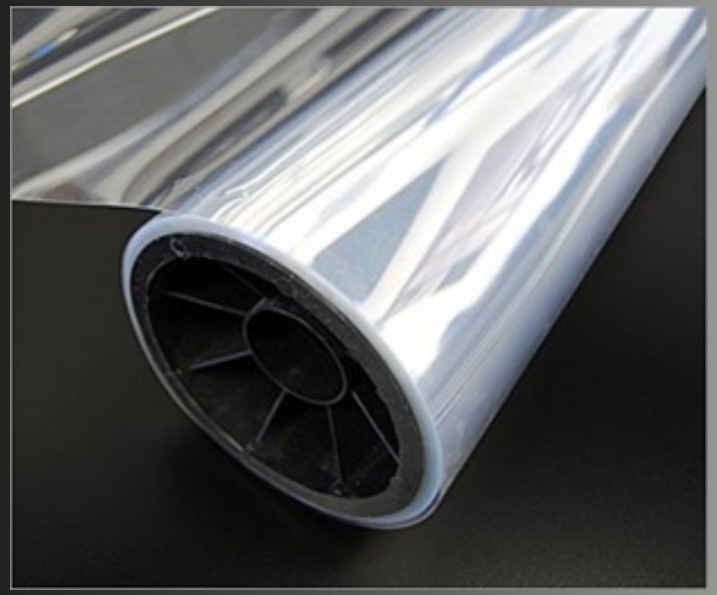
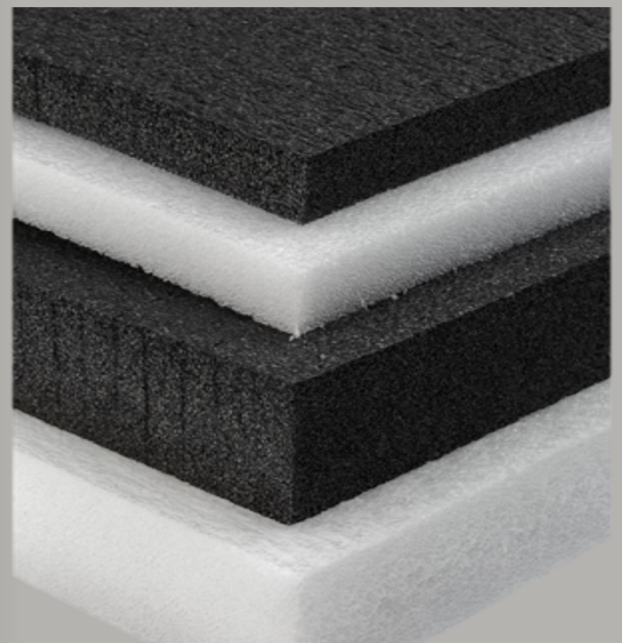


