

# Guidelines for Selecting Materials for Exhibit, Storage and Transportation

by

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# Material Which is Compatible with an Artefact

## Definition:

A material which is compatible with artefact may not be absolutely inert, but its instability or the products it gives off may not represent a danger to the artefact with which it is used. Care must always be taken to ensure that the materials are compatible with the artefacts and that the artefacts are compatible with one another.

The compatibility of material with artefacts depends of the following variables:

### Museum objects:

- nature of artefacts
- age and condition

### Material:

- nature of material (chemical composition)
- concentration of chemical products
- age of material
- surface of the material (m<sup>2</sup>)

### Context:

- proximity of the artefact and the material (contact or non-contact)
- air tightness of the environment (open or close system, ventilation and dimension of the system)
- duration of living together
- physio-chemical conditions:
  - cleanness of the artefact
  - relative humidity
  - temperature
  - ultraviolet and visible radiation

There are no absolutes. Whenever possible, discuss your plans with a conservator

## Wood

### Problem with wood:

- acids are released that may damage objects

### General rules:

- no wood is perfect
- avoid direct contact between wood and objects
- substitutes:
  - metal with powder coating
  - galvanized and stainless steel
  - acrylic or glass

### Best:

Wood: aged  
conditioned  
dried  
certain species are less acidic

### Worst:

Wood: green  
unconditioned  
with knots  
certain species are more acidic  
(*e.g.* red cedar; oak; Douglas fir)

## Wood Panel Products:

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### Problems:

- emission of organic acids from the wood
- emission of formaldehyde and acid from the adhesives
- there is less control over the wood species used

### General rules:

- use the best type of adhesives (*e.g.* exterior grade)

### Best Adhesives:

- phenol formaldehyde
- polyurea
- epoxy

### Worst Adhesives:

- urea formaldehyde
- polyformaldehyde
- drying oil
- rubber contact cement

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**Best:**

- *overlaid plywood and plastic-laminated panels*

(These products reduce or stop the release of volatiles from panel faces. Panel edges release volatiles and should be sealed.

Order with the colour that you want.

Specify without urea formaldehyde.)

- plywood with phenol formaldehyde impregnated paper overlays
  - High Density Overlaid (HDO) plywood - *stops emissions*  
(e.g. Crown HDO; Fineform HDO)
  - Medium Density Overlaid (MDO) plywood - *reduces emissions*  
(e.g. Crown 44; Crezon)
- plywood with ABS plastic laminates - *stops emissions*  
(e.g. Multi-Caisses, Inc.)
- plywood with phenolic laminates - *stops emissions*  
(e.g. Arborite; Formica)
- particleboard with factory applied Melamine laminates  
(some colour selections available)
- *unlaminated panels*
  - exterior grade plywood
  - particleboard without urea formaldehyde adhesives  
(e.g. Medex with polyurea;  
and other exterior grade particle boards)

**Worst:**

(These tend to emit volatiles harmful to artifacts).

- interior plywood
- interior particleboards
- waferboard
- chipboard
- untempered hardboard (e.g. Masonite)
- oil tempered hardboard (e.g. tempered Masonite)
- fiberboards

## **Papers and Cardboards**

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### **Problem:**

- acids released may damage objects

### **General Rules:**

- choose products that are labelled acid-free
- *substitute:*
- non-woven, spunbonded, polyethylene (PE) sheeting (Tyvek)

### **Best:**

- acid free tissue paper
- archival quality papers (*e.g.* Permalife paper)
- acid-free mat board
- acid free corrugated paper board
- acid free folder stock (*e.g.* Perma/Dur)
- acid free honeycomb paper panel

### **Worst (acidic products):**

- news print
- Kraft paper
- cardboard
- glassine
- wrapping paper

## Coatings: Paints, Varnishes and Stains

### Problems:

- efficiency as a barrier to volatiles is variable from product to product
- release organic acids, peroxides, formaldehyde, *etc.* at different rates

### General Rules:

- avoid direct contact between coating and objects
- let dry at least one month before using (requires good ventilation)
- avoid:
  - oil-based paints; alkyd paints
  - oil-modified polyurethane varnish
- no coating is a complete barrier but vapour barrier character increases with each layer applied
- *substitutes* for coatings:
  - avoid use of materials that require use of vapour barriers
  - aluminum foil barrier sheeting: completely impermeable if not damaged (*e.g.*, Marvelguard; Marvelseal)

