rolls and various sizes of prefabricated envelopes.	Chemically stable. Acts to filter out some ultraviolet (UV) radiation. When used under blotter paper, it prevents acid migration to specimens.

Polyethylene (PE) Film or Sheeting	Slightly opaque plastic film.	A less expensive alternative to Mylar® and Melinex®. Protects smaller artifacts, photos and paper from dust, abrasion and fingerprints.	Available in resealable bags, sleeves, and envelopes. All types come in a variety of sizes and thicknesses.	Inert and water resistant. Less chemically stable than polyester films and not as clear. Some recommend keeping bags open due to possible condensation in RH fluctuations.
Ethafoam®, Microfoam, Sentinel, or Cell-Aire®	Extruded, closed-cell polyethylene (PE) foam.	Provides cushioning and support in storage mounts. Good for packing and shipping. Sheets are good for lining drawers or shelves.	Available in various sizes, shapes and thicknesses (1/32" to 4"). From thick dense blocks to thin flexible sheets.	Inert, moisture and chemical resistant, lightweight and energy absorbent. Easy to shape with a knife. Edges can be abrasive requiring a liner when in contact with objects.
Plastazote® and Volara®	Closed-cell polyethylene (PE) foam.	Cushions collections in storage or shipping. Great for entomology pinning trays.	Available in a range of densities and thicknesses.	Denser and softer than Ethafoam® and similar products. Special manufacturing results in a smooth continuous surface. No harmful additives and ozone friendly.
Polyethylene (PE) foam rod	Polyethylene foam in a cylindrical shape.	Supports and cushions artifacts and specimens in storage and shipping. Used to gasket exhibit and storage cases and to plug specimen vials.	Available in various diameters from ¼" to 2".	Not to be confused with polyurethane "backer rod," which should not be used due to its tendency to off-gas harmful chemicals.
Coroplast® or Polyflute	Polypropylene and polyethylene corrugated board.	Makes great storage boxes and trays. Used in picture framing, backing prints, and shelf and drawer lining.	Available in a variety of thicknesses (2mm - 10 mm) and colors.	Plastic version of cardboard. Light, stable, and easily cut with a knife or straight edge. May degrade in sunlight. Watch channels for insects.
Bubble Wrap®	Low-density polyethylene.	Packing material that cushions and protects objects during transport.	Available in a variety of thicknesses and bubble sizes. Sold in rolls.	Avoid direct contact with objects that have a sensitive surface. Some brands of similar material may contain additives and emit harmful by-products. Do not use in long-term storage.

Fabrics

Many fabrics are safe to use with museum collections. They often are very cost-effective, too.

You can use fabrics to:

- line exhibit cases
- separate objects from rough exhibit or storage supports
- cushion and support objects in long-term storage

You can choose from a variety of archival quality natural and synthetic textiles. The most common and cost-effective natural textiles used in museums are unbleached linen and cotton. Reliable synthetic products include polyester, poly-cotton blends, and acrylic felts.

Be sure to consider the fabric's fiber content and composition before using it. This is very important, especially if the fabric will:

- come in contact with an artifact
- be used in an enclosed exhibit case or storage cabinet

Avoid fabrics that contain finishing treatments. These products can emit harmful degradation products similar to those found in plastics.

Common finishing treatments include:

- fire retardants
- formaldehydes
- phosphates
- adhesives
- resins
- dyes

Look for fabrics with fibers that are held together by *thermal-spin-bonding* (randomly placed fibers bonded with heat and pressure) or *needle-punching* (long, random fibers that are mechanically entangled). Also, choose fabrics with a texture that will not harm or stick to the surface of the object.

Do not use:

- **Wool or Jute**, which tend to be abrasive and release harmful by-products that can tarnish metals and cause degradation to other collections materials.
- **Carpets** can off-gas harmful emissions and attract dust and insects.

The following chart lists several useful archival quality fabrics for museum storage, exhibition, and packing.

<i>Material</i>	<i>Description</i>	<i>Uses</i>	<i>Types</i>	<i>Remarks</i>
Muslin	Light, woven, cotton fabric.	Used for storage covers, barriers, liners, display backgrounds, and restoration projects.	Unbleached, off-white fabric is available in a variety of weights and thread counts, and as a cotton-polyester blend.	Fabric should be washed before use, and at least once a year to remove any unwanted chemicals and particulates.
Calico Cloth and Unbleached Linen	Light, woven, natural linen fabrics.	Good for dust covers, support stuffing and as a barrier between objects and abrasive storage materials.	Archival quality includes unbleached and untreated linen available in a variety of thread counts.	Should also be washed like muslin. Very cost-effective material.

Cotton Stockinette	Woven cotton that stretches to any shape.	Provides storage and exhibit supports when stuffed with tissue or batting. Good for mounting hats, shoes, and bags.	Comes in a tube shape like a “stocking.” Available in rolls.	Easy to use. Requires some stitching to enclose any stuffing within.
Twill Tape	Acid-free, twill-woven cotton “tape” or ribbon.	Used to label textiles, secure objects to mounts, or to tie bags and boxes.	Available in rolls from ¼” to 1’ thick.	Soft but strong material that can be marked with acid-free pen for labeling.
Polyester Batting	100% needle-punched polyester that resembles “cotton candy.”	Used as stuffing for cushion supports, lining drawers or boxes, and in textile conservation.	Available in bundles or flattened sheets.	Use only thermally bonded fibers, not resin-bonded. Does not absorb water, good in high humidity.
Polyester Felt (Polyfelt)	100% inert polyester. Thick, soft, synthetic felt material.	Provides cushioning in containers, drawers, and shelves. Texture helps prevent shifting of objects.	Available in ⅛”, ¼”, ½” thicknesses. Comes in rolls or sheets.	Make sure to use only thermally bonded, virgin polyester felts to avoid harmful resins.
Tyvek®	Spin-bonded, non-woven, high-density polyethylene fibers. Material resembles a cross between fabric and paper. Contains Teflon®.	Good for shelf lining, dust covers, and as a barrier between objects and exhibit environment. Also can be used for specimen labels.	Available in rolls, in a variety of thicknesses and strengths.	Strong, flexible and smooth. Water and dust resistant, but gas permeable. Used commercially in construction, as indestructible envelopes, and protective clothing.
Remay®	100% spin-bonded, non-woven, polyester sheet.	Provides strong support. Good as a lining, backing, or for interleaving of paper, maps and textiles.	Available in rolls or by the yard.	Does not stretch or tear. Retains its physical properties when wet or with humidity fluctuations. More rigid than Tyvek® or natural fabrics.
Hollytex	100% spin-bonded polyester web sheet.	Same as Remay, but also used to cover fabrics and leather.	Available in rolls or by the yard.	Same properties as Remay®; greater tensile strength, is slightly thinner and less rigid.

Pellon®	Synthetic needle-punched 'fleece.' Sheet version of polyester batting.	Used in storage and exhibit mounts, and for lining and packing shipping crates.	Available at fabric and craft stores in various pre-packaged bags and sheet sizes.	Some Pellon® products are bonded with adhesives. Only use thermally or mechanically bonded Pellon.
Pongee	Synthetic, woven polyester fabric. Soft, slick and shiny.	Used for mounts in storage and display.	Available by the yard.	Does not snag or stick like polyester felts and fleeces. Good for objects with rough or delicate surfaces.
Nomex®	Woven synthetic nylon polymer. Soft, smooth texture. Fire and water-resistant.	Used as a packing material. Makes good object covers for long-term storage.	Available by the yard.	Chemically inert. Resists dust and does not support mold or mildew. Permeable to air and water vapor.

Consult your regional/SO curator and a conservator for more information on the proper use of, and sources for, archival quality storage, exhibit, and packing materials. Also, refer to the following NPS publications:

- *Tools of the Trade*
- *Museum Handbook*, Part I (Chapter 7 and Appendix G)
- other *Conserve O Grams*

The following list of suppliers serves as a preliminary guide for researching the purchase of supplies for your collection. There are numerous distributors of these products. Be sure to consider both convenience and price. **Note:** Check your local fabric and arts & crafts stores for some of these products.

Suppliers

Archivart
7 Caesar Palace
Moonachie, NJ 07074
(800) 804-8428
www.archivart.com

Conservation Resources International
5532 Port Royal Rd.
Springfield, VA 22151
(800) 634-6932
www.conservationresources.com

Coroplast Inc.
4501 Spring Valley Rd.
Dallas, TX 75244
(800) 666-2241
www.coroplast.com

Dow Chemical (Ethafoam® etc.)
P.O. Box 1206
Midland, MI 48642
(800) 441-4369
www.dow.com

Dupont Co. (Tyvek® etc.)
1007 Market Street
Wilmington, DE 19898
(800) 441-7515
www.dupont.com; www.tyvek.com

Testfabrics, Inc.
P.O. Box 26
West Pittston, PA 18643
(570) 603-0432
www.testfabrics.com

University Products
P.O. Box 101
Holyoke, Massachusetts 01041
(800) 628-1912
www.archivalsuppliers.com

Voltek (Volara® products)
100 Shepard St.
Lawrence, MA 01843
(800) 225-0668
www.voltek.com

Zotefoams, Inc. (Plastazote® products)
55 Precision Dr.
Walton, KY 41094
(800) 362-8358
www.zotefoams-usa.com

Tetreault, Jean and R. Scott Williams. *Materials for Exhibit, Storage and Packing*, Version 4.1. Ontario: Canadian Conservation Institute, 1992.

Williams, R. Scott, et. al. "Guide to the Identification of Common Clear Plastic Films." *SPNHC Leaflets*, no. 3: Fall 1998.

Winsor, Peter and Stephen Ball. "Museum Conservation Materials." The Museums, Libraries, and Archives Council. Available on the web at: <<http://www.mla.gov.uk/information/advice/conserv15.asp>>

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References

Society for the Preservation of Natural History Collections. "Supplies and Materials for Museum Collections." Available on the web at: <http://www.spnhc.org/documents/supplies_usa.htm>

Storch, Paul S. *Exhibits and Storage Handbook*. St. Paul: Minnesota Historical Society Conservation Department, 2002.

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