Testing Methods Used to Inform Material Choices for Storage and Display



Connecting to Collections Care

July 9, 2024

Samantha Springer, Art Solutions Lab LLC

Images from University Products

Images by Paola Valentin and Samantha Springer

Samantha Springer

www.artsolutionslab.com

samantha@artsolutionslab.com

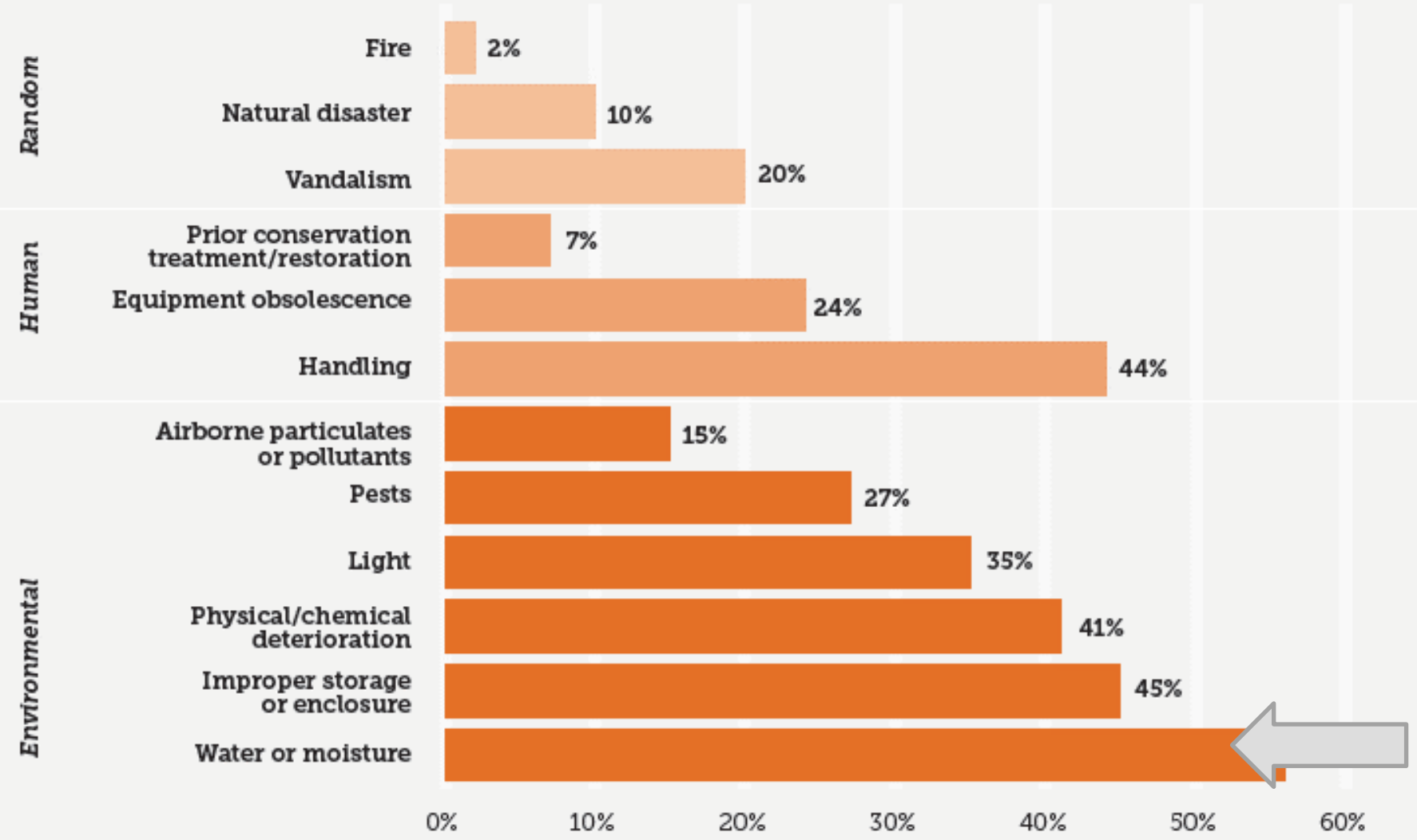
ART SOLUTIONS LAB

OUTLINE

1. Introduction - Framing the challenge
2. Assessing vulnerability
3. Assessing threats
4. Assessing context
5. Evaluating products

Key resources 

Figure 4. Sources of Damage or Loss among Institutions that Reported Damage or Loss in the Past Two Years



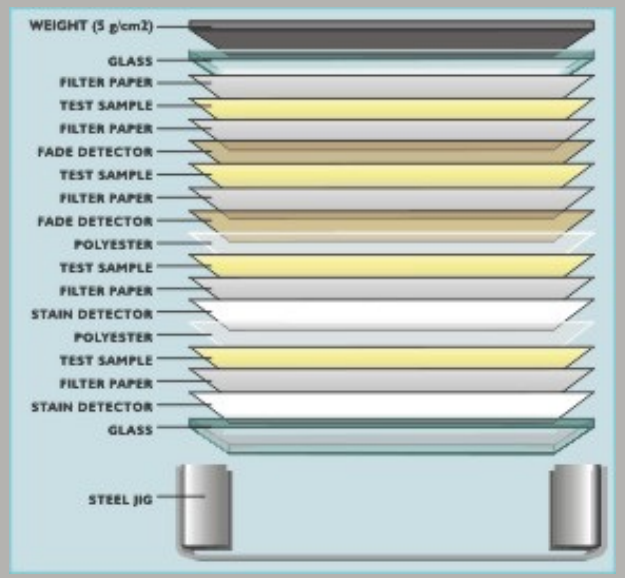
Protecting America's Collections: Results from the Heritage Health Information Survey, 2019. Institute for Museum and Library Services, p.18. www.imls.gov/sites/default/files/publications/documents/imls-hhis-report.pdf