**Best:**

*Low volatiles, medium barrier:*

- acrylic emulsion (exterior or interior)  
(commonly called acrylic latex)
- vapour barrier paint composed of butadiene-styrene  
(e.g. Insul-Aid by Glidden)
- acrylic urethane (fully reacted urethane type) (e.g. Crystalex by Sico)
- vinyl acrylic or modified acrylic
- epoxies or urethanes (two component systems)

*Few volatiles:*

- powder coating (for metals and alloys only)

*Poorer barrier:*

- shellac (e.g. Behlen) (but not bleached shellac)
- alcohol or water-soluble stain (e.g. Goudey)

**Worst:**

*High volatiles:*

- oil-based paints; alkyd paints
- oil-modified polyurethane varnish
- epoxies and urethanes (one component)
- chlorinated rubber paints
- poly(vinyl chloride) (PVC) (for metals and alloys)



## Plastic Products

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### Problems:

- some plastics release harmful degradation products and additives such as plasticizers (phthalate)

### General Rules:

- do not use chlorine-containing compounds, *e.g.* poly(vinyl chloride) (PVC);  
chlorinated rubbers or rubbers containing sulphur vulcanizing agents *mosque!*
- choose acid-free products
- choose:
  - polyethylene (PE)
  - polypropylene (PP)
  - polyester (poly(ethylene terephthalate)) (PET)
  - polystyrene (PS) and modified PS such as:
    - acrylonitrile/butadiene/styrene (ABS)
    - high impact polystyrene (HIPS)
  - acrylic
  - polycarbonate
  - polytetrafluoroethylene (PTFE)

## Sheet Plastics

**General Rule:** The efficiency of the vapour barrier increases with the thickness.

**Best:**

*best barrier:*

- aluminum foil barrier sheeting (e.g. Marvelseal; Marvelguard)

*good barriers:*

- poly(ethylene terephthalate) (PET) (e.g. Mylar)
- polyethylene (PE)
- acrylics (e.g. Acrylite SDP; Plexiglas)
- polycarbonate (e.g. Cryolon SDP; Lexan; Tuffak)
- air-bubble sheeting (e.g. Aircap; Astro-bubble; Bubble Pack; polyCap)
- polytetrafluoroethylene (PTFE) (e.g. Teflon)
- silicone

*substitutes:*

- glass
- Denglax (non-reflective glass)

*excellent barrier:*

- poly(vinylidene chloride) (e.g. Saran)  
(potential problem with Chloride)

**Worst:**

- poly(vinyl chloride) (PVC)
- rubber with sulphur vulcanizing agents
- chlorinated rubber
- cellulose nitrate
- cellulose acetate

## Foams

### Best:

- polyethylene (PE) (e.g. Ethafoam; Polyplank; Polyfoam)
- cross-linked polyethylene (e.g. Plastazote; Volara)
- white, extruded plank (not expanded bead) polystyrene (e.g. Styrofoam)
- ethylene/vinyl acetate copolymers (EVA foam) (e.g. Evazote; Volara)
- polypropylene (e.g. Microfoam)
- silicone

### Worst:

- polyester polyurethane foam (commonly called polyester foams)
- polyether polyurethane foam (commonly called polyurethane foam)
- chloroprene (e.g. Neoprene)
- poly(vinyl chloride) (PVC)
- rubber with sulphur vulcanizing agents *≠ Floorgum*

## Plastic or Foam Boards

### Best:

- corrugated plastic boards (Coroplast; Cor-X; Hi-Core; PolyFlute; Kortek)
- paper-faced, laminated panel board (ArtCor; Fome-Cor)
- styrene plastic faced laminated panel board (ArtCor)
- aluminum sheet laminated to panel board

### Worst:

- urea formaldehyde impregnated paper laminated panel board (Gatorfoam)
- polyurethane foam board
- poly(vinyl chloride) (PVC) foam boards (e.g. Sintra)

## Wires and Tubes

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**Best:**

- Nylon monofilament (fishing line)
- polyester monofilament (fishing line)
- polyethylene (PE) plastic-coated wire
- polyethylene (PE) or silicone tubing
- polytetrafluoroethylene (PTFE) (*e.g.* Teflon)
- glass tubing

**Worst:**

- poly(vinyl chloride) (PVC) tubing (*e.g.* some Tygon)
- rubber tubing with sulphur vulcanizing agents
- chloroprene rubber (*e.g.* Neoprene)

## Adhesives and Tapes

### Problems:

- components of adhesives may be transferred to objects
- adhesives may embrittle, ooze, yellow, become acidic

### General Rules:

- wait at least one month before putting object in a closed system to allow for the evaporation of any solvents.
- avoid direct contact between adhesives and objects
- substitutes:
  - mechanical fastening are preferable then adhesives (e.g. nails, screws, Velcro)

### Best:

- certain acrylics  
(e.g. Acryloid F-10; Acryloid B-72; Acryloid B-82; Rhoplex AC-33; Rhoplex AC-234)
- transparent acrylic adhesive on polyester tape carrier  
(e.g. Scotch Brand Tape #415)
- acrylic contact cements
  
- certain two-part epoxies  
(e.g. Epo Tek 301-2; Hxtal NYL-1)
- certain poly(vinyl acetate) (PVA) emulsions  
(e.g. Jade No. 403; R-2258; Mowilith DMC2)
- certain ethylene/vinyl acetate copolymers (EVA)  
(e.g. Beva 371)
- certain hot melt glues
- animal glues (may stain)
- starch paste (rice; wheat)

### Worst:

- most epoxies
- polysulphides
- most poly(vinyl acetate) (PVA) emulsions and solids  
(e.g. sure-Grip; CM Bond M-2; Bulldog Grip 20 minute resin)
- cellulose nitrate (e.g. Glyptal)
- natural and synthetic rubber cements (most contact cements)

## **Textiles**

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### **Problem:**

- may have finishing treatments that compromise their inherent qualities

### **General Rules:**

- avoid wool products (sulphur-containing protein)
- colour fast to water, solvents and crocking
- wash fabrics before using
- use undyed, unbleached fabrics for storage and packing
- use non-fading fabrics in exhibits

### **Best:**

- unbleached cotton and linen
- polyester: woven, spunbonded (*e.g.* Hollytex; Reemay)
- nylon: woven and spunbonded (*e.g.* Cerex)
- acrylic (*e.g.* Decofelt; Orlon)
- hook and loop fasteners (Velcro)

### **Worst:**

- wool (tarnishes silver)
- fire retardant treatments (disodium phosphate, *etc.*)
- durable press finishes (urea formaldehyde)
- carpets: generally accumulate dust and can house insects
- carpets with rubber based backings

## **Miscellaneous**

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### **Best:**

- glass
- ceramics
- neutral silicone sealant (*e.g.* Dow Corning 795; Silicone GE II)
- rubber sealants without sulphur vulcanizing agents  
(non-contact) (use after 1 month)
- metals (avoid galvanic corrosion)
- pen with acid-free indelible ink (*e.g.* Pigma Pens)

### **Worst:**

- cellulose nitrate
- sand, soil and pebble (contact with salts)
- acidic silicone adhesive and sealant

## Pesticides

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### Problems:

- content of corrosive agents, solvents and other volatile compounds that are harmful to objects

### General rules:

- no contact with object (no sprays)

### Best:

- low temperature
- Bendiocarb (Ficam)
- fumigation with:
  - inert atmosphere (N<sub>2</sub>; CO<sub>2</sub>; Ar)

### Worst:

- fumigation with:
  - Chloropicrine
  - Dichlorovos
  - phosphine



## Control of Volatile Levels and Pollutants

- activated charcoal (6 to 14 Mesh or 1.4 to 3.4 mm)
- silica gel
- anti-tarnish cloth or paper
  
- copper, zinc or silver compounds (*e.g.* Pacific Silvercloth)
- oxygen absorber (*e.g.* Ageless)
  
- wrap object and limit access
  - e.g.* unbleached cotton
  - acid free tissue
  - polyethylene
  - poly(ethylene terephthalate) (Mylar)