

Supplies and Materials for Museum Collections (Canada)

Presented by the Resources Subcommittee (Conservation Committee) of the Society for the Preservation of Natural History Collections. This display was compiled by Helen Coxon, Conservation, and Janet Waddington, Palaeobiology, Royal Ontario Museum. Please address all questions, comments and suggestions to Janet Waddington, Palaeobiology, Royal Ontario Museum, 100 Queen's Park, Toronto, ON, Canada M5S 2C6 (janetw@rom.on.ca) A copy of this list is maintained in hypertext and portable document formats at the SPNHC web site: <http://www.spnhc.org>.

This compilation was developed to accompany the travelling display and lists suppliers for the products displayed. It in no way claims to be an exhaustive listing of products suitable for use in museums, nor an exhaustive listing of the suppliers stocking such products. It should be considered a work in progress, and it is intended that it will evolve through further drafts to include some items which could not be included at this time, and to expand the suppliers list.

Suppliers are identified by numbers in square brackets []. Please refer to suppliers list for names and locations. All supplier information is in a separate file: [Supplier Information](#).

(alternative format: [Portable Document](#), including Supplier Information)

Contents:

- [Terminology](#)
- [Humidity Control](#)
- [Humidity and Temperature Monitoring](#)
- [Air Quality Control](#)
- [Documentation and Labelling](#)
- [Storage, Packing and Wrapping](#)
- [Pest Control](#)
- [Handling and Safety](#)
- [Miscellaneous](#)
- [References](#)

A word on terminology

A number of "buzzwords" have crept into the terminology of materials used for collections care. These should be treated with caution (as in the use of the term "low-fat" on food products.)

"Acid-free", or **"pH-neutral"**, though it is often assumed to be an indication of a material's stability, merely means that the item had a neutral pH (i.e. was neither acidic nor alkaline) when manufactured. However, it may not stay that way, depending on the characteristics of the material itself and the materials surrounding it in use (or in storage.) For example, if acid-free tissue paper is stored for a long period of time in an acidic corrugated cardboard container, the outer layers, at least, will pick up the acidity from the cardboard. By extension, acid-free tissue used as a wrapping or stuffing may need to be replaced periodically.

"Buffered" or **"buffered acid-free"** indicates that a buffer has been added to extend the pH-neutral lifetime of a material by providing an alkaline reservoir to neutralize acidic degradation products. When the buffer has been consumed, the degradation continues. Calcium carbonate is the most common buffer, and is typically present in paper and board materials for archival use in quantities of around 3%. Buffered materials are generally not recommended for photographic storage purposes, or for collections containing proteinaceous materials.

"Archival" means a material which is lignin-free, sulphur-free (especially important for silver and for photographic materials), alkaline-pulped and containing a 3-5% alkaline buffer reserve.

"Lignin-free" and "high alpha cellulose" are also terms which indicate a good quality paper or board.

Humidity Control

Silica Gel

A porous, granular, chemically inert, amorphous form of silicon dioxide, capable of absorbing and desorbing water vapour in order to reach equilibrium with the surrounding air. Hence it is used for drying the air in an enclosed space, or for buffering humidity changes, or to help maintain a specific level of relative humidity (RH) during storage, display or shipping. Gel can be reconditioned as necessary, using an oven for drying or a humidity chamber for higher humidities. N.B. For effective control using silica gel, the controlled space must be properly air-tight. Silica gel is most efficient when used in a fairly shallow layer spread over a large surface area.

Quantities quoted in suppliers' catalogues are not always equivalent. Typically, the amount suggested for silica gel used as a desiccant is considerably less than that suggested for use as a humidity buffer. The smaller packages and tins are best used simply as desiccants in small enclosures, since an unmanageable number would be required for buffering. Loose gel can be used either as a desiccant or as a buffer.

- **Loose gel**
Available with or without an indicator, which is bright blue when the gel is dry, turning to pink as it becomes saturated with moisture. A handful of indicator gel scattered in a mass of regular gel can be used to show when the gel needs reconditioning. Indicator gel is only meaningful when the silica gel is used as a desiccant. For gel which is not readily visible, or when gel is used to achieve and hold a specific RH level, use RH indicator strips or a more sophisticated monitoring device (see below.) Loose gel can be enclosed in cotton bags for easier handling. [1,2,3, chemical suppliers, e.g. 11,12,13,20]

Usual quantity recommended to maintain a specific humidity level (i.e. as a buffer) is 20kg per m³. When ordering, gel should be listed in catalogues as "desiccant". Silica gel is also used for chromatography, but this form is not useful for climate control. Available in a variety of densities and particle sizes. Mesh size 6-12 is about average.

N.B. Silica gel is an amorphous form of silica and does not carry all the health hazards associated with crystalline forms of silica. However, gel must be housed in cloth bags or other permeable containers, and the use of gloves and dust masks is advised when handling.

- **Packages**
3.9g sachets, e.g. for use with slide storage systems as a desiccant. Amount required is given as 1 kg per 2m³, i.e. 0.5kg/m³. Packet size 2x2" \diamond . Non-indicating. [1,2,28]
- **Protek Sorb \diamond**
23.5g, 3x5" flat packets, useful as desiccant for picture frames, slide drawers, etc. Non-indicating. [2, 29]
- **Tins/canisters**
43g blue indicating gel in an aluminum tin, 4" diameter x 17/32" high [1], or rectangular, 4x2x" \diamond [2,3]. Controls 3 ft³ as a desiccant (equivalent to 0.5kg/m³.) Also available in 400g (2x4x5", for up to 27 ft³) and 750g (6"x4" diameter, for up to 57 ft³) sizes [2]. All with built-in indicators. [Also 13, etc]

- **Arten** tiles

Polystyrene tray, 7x7x", with four compartments containing total of 150g of Arten silica gel (enough for 1 ft³ enclosure), covered with a permeable non-woven fabric. Indicators included. The large surface area allows rapid response to changes in RH and the thin section allows installation into thin frames, shipping crates or storage drawers. Good for vertical installation. Said to have 75% of the performance of Art-Sorb (see below) at a fraction of the cost. 2 times the moisture capacity of regular silica gel. Equivalent is 5kg/m³. Can be ordered preconditioned to 33% [2], 43% [2,3], 50% [1], 52% [2] or 56 % [2] RH.

- **Art-Sorb**

A silica material with a greater buffering capacity than regular gel, therefore less quantity will be needed. Available as loose beads, prepackaged in cassettes, or in thin sheets. [1,2,15] Manufacturer says Artsorb is better used to maintain constant RH than as a desiccant.

Beads require 0.5-1 kg per m³. They create much less dust than the irregular granules of ordinary silica gel. Sheets are a permeable mixture of non-woven polyethylene and polypropylene fibres, 19.7" (50cm) square, each impregnated with 100g of gel, i.e. approx eight sheets are required to control 1 m³. Useful for backing paintings, or for lining a display case or crate. Sheets can be cut to size.

The cassette form consists of a non-woven polyethylene/polypropylene package supported by a cardboard framework, and is available in two sizes. One full-size cassette (13x45/16x1") contains 750 g and will control 1 m³ of space (i.e. 35.31 ft³.) Half-size cassettes are 13x4 5/16x7/8" and contain 400g. Cassettes are much easier to handle than loose regular gel in bags, and create less dust. (Card used for cassettes is thin, however, and crushes easily.) Can be ordered preconditioned to a specific RH: 40-70% at intervals of 5% [2]

- **Damp-Rid**

Calcium chloride flakes in a refillable plastic container act as a mini-dehumidifier. Helps prevent mildew, mould and musty odours. Not reusable, and will not absorb as much moisture by weight as silica gel, but has the advantage of not creating dust and therefore not requiring special handling. [1] It may be cheaper to order anhydrous calcium chloride from a scientific supply house. [11,12,13,14]

Micro-Climate Generator (N.B. These may not be in production much longer.)

For control of up to 600 ft³ (17m³). Electrically operated machine continually recirculates air in a display case or storage cabinet. Removes stratification problems associated with silica gel, and is maintainable without destroying the conditioned environment. Machines are equipped with optional datalogging and remote control. "On-screen" readout enables easy monitoring of case environment. Touchpad electronic control can be used to increase or decrease RH in gradual steps for extremely sensitive items, or for use in conservation treatments. [5]

Humidity Control Unit

Controls up to 5,000 ft³ (142 m³). Two individual machines in combination, set at different humidities can control a total of 10,000ft³ of display space or cabinets at a range of humidities achieved by controlling access pipe diameter. Positive pressure system reduces the effect of leaky cases. [5]

Humidity and Temperature Monitoring

Monitors for humidity and temperature vary widely in cost and degree of accuracy, from simple indicator strips costing a few cents, to sophisticated electronic monitors which may cost \$2000.

- Humidity indicator card**
 Most usual type has nine squares corresponding to 10% changes in relative humidity. Colour changes from blue (dry) to pink (humid.) Quick and inexpensive guide to RH change, but not especially accurate. Use with bagged silica gel instead of the indicating gel. Standard card is 4" x 1" with a pressure-sensitive backing, and indicates current humidity levels. A maximum RH indicator (4" x 4") also registers the highest humidity reached, but this feature is non-reversible. [1,2] A third version is 2" x 3" and indicates current humidity plus temperature in both Celsius and Fahrenheit. [1, 2, 28]
- Hydriion strip**
 A tear-off paper strip which indicates RH by comparison with a colour chart. Strip should be replaced every 10-14 days. One dispenser contains enough for 200 strips. [1]
- Dial thermohygrograph**
 Provides an instant indication of the current RH. Can be used for general room conditions, or placed in a display case. More accurate than RH strips, but less expensive models can still be inaccurate. For preference, choose one which is calibratable, and check the calibration regularly. Available in a variety of styles and sizes, with or without temperature indication. Arden model is 1 x 1 x 9/16", calibratable (kit sold separately), with two dials plus a row of indicator squares, and a paintable casing. [1,3] Others are up to approx 4" diameter, with both temperature and humidity scales on one dial, but with two separate needles. [1,2,3,4,13,20,21...]
- Digital indicators**
 Comments similar to those for dial thermohygrograph. Less expensive models are not usually recalibratable, and are less accurate. Since they rely on battery power, they cannot usually be used inside display cases unless easily accessible. [1,2,3, 20,21.....]
- Sling psychrometer**
 A manual or battery-operated humidity gauge which uses a wet-and-dry bulb thermometer pair. RH reading must be determined by using a sliding scale or graph. Properly operated, should be extremely accurate, but readings drift quickly once the swinging or electric fan stops. Only useful for RH determinations in open areas, not for display cases. Battery operated is 10x4x1"; pocket size is 5/8x1 5/8x 6 7/8"[1,2,3,13,20,21...].
- Electronic RH/ temperature probe**
 Available in a variety of styles and levels of accuracy, with assorted additional features. Typically have a rigid probe on a cable, which can be used for spot readings, or can be inserted through a probe-hole (see Misc. section) to read conditions inside a display case without disturbing the climate control. Calibration should be checked regularly. [1,2,6,21,13,20...]
- Recording thermohygrograph**
 The old classic drum-style chart recorder. Still useful for an instantly visible continuous reading over a period of one day, one week or one month, depending on the chart selected. Drum type or circular. [1,2,3,13,20.....]
- Datalogger**
 Battery powered continuous passive electronic monitoring and storage of RH and temperature readings. (Battery is lithium-type, built into the unit, and does not need to be changed.) Most models need to be downloaded to a PC running suitable software to see the results, but can then produce graphs and charts in various forms. A few have direct printout of numerical readings. Small enough to be placed inside a display case. Some come with remote probes to enable simultaneous monitoring inside and outside an enclosure. Variety of prices and levels of sophistication. [1, 20,10....]

Air Quality Control

Scavengers and filters

Unwanted contaminants in air (such as hydrogen sulphide, carbonyl sulphide, hydrogen chloride, sulphur dioxide, nitrogen dioxide, formaldehyde, formic and acetic acids) can be removed or reduced by employing a material often known as a scavenger. A scavenger can be used actively, as when a filter is inserted into the air flow, e.g. in a heating duct, so that all incoming air has to pass through it, or passively, as when the scavenger material is simply placed into a sealed enclosure with the object or specimen to be protected. The scavenger may work by simply binding the contaminants to its surface, or it may enter into a chemical reaction to remove the unwanted gases from the atmosphere. Some are fairly specific to one particular contaminant, others are more broad-ranging.

- **Activated charcoal**
Recommended as an all-purpose scavenger for a wide range of contaminants. Consists of small pieces of specially treated charcoal, most easily used in a filter through which incoming air is blown. If loose charcoal has to be handled in order to fill filter enclosures, dust from the charcoal may be a problem. Probably the most efficient overall scavenger material. [11,13, other chemical suppliers]
- **Purafilter**
An example of a two-layer filter, impregnated with activated charcoal, potassium permanganate and activated alumina. Removes many contaminants. Easier to handle than loose charcoal, and now has a saturation indicator. [22]
- **Charcoal cloth**
A woven cloth impregnated with activated charcoal, on a non-woven backing. Useful for lining a box or for wrapping. Said to be 5-10 times more effective by weight than granular charcoal. Charcoal dust falling from the cloth may be a problem in some situations. [1,27]
- **Pacific Silvercloth**
Specific for hydrogen sulphide. Consists of fine silver particles embedded in a brown woven cotton cloth. When used for wrapping artifacts, it intercepts tarnish-causing gases before they reach the artifact surfaces. Used as a backdrop or a shelf liner, it may be slightly less effective, but several institutions report good results over periods of time. Most typically used for silver flatware. 38" wide, in 3yd, 15yd, rolls [1,2,3, possibly try places such as jewelers or fine china stores for small quantities]
- **Ageless** ♦
An oxygen scavenger. Uses an iron oxide-based powder to remove oxygen from a sealed enclosure. In the short-term it can be used to kill insects and eggs without pesticides or freezing. In the long-term, it controls storage for oxygen-sensitive objects. Double-bagging with a good barrier film is recommended, with Ageless added to both bags. Available in various sizes to absorb oxygen from 500-10,000 ml of air. [18]

Barriers

Polyethylene sheet is an inexpensive, frequently-used, all-purpose barrier material, but in practice it is not an especially good barrier, either for water vapour, or for blocking gases. For use with silica gel, Ageless ♦ and other scavengers, or for insect extermination, other barrier sheets may be more effective. Barrier films are typically laminates of two or more materials, often with polyethylene as an outer layer on one or both sides, since polyethylene is easily heat-sealable.

- **Marvelseal** ♦
A laminated material containing a layer of aluminum. It is heat sealable to itself and to surfaces such as plywood, which makes it useful for sealing acidic surfaces against acid migration, or for creating passive RH controlled containers. Provided the Marvelseal remains intact, it provides a good barrier to offgassing of organic gases, etc. Stapling is often mentioned as a means of application, but staples destroy the integrity of the barrier and should be avoided if possible.

Alternatively, staple punctures may be covered with foil sealing tape (see below.)

Marvelseal 360 is a nylon/polyethylene/aluminum foil/polyethylene laminate. It requires a certain attention to ensure that the heat sealing is properly achieved. 48" wide rolls, 10' or 50'. [1,2]

Marvelseal 470 is a polypropylene/polyethylene/aluminum/polypropylene laminate which heat seals more easily than Marvelseal 360 but is less resistant to accidental puncturing. [1]

- **Corrosion Intercept**

Heat-sealable barrier film consisting of finely divided copper particles bonded into a polyethylene sheet. When used for encapsulation or as a bag, the copper in the matrix reacts with and neutralizes corrosive gases such as hydrogen sulphide, sulphur dioxide, hydrogen chloride, before the gases can contact the artifact within. Protects silver, copper, bronze, brass, tin, iron, etc. It has a built-in saturation indicator, in that the material turns black when its protection is exhausted. Said to give 10 years of protection per 1 mil thickness. Can also be used to protect textiles, paper, books, etc. Available as zipper bags in a variety of sizes from 2 x 2" to 20 x 24" (2 x 2" has one clear side for easy visibility of contents), pouches, and in roll form, 48" x 150'. [1,2,18]

- **Aclar**

A barrier sheet based on polychlorotrifluoroethylene (PCTFE), consisting of layers of polyethylene/ PCTFE/ polyethylene/ polyethylene terephthalate. [18]

- **EVOH**

A heat sealable barrier film derived from ethyl vinyl alcohol. Strong, flexible and transparent. Low moisture and oxygen transmission. Less subject to 'pinholing' than foil laminates, and has the advantage that the contents are visible. Currently the laminate consists of nylon/ethyl vinyl alcohol/polyethylene, but the constituents may change with evolving technology. 4.0 mil film. [18]

Documentation and Labelling

- **Archival file folders and envelopes**

Acid-free card-stock, lignin-free. May or may not be buffered. Use unbuffered for photographs. Wide variety of styles e.g. sample folders, folders with Mylar ♦ covers, open 1,2 or 3 sides, 4-flap enclosures, etc [1,2,3]

- **Polyester sheets and envelopes**

Mylar ♦ sheets, envelopes and page protectors have been used for encapsulating fragile items, using heat sealing or double sided tape (see below). Crystal clear plastic allows for easy viewing. The relative impermeability of mylar insulates the contents from outside conditions, but at the same time, an acidic item is then sealed in its own microclimate and may continue deteriorating. The static charge built up on Mylar may also negatively affect a fragile item if the encapsulation should be undone at a later time. Usually 2,3, or 4 mil. [1,2,3]

- **Tyvek ♦ envelopes**

Spun-bonded high-density polyethylene fibres. Acid-free, inert, resists water and chemicals, will not tear. 6 ♦ x 9 ♦ to 11 ♦ x 14 ♦" [2]

- **Print File ♦ sheets**

Polypropylene sheets for storage of photographs, slides and negatives in a wide range of formats. Pages can be laid on a light table for easy viewing. Some are punched to fit in standard three-ring binders, some designed for hanging files, or with cardstock header for filing or mailing. [1,2,3, local camera or photo stores.]

- **Perma-Saf ♦**

Alternative polypropylene photographic storage system. N.B. Perma-Saf pages fit only their own

binders - they cannot be used in a standard three-ring binder (unless extra holes are punched.)
Or use with hanger bars. [1,2,3]

- **Saf-T-Stor**◆

Rigid polypropylene slide storage. Rigidity makes handling and storage easier (these pages can be hung like hanging files, as well as placed in ring binders), and ensures that slide emulsion does not come into contact with storage page, but pages are bulkier, slides can be knocked out of their holders, and are less protected from mechanical damage due to scratching. The design allows air circulation, unlike the Print File pages. Less transparent than Print File pages. 9 1/2 x 11". [1,2]

- **Saf-T-Sleeves**

Individual sleeves holding one slide each. [1,2]

Labels

- **Artifact ID tags**

Acid-free paper labels with a string for tying to specimens or containers. ◆ x_ to 3◆x1◆"[2,3]

- **Resistall**

Byron Westall Resistall paper. 100% cotton fibres treated for longevity and superior wet strength. Not acid-free. Used for "wet" natural history collections (alcohol or formaldehyde.) 28 and 36lb weights. Several formats from full sheets to perforated labels. [1]

- **Tyvek**

Spunbonded high-density polyethylene "paper", e.g. 6060 or 1073D grades. Lighter, tougher and longer lasting than paper. Can be written on with pencil, pen, marker. Will not tear when wet, therefore popular with archaeologists and for wet specimens. pH 6.4-6.7. May have antistatic agent incorporated or as a coating. Strong, will not support mould growth, low-linting, lighter and much tougher than paper. [1,2 - with eyelet]

- **Self-adhesive foil backed**

Paper label with a self-adhesive backing. The two layers are separated by a layer of aluminum foil so that ink from the label cannot contaminate the substrate, and the adhesive cannot affect the ink. Range of sizes from ◆x1" to 3x4". [1,2,3]

- **Pigma pen**

Permanent pigmented ink for labelling. Waterproof, no fading or discolouration under direct sunlight. However, tip wears out rapidly when used on rough surfaces such as rocks and fossils. [1,2,3, art supply stores]

- **Identi-pen**

From same manufacturer as Pigma pens. Fine point fibre marker on one end, extra fine plastic tip the other. Writes permanently on metal, glass, ceramics, rubber, fabric, resin-coated photographs, etc. Removable from non-porous surfaces using mineral spirits. [2]

- **Staedtler Lumocolor**

permanent pen More durable tip than Pigma pen. Pigment washes off with alcohol. [Stationery stores]

Storage, packing, and wrapping

Pre-fabricated boxes and trays

- **Cardboard**

Available in a range of styles and sizes; buffered and unbuffered; acid-free and not; lignin-free or with a lignin-free liner; telescope, drop-front, clamshell, with or without a window in the lid; with

partitions, etc, Mostly 40 or 60pt board, tan or blue-grey. [1,2,3, or contact local box manufacturers]

- **Plastic**

Two types are particularly useful: a) those made from corrugated polyethylene and/or polypropylene, such as Coroplast♦ [1, 2]; b) ordinary Rubbermaid-type, which are good off-the-shelf storage containers. [4] Smaller, lighter weight boxes or trays, such as those developed by the Canadian Museum of Nature and made from polyethylene terephthalate, may be useful for storing small specimens. [30]

Make-your-own boxes

- **Coroplast♦**

Extruded fluted twin-wall sheet (also known as polyflute), composed of 90% food-grade polypropylene and 10% polyethylene, looking like a plastic version of corrugated cardboard. Usual size is 4'x8' sheets in a range of colours, thicknesses and densities. The uncoloured translucent is marketed as "archival", and said to be free of colouring agents, anti-static and ultraviolet inhibitors. (For this reason it is not recommended for use where it will be exposed to sunlight and may degrade.) However, the colourants are stable, so coloured Coroplast is also acceptable, though be careful that coloured sheets have not been treated to accept printing. Easily cut with a knife and straight-edge. Boxes can be constructed by screwing, rivetting, stitching, tying with cotton tape, glueing with hot-melt glue (see below), or using staples or plastic fasteners (see below.) Refer to CCI Technical Bulletin #14, Working with Polyethylene Foam and Fluted Plastic Sheet for detailed suggestions on construction. 2-10mm thicknesses available. [1,2, 8, or local plastics supplier or fabricator] Also available with Corrosion Intercept or Static Intercept protection. (See Corrosion Intercept in Barrier section above.) Has built-in saturation indicator, and is said to offer 15-20 year protection for non-ferrous metals. N.B. Channels in Coroplast may provide habitat for insects.

- **Hi-Core♦, Cor-X♦**

Similar to Coroplast.

- **Foam cored board**

e.g. Fome-Cor♦. Neutral pH paper on both sides of an extruded polystyrene foam core. Regular or acid-free, 1/8", 1/4", 3/16", 1/2". Can be glued or taped. Light weight support panels, or for framing or displays. [1,2,3, local art supply stores]

- **Gatorplast♦**

Has the outer skin as well as the foam core of polystyrene. [31]

- **Corrugated acid-free board**

Blue or grey, pH neutral, acid-free, lignin-free. Most grey boards are buffered with 3% calcium carbonate, so a lining or padding must be used for proteinaceous materials. Available in sheets or as pre-made boxes, single or double wall or cross direction construction, 1/8" or 1/4".

Tradenames are Permec♦, Perma/Dur♦, Bi-Corr♦ [1,2,3]

- **Acid-free mattboard**

Several thicknesses. White or off-white. Useful for support, or for dividers, or for small trays. See comment on terminology above. [1,2,3, art supply stores]

- **Hot-melt adhesive**

Solid rods, used with a hot glue gun. Almost always polyethylene/ethylene vinyl acetate. Can be applied in 'blobs', then remelted with an iron or heated spatula if necessary. Do not use directly on specimens. Good for adhering polyethylene foams, paper, board, textiles, Tyvek. Examples are 3M #3764, Bostik #6363, Evo-stik #7702, but most glue sticks available at hardware stores, art stores are acceptable.[1, local hardware, art stores]

- **Monel♦ staples**

Corrosion-resistant staples. Mostly nickel and copper, with small percentages of carbon, manganese, iron, sulphur and silicon. [1,2,3]

- **Plastic fasteners**

Two-part nylon rivets for construction of boxes, trays, etc. May be known as nylon adjust-a-lock. One part is inserted through the box layers, and the second screws into it. [4]

Tapes

- **Cotton twill**

May be called labelling tape. Strong, inert twill-woven tape, white or unbleached, for tying specimens to boards, or for constructing boxes, etc. Can also be used for labelling on textiles, by marking with permanent acid-free pen, or using typewriter, then sewing on label. 1/8 to 1" wide. [1,2,3, sewing supply stores]

- **Tying tape**

Cotton tape, softer than twill tape. Bleached or unbleached, ◆-_" [1,2,3, sewing supply stores]

- **Gummed linen**

Neutral pH adhesive, reversible with water. 1/8"-3" widths, water-activated. Good tack. 65/55 thread count. Used for hinges and repair work. [1,2,3]

- **Self-adhesive linen**

Neutral pH acrylic adhesive. Non-yellowing. Good for hinging. Useful for box and tray construction; mounting botanical specimens to herbarium sheets. 1◆". [1,2,3]

- **Double-sided tape**

3M◆ #415. Transparent acrylic-based adhesive on both sides of a polyester carrier. Inert, non-yellowing, reversible with solvents, pressure sensitive. Adheres paper, board, sheet plastics, expanded foams. _- ◆"[1,2,3, local art supply stores]

- **Filmoplast◆**

Usually used for archival repair, but might also be useful for constructing folders for specimens. Pressure-sensitive adhesive. Paper and adhesive both buffered with calcium carbonate. High tear resistance, high tack. Will not harden, dry out or discolour. Water-reversible. P90, P91 are long-fibred. P & P1 are translucent, short-fibred. P1 and P91 are toned off-white. 3/4" [2, 1 (90,91), 3(90), possibly art stores]

- **Foil sealing**

Acid-free, acrylic adhesive. Use for sealing punctures or covering staples in Marvelseal◆. 1◆, 3◆" [1]

- **Frame-sealing**

Perma-Saf◆ stock with foil layer and non-yellowing acrylic adhesive. White or blue-grey. 1◆, 3◆" [1, 3]

Interleaving/ wrapping/lining

- **Polyethylene bags**

Zippered bags (e.g. Ziploc◆) are often used for storage of small items. PE is not an especially good moisture barrier, though it is often suggested for that purpose, but nevertheless, bags used for storage should not be sealed, as a sudden change in temperature may cause a drastic alteration in RH. [1,2,3, jewelry suppliers; thin ones from grocery stores]

- **Acid-free tissue, unbuffered**

Recommended for many applications - interleaving, wrapping, stuffing, lining. A single sheet does not provide much protection against acid migration, however, and if used for this purpose with no other barrier, the tissue will have to be changed at regular intervals. Sheets or rolls. 0.001" [1,2,3, art stores]

- **Acid-free tissue, buffered**
Provides a somewhat greater protection against acid migration, as each sheet contains calcium carbonate as an alkaline reservoir. A typical level is 2-3%. Some types have a greater percentage [2 - 25% buffer]. Buffered tissues should be avoided in the case of proteinaceous and photographic materials. Minimum pH 8.5. [1,2,3]
- **Acid-free glassine**
pH-neutral, transparent, smooth, non-buffered sheets. Often used as interleaving, e.g. between herbarium sheets. Included here because of its prevalence, but not recommended. Method of manufacture means that it has been heavily beaten, which breaks fibres and hastens degradation. No salts, additives or chemical surface treatment. Moisture also allows softening of the surface, and possible embedding. Min pH 6.8. Sheets or rolls or envelopes. [1,2,3]
- **Blotting paper**
Good heavy-weight lining paper. Buffered or unbuffered. [1,2,3, probably art supply stores]
- **Foil-backed shelf liner**
Like Marvelseal, a good barrier against acid migration from wooden shelves or drawers. Aluminum foil with buffered paper layer. 25" wide roll. [1]
- **Polyfelt**
Like a thick felt. 100% polyester, thermally bonded, therefore no resins. Useful for lining containers, cushioning in drawers, stuffing. Polyfelt. $\frac{1}{8}$, $\frac{1}{4}$ " thick, in sheets and rolls. [1]
- **Polyester batting**
As used for crafts, quilts, etc. Comes in two forms, one of which has the fibres thermally bonded and is safe to use; the other uses resin for bonding, and should be avoided. Useful for lining and cushioning for fragile objects, or as a substitute for cotton in stuffing. It is non-hygroscopic (i.e. it will not absorb water) and therefore is a better stuffing material in conditions of high humidity. In bundles or sheets. [1, fabric stores, craft stores]

Sheet materials for barriers or dust-covers

- **Polyethylene**
Inexpensive, inert. There has been much debate over whether additives in polyethylene, such as slip agents, may be a source of potential problems. A particularly cloudy film may suggest the presence of slip agents, but polyethylene tends to look cloudier with increasing thickness. For general storage and dust covers, where sheet is not in contact with specimens or artifacts, it may not matter, but for more critical uses, specify high-grade polymer, e.g. food-grade, with no recycled content. [Plastic sheet suppliers, possibly hardware stores or building suppliers, but beware of quality]
- **Mylar** ♦
Polyethylene terephthalate (polyester), also used for page protectors, encapsulating sleeves, etc. Crystal-clear, unlike polyethylene. Neutral pH, no plasticisers. A better oxygen barrier, but a less good vapour barrier than polyethylene. More stable than polyethylene, but easily generates a static charge. For this reason, do not use Mylar in connection with powdery or friable artifacts. Various thicknesses, also pre-folded or heat-sealed packets or envelopes, or on rolls. Useful as lining for drawers if covered with tissue, or as dust cover. With thicker sheets, beware of sharp edges and corners. 1.5-5 mil, sheets or rolls. [1,2,3, art supply stores]
- **Reemay** ♦
100% spunbonded polyester sheet, acid-free. Has random fibre orientation, therefore will not pull or stretch. Provides a strong support when immersing objects, or for interleaving, lining or backing. Does not stretch when wet. 4-15mil. [1,2, fabric stores, known as interfacing or Pellon]
- **Hollytex**
Similar to Reemay (see above) - 100% polyester, non-woven support material. Smoother than Reemay, and with greater tensile strength. 4,8,12 mil [2]

- **Nylon gossamer**
100% nylon filaments, non-woven. Resistant to mildew. Good light and dimensional stability. High tear resistance and tensile strength. Good adhesion characteristics. 3 mil [2]
- **Tyvek**◆
Spunbonded high-density polyethylene fibres. Soft grades e.g. 1433R, 1422A handle like fabric and are used commercially for disposable protective clothing because the fabric allows the passage of water vapour while blocking water, dust, dirt, etc. The material is inert, gas-permeable and non-abrasive, water and dust-proof. Flexible, strong, soft and smooth. Heatsealable or stitchable on a conventional sewing machine using cotton or polyester thread. Useful for protective covers, shelf lining, padded hangers, etc. N.B. Most grades have an antistatic coating applied to repel dust, and may be treated to enable printing. 60" wide. [1,2, or try garment manufacturers for ends of rolls]
- **Nomex**◆
Soft packing material made from aramid fibre. Soft, smooth surface, flame resistant. Chemically inert, highly permeable to air and water vapour. Resists dust. Does not support mould or mildew. Can be taped, sewn, or glued with hot-melt adhesive. [1]
- **Dartek**◆
Cast nylon film. Soft and transparent. No plasticiser, additives or surface coatings. Useful as a barrier layer or dust cover. Does not puncture easily. Use tape or heat sealing or hot melt glues. 0.075" thick [1]
- **Unbleached cotton**
Sometimes known as crash cloth, muslin (especially thinner types) or ticking. Off-white woven cotton fabric in various weights and thread counts. Useful all purpose cover/wrapping/stuffing. May contain sizing, so wash before use. Dust covers, cloth bags, barrier for abrasive substrates such as ethafoam. [Fabric stores]

Structural materials

- **Polyethylene foam**
Extruded closed-cell foam, e.g. Ethafoam◆, Sentinel, Volara◆, Cell-Aire◆. Inert, moisture and chemical resistant, energy absorbent, light-weight. Variety of densities and thicknesses from 1/32" to 4". Easily shaped by cutting or sawing or filing. In thicker planks, cut edges can be abrasive and may need to be lined. Useful for support and cushioning, e.g. in packing crates, for storage. Thin sheets useful for lining drawers or shelves. Can be glued with hot-melt adhesive or welded with hot air gun. Use white or black, avoid pink (anti-static) or blue (probably recycled.) [1,2, 26, local plastics suppliers]
- **Volara, Foamflex**
Closed-cell polyethylene foam, crosslinked by electron irradiation, giving a smooth continuous surface. Typically denser than Ethafoam, with much smaller bubbles, providing a very smooth, non-abrasive surface, even when cut. Excellent chemical resistance, low water absorption, superb thermal insulation. Useful for pinning trays, cushioning, lining boxes, etc. Available in 1/8", 1/4" and with an acrylic adhesive backing, but adhesive has not passed stability tests. [1]
- **Bubble pack**
Fused polyethylene sheets containing air pockets. e.g. Astrobubble [2], 3/16" bubble, perforated every 12". Fine for short term packing. Probably not advisable for longer term - vapour permeability of polyethylene means that bubbles flatten under weight of object. It is probably best to avoid forms of bubblepak in which bubbles are lined with PVDC in order to reduce air loss. [32]
- **Polystyrene 'peanuts'**
Come in a range of sizes, shapes and colours. Watch out for 'peanuts' made from cornstarch, which may be mixed in with polystyrene. They dissolve/collapse with water, and also provide a handy food source for pests. [32]

- **Ethafoam** ♦ **crystals**
Shredded ethafoam. Useful as packing material or to create display "pillows". [1]
 - **Polyethylene foam rod**
Not to be confused with polyurethane backer rod, which should not be used. This is a cylindrical version of ethafoam, i.e. closed-cell polyethylene foam, extruded as rods. Useful for supporting artifacts gasketing, padding. May also be useful for plugging sample vials. Archival safe, closed-cell PE foam, extruded as rods. 1/4" to 2". Doughnut supports, gasketing, padding, plug for vials. Fairly compressible, flexible and chemically inert. Hot glue gun or hot air to join. 1/4" to 2". [1, local hardware or building supply stores]
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Pest Control

A variety of traps and lures is now available [1,2,33]:

- **Sticky sheet traps**
Trap flying insects for monitoring purposes.
 - **Monitoring traps**
As above, for crawling insects.
 - **Pheromone lures**
e.g. Storgard. Targeted at a specific species, e.g. clothes moth, cigarette beetle. Designed to use the pheromones of a male/female to attract the other gender.
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Handling and safety

Gloves

Gloves may be advisable when handling artifacts and specimens, both to prevent oils from the skin contacting the object, and to prevent dust, pesticide residues or solvents from contacting the skin of the handler. Consult Materials Safety Data Sheets for appropriate protection from specific materials.

- **Vinyl**
Lightweight, disposable, available powdered or unpowdered. Fine for general handling, to keep skin oils off artifacts and dust off hands. Not resistant to some chemicals.
 - **Latex**
Lightweight, disposable, stretchy, available with or without powder. Beware of latex sensitization - some people are allergic to latex. Also not resistant to some chemicals, though resists different ones than vinyl.
- N.B. Beware of powders inside and outside some vinyl and latex gloves. This may transfer to specimens.
- **Finger Cots**
Latex fingertip covers. Provide protection without clamminess from perspiration inside gloves.
 - **Cotton**
Breathable, washable. No chemical resistance at all, and beware of snagging on artifacts. Will not protect from arsenic used on taxidermy skins, for example. Cotton will not necessarily protect specimens from acidic effects of skin, as it can wick the acid out onto the specimen. Wash frequently.
 - **Nitrile**
Combines a chemical resistance similar to that of neoprene with a touch sensitivity almost as

good as that of latex or vinyl. Resists snags and tears. Some types have a smell which may be unpleasant to some wearers.

- **Neoprene**
Heavier weight, good chemical resistance. Reduced touch sensitivity. Use for handling spirit or formaldehyde-stored collections. Hot.

Other specialized gloves available, e.g. Gore-Tex, nylon lint-free, cotton with plastic dots for better grip.

Masks

Single use dust masks, e.g. 3M #1818 or 3M #8710. 1818 is relatively thin. Use only for nuisance dusts. For dusts which may be toxic, or specimens which may have been treated with pesticides, use the heavier 8710, or, better still, a half-face respirator with cartridges. Consult Materials Safety Data Sheets (MODS) for appropriate protection from specific contaminants.

[Wide range of gloves and masks available from chemical suppliers e.g. 12,13,20, and from safety supply sources, e.g. 23, 19, 25]

Miscellaneous

- **Ultra-violet Protection**
Film for application over glass to reduce ultra-violet component of light and hence reduce fading and deterioration. [1,2]
- **Specimen pins**
Black lacquered finish, 37mm, size 1,2,3 [1]
- **Stainless steel pins**
Various diameters, headless [2][Regular from dressmakers supplies, craft stores]
- **Storage jar inserts**
In storing specimens in wet collections, evaporation is an issue. Inserts placed inside standard polyethylene screw-top lids will cut down on evaporation through the lid.
- **Polyethylene tubing**
For making custom-sized heat sealed bags, e.g. for insect extermination. [24, or local supplier]
- **pH testing pen**
e.g. Archivist pen. Helps to determine whether board or paper is acidic. Indicator turns purple at pH 6.8 or above. Clear or yellow indicates acidity. May not be reliable on coloured or coated papers. Use as a general indication only. [1,2,3]
- **Anti-slip foam**
Very thin polyethylene foam sheet used on airline food trays. Useful as a shelf liner where vibration is a problem to prevent items from "walking" on the shelves. Sheets. [17]

References

Managing the Modern Herbarium: An Interdisciplinary Approach, edited by Deborah A. Metsger and Sheila C. Byers. SPNHC. 1999.384 pp.

See the SPNHC Website (www.spnhc.org) for ordering information for this and other SPNHC publications, and other references.