Choosing Materials

To store stuff…

We need to choose stuff…

That won't harm our stuff!



Images courtesy of Becky Kaczkowski, Smithsonian Institution

The Right Stuff

Do we base our choices on…

A. Stability
B. Cost
C. Sustainability
D. Logistics
E. Availability

OUTLINE

1. Introduction - Framing the challenge
2. Assessing vulnerability
3. Assessing threats
4. Assessing context
5. Evaluating products

Contents

Products Used in Preventive Conservation

CCI Technical Bulletin 32 by Jean Tétreault

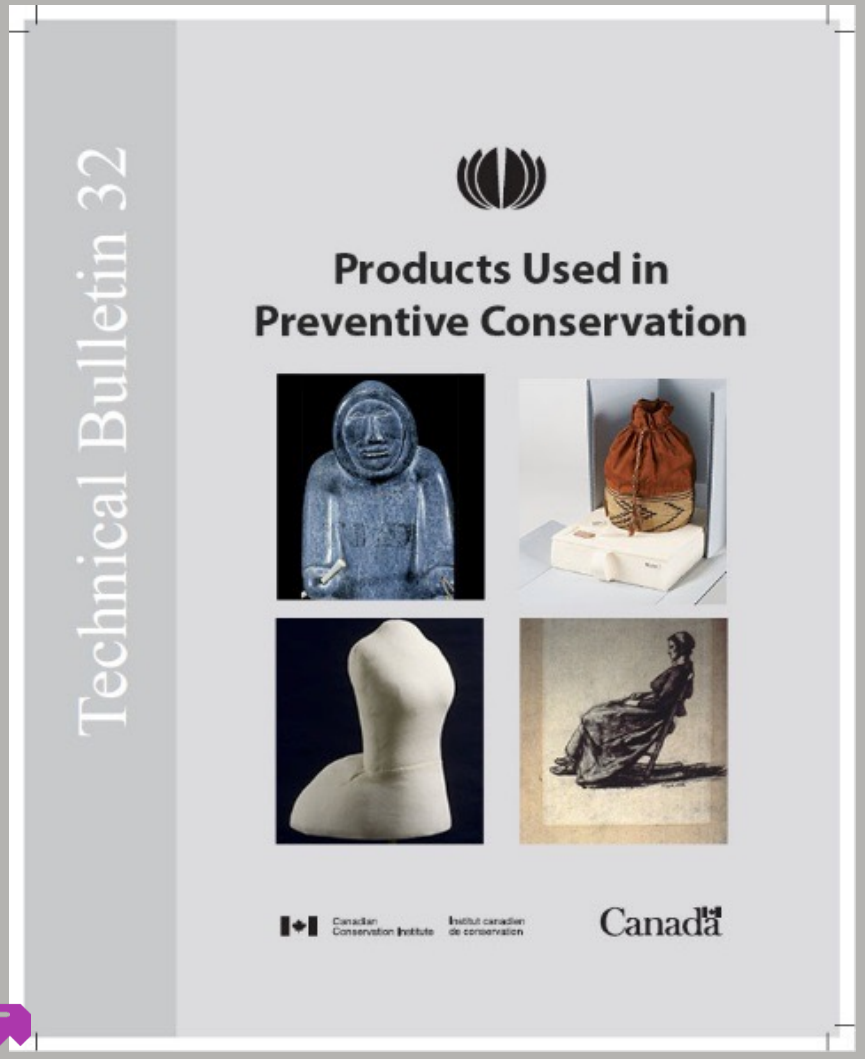


Table 1: vulnerable objects and damage caused by airborne pollutants emitted from products

Objects and types of damage[1]	Pollutants	Products that can release the pollutants
• Lead, zinc and cadmium metals: corrosion • Calcium-based objects (e.g. seashell, egg shell, coral, pearl, limestone): efflorescence • Ceramic and limestone contaminated by nitrate and chloride compounds (e.g. salt): efflorescence • Some colour photographs: fading • Lead glazed ceramics: salt efflorescence on the glaze	Acetic acid	• Wood (oak and cedar being among the most acidic) and wood products (such as plywood, particleboard, cardboards and papers) • Degraded cellulose acetate • Many types of fresh coatings (oil-based paint being the most acidic) • Poly(vinyl acetate) glue • Acetoxy cure silicone sealants (universal type, which release acetic acid) • Vinegar-based cleaning solutions (sometimes labeled as “green” cleaning products) • Some incorrectly washed dyed fabrics
• Copper, bronze and zinc: corrosion	Adipic acid	• Degraded polyurethane ester-type foams
• Cellulose nitrate film or object: crystal growth, disfigurement of image • Linseed oil (e.g. traditional oil paintings): yellowing	Ammonia	• Concrete • Emulsion paints and adhesives • Neutral cure silicone sealants (but some may release ammonia, acetone or alcohol)
• Copper and bronze: corrosion	Benzoic acid	• Degraded plasticizer from flexible poly(vinyl chloride) (PVC)
• Copper and bronze: corrosion • Paper: weakening • Alkali silicate glasses: crizzling • Some colour photographs: fading	Formic acid	• Wood products • Linoleum • Oil-based coatings or any coatings formed by oxidative polymerization

OUTLINE

1. Introduction - Framing the challenge
2. Assessing vulnerability
3. Assessing threats
4. Assessing context
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Pinnacle Polymers

SAFETY DATA SHEET
Polypropylene Pellets/ Resin

SECTION 1: Identification

GHS Product Identifier:	**Polypropylene (PP)**
Product Form:	Pellets/ Resin
Other means of Identification:	Polypropylene Random Copolymer Product Series 5000, 6000 & 7000
Recommended use of the chemical and restrictions on use:	Industrial applications/ Manufacture of plastic articles
Supplier Details:	
Company Name:	Pinnacle Polymers
Company Address:	PO Drawer E One Pinnacle Ave Garyville, La 70051
Email address of responsible person:	Bryan.englade@pinnaclepolymers.com
Emergency Telephone Number:	CHEMTREC: 1800-424-9300 Pinnacle Polymers: 985-535-2983

Section 2: Hazard Identification

Classification of substance or mixture

Classification (GHS – US) Combustible Dust

Label Elements

Signal Word (GHS – US) Warning

Hazard Statements (GHS – US) May form combustible dust concentration is air during processing and handling.

Precautionary Statements

Prevention: Not Applicable

Response: Not Applicable

Storage: Not Applicable

Disposal: Not Applicable

Additional Label Elements This production contains no substances subject to the reporting or planning requirement of SARA Title III.

Dust can irritate eyes.

Pellets may present a slipping hazard.

Melted polymer may stick to skin creating burns.

Static charges and discharges may be produced during product transfer.

Base polymer contains the elements hydrogen and carbon.

Section 3: Composition/ information on ingredients

Substance/ Mixture: Polymer

Common Name and Synonyms: Polypropylene Random Copolymer Product Series 5000, 6000 & 7000

CAS Number: 9010-79-1

Product Code: 5000, 6000, & 7000

Ingredient Name	%	CAS Number
Propene, polymer with ethylene	> 99	9010 – 79 – 1
Proprietary Stabilizers	< 1	Trade Secrets

Section 7: Handling and Storage

Precautions for safe handling

Protective Measures:	Maintain good housekeeping. Avoid spills and potential slipping hazards caused by pellets. Employees may be exposed to engulfment hazards when handling bulk materials. Do not store material near flammable substances. Provide adequate ventilation and dust control measures. Ground and bond transfer equipment and storage containers to dissipate static charges. Do not breathe gas, fumes, or vapors from this product. Wear protective clothing when handling hot or molten material.
Hygiene Measures:	Do not eat, drink or smoke while handling material. Wash hands and face after handling material.
Conditions for safe storage, including any incompatibilities	Avoid storing material near flammable materials. Keep away from strong oxide agents. Store in clean dry areas away from direct sunlight. Ground/ bond containers and transfer equipment.

Section 8: Exposure controls/personal protection

Occupational exposure limits

Ingredient Name	Exposure Limits
Polypropylene (PP) Resin/ Pellets	**ACGIH TLV (United States).** Particulates Not Otherwise Specified TWA: 10 mg/m³ 8 hours. Form: Inhalable Particulates Not Otherwise Specified TWA: 3 mg/m³ 8 hours. Form: Respirable fraction **OSHA PEL (United States).** Particulates Not Otherwise Specified TWA: 5 mg/m³ 8 hours. Form: Respirable fraction Particulates Not Otherwise Specified TWA: 15 mg/m³ 8 hours. Form: Total

Exposure Controls

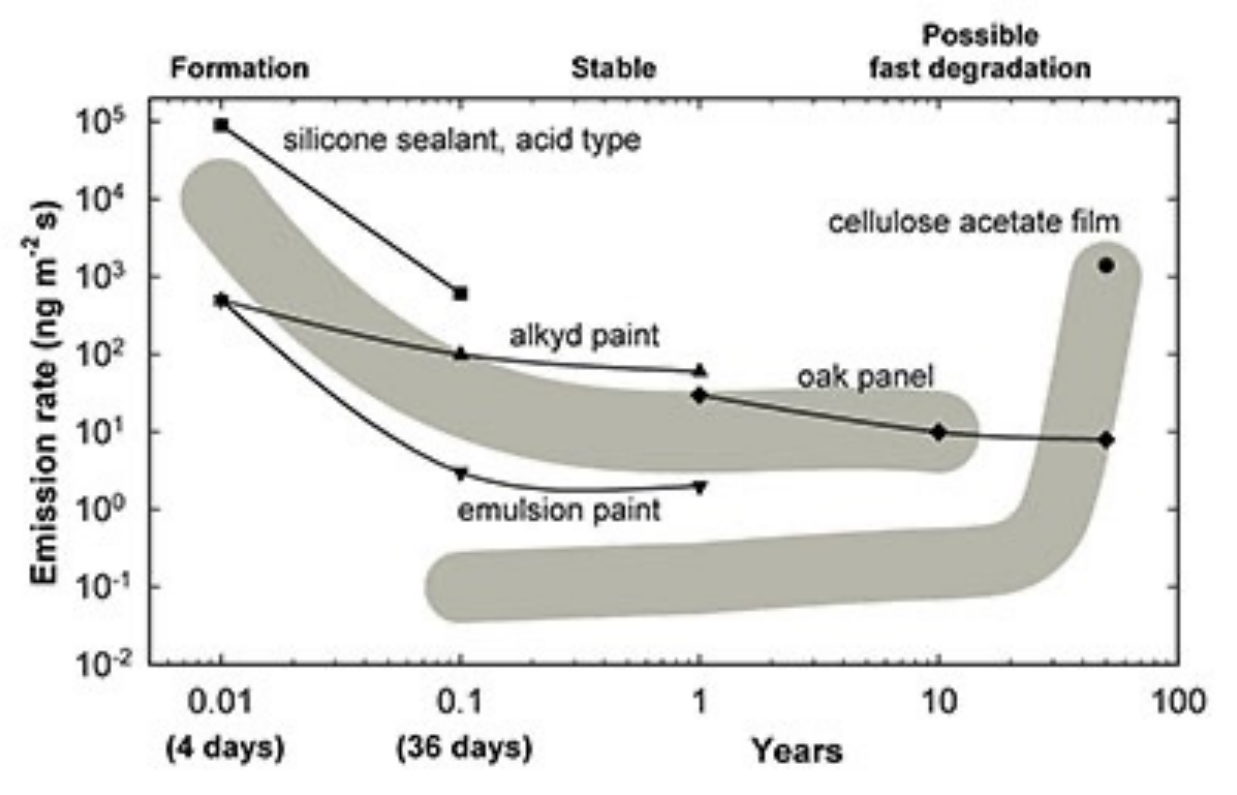
Appropriate engineering controls	Work area should have adequate ventilation. If dust generation occurs during processing, local ventilation should be provided to prevent exposure.
Environmental exposure controls	Ventilation of dust must comply with local, state and federal regulation.
Individual protection measures	
Hand protection	Use proper hand protection when handling hot or molten material to prevent thermal burns.
Eye/ face protection	Safety glasses. Face shield may be need when handling hot or molten material to prevent thermal burns.
Skin and body protection	Wear proper protective clothing.
Respiratory Protection	Respiratory protection may be needed when handling material in areas that do not have adequate ventilation, or if vapors or fumes are present.

Section 9: Physical and Chemical Properties

Information on basic physical and chemical properties

Physical State	Solid
Appearance	Pellets/Resin
Color	Translucent, opaque, or white
Odor	Odorless
Odor Threshold	No data available
pH	No data available
Melting Point	144° C to 165° C
Boiling Point	No data available
Flash Point	No data available
Evaporation Rate	No data available
Flammability (solid, gas)	No data available
Lower and up flammability or explosive limit	No data available

Threats



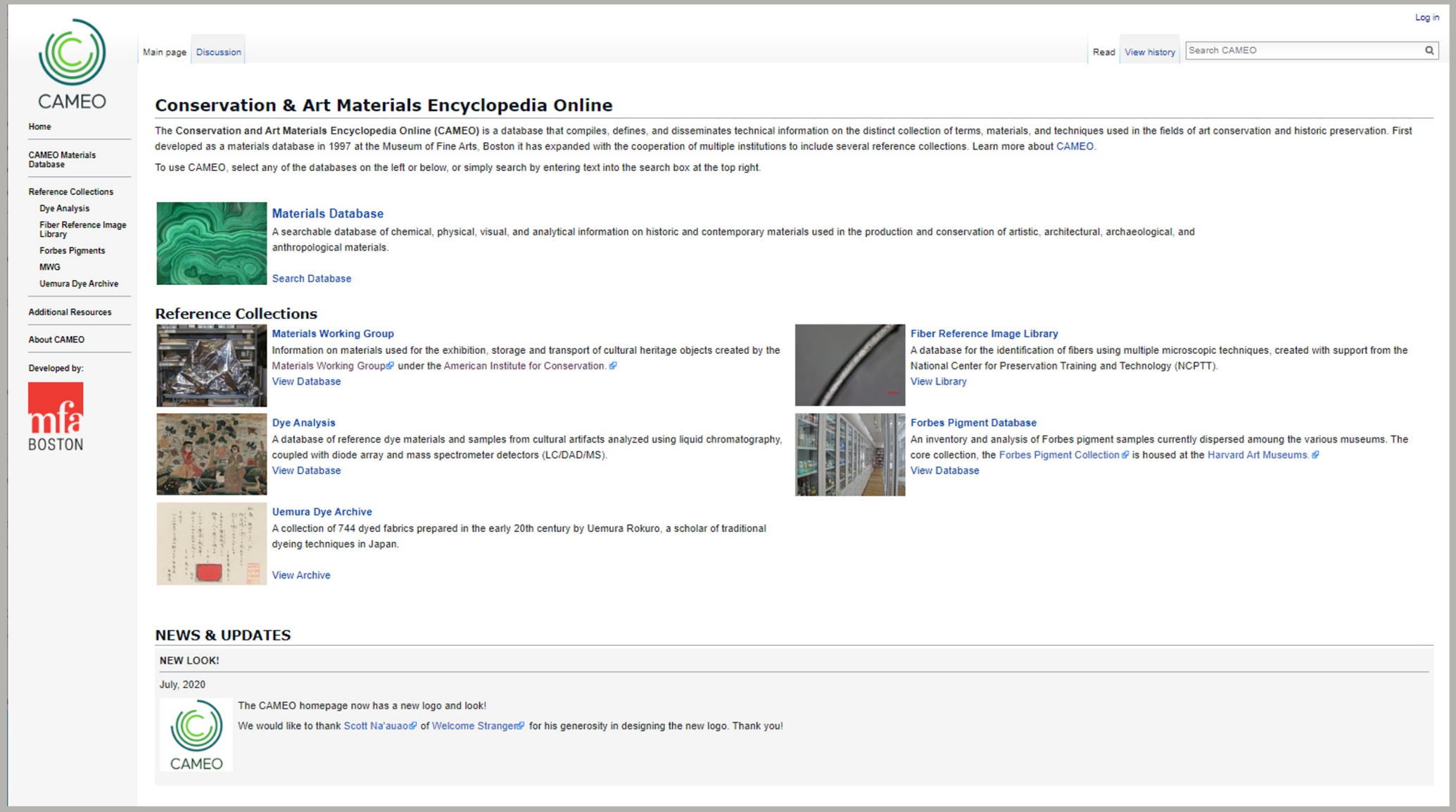
1. Chemical composition
2. Physical properties
3. Changes over time

Emission of acetic acid from products over time.

Image: Figure 2, © Government of Canada, Canadian Conservation Institute. CCI 120171-0003 https://www.canada.ca/en/conservation-institute/services/conservation-preservation-publications/technical-bulletins/products-used-preventive-conservation.html#a2c2

CAMEO

http://cameo.mfa.org/wiki/Main_Page



CAMEO

Home
Cameo Materials Database

Reference Collections
Collections
Asian Textiles
Dye Analysis
Fiber Reference Image Library
Forbes Pigments
Fact Sheets on Exhibit & Storage Materials
Uemura Dye Archive

Additional Resources
Directory
About CAMEO

Developed by:
Museum of Fine Arts, Boston

Particle board

Contents [hide]

Description

A type of Fiberboard. A composite wood board made from small wood chips, shavings, or sawdust mixed with a water-insoluble adhesive then compressed into a dense solid panel. Generally, particle board is less dense, lighter, weaker, and cheaper than MDF and is made of larger pieces. Particle boards were originally made in 1915 as wallboards. The most common adhesive in particle boards is urea formaldehyde glues are used which release volatile formaldehyde. Some particles boards advertised as formaldehyde free, such as Medite, are made with polyurea or phenolic resins. Particle boards are water-resistant, insect resistant and dimensionally stable during humidity and temperature fluctuations. Particle boards are commonly used in the construction of inexpensive furniture, cabinetry and mobile homes. Composition wood boards are usually classified by fiber size (largest to smallest): Waferboard, strandboard, flakeboard, particleboard, and Fiberboard.

Synonyms and Related Terms

particleboard; chipboard (Br.); panneau de particules (Fr.); conglomerado (Esp.); aglomerado de partículas (Port.); pannello di particelle (It.); pressed wood; composition board; fiberboard

Brand name: Medite

Applications

- Exhibit - case construction, mountmaking

Personal Risks

May emit formaldehyde. Health risks associated with exposure to formaldehyde gas: eye and respiratory irritation, respiratory difficulty.

Health risks associated with elevated concentration of VOCs: respiratory irritation, irritability, inability to concentrate, and sleepiness.

Dust and chemicals released when worked.

Collection Risks

Any wood product may release VOCs (volatile organic compounds) such as aldehydes, terpenes, and acids . The types and quantities of VOCs released depends on wood species, as well as the presence of coatings. Generally, the most VOCs are released when the product is new. Barrier layers (i.e. coatings) can be applied to limit the release of VOCs.

Physical and Chemical Properties

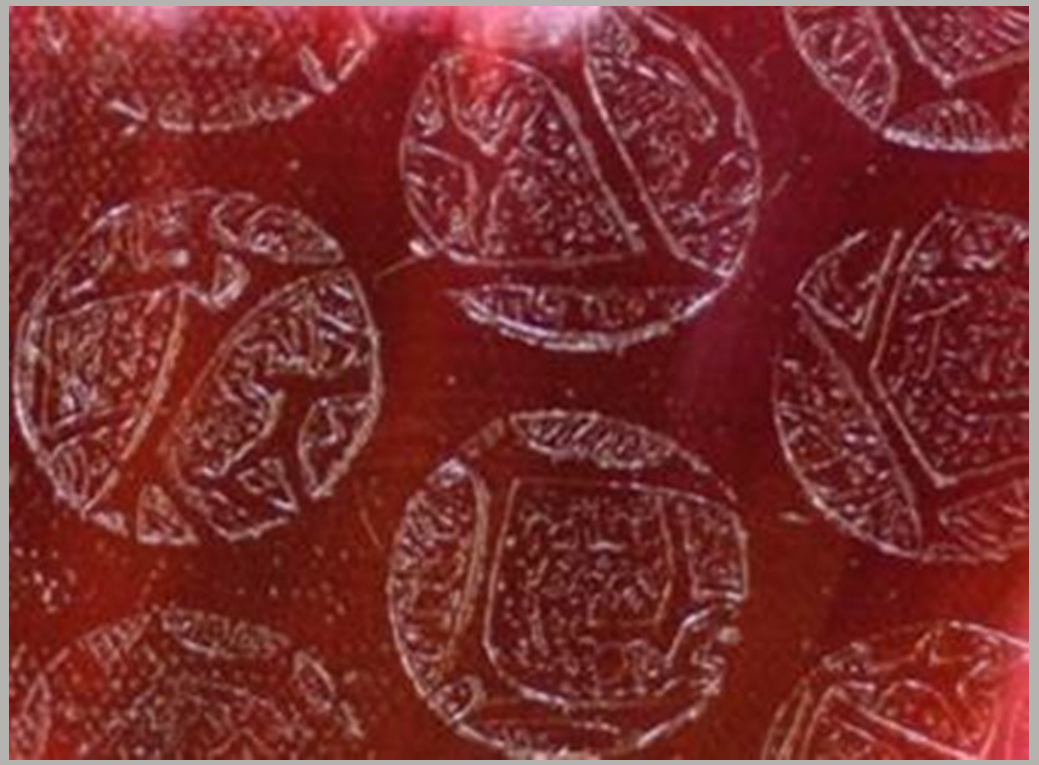
- pH = 5.4-5.6;
- Density = 31 ppcf

Working Properties

Tendency to chip when worked.

OUTLINE

1. Introduction - Framing the challenge
2. Assessing vulnerability
3. Assessing threats
4. Assessing context
5. Evaluating products



Context

1. Contact
2. Enclosure
3. Length of exposure

AIC NPS Exhibition Guidelines

Wiki

A Collaborative Knowledge Resource

Log in

Search MediaWiki

Navigation | Specialty Groups | Content Areas

Page | Discussion | View source | View history

Exhibition Standards & Guidelines

Exhibition Standards & Guidelines

Background [edit | edit source]

The content on this page is drawn from two separate but related projects:

1. **The Exhibit Conservation Guidelines**, which was originally published as a CD-ROM in 1999 by the U.S. National Park Service (NPS) - Harpers Ferry Center (HFC) - Division of Conservation and developed by Toby Raphael, Nancy Davis and Kevin Brookes. View additional publication credits here.
2. **The Conservation Standards & Guidelines for Exhibitions Utilizing Museum Collections**, previously unpublished, was written and developed by the late Toby Raphael, Fellow AIC, Conservation Advisor to the Board of the National Association for Museum Exhibitions and Felicity Devlin, Museum Consultant. The work was funded, in part, by a FAIC Samuel H. Kress Conservation Publication Fellowship.

These two products complement each other and have been combined here to encourage collaborative editing and comments; the NPS and American Institute for Conservation (AIC) 2018 memorandum of understanding created an opportunity for joint work towards presenting an updated resource to meet the needs of the cultural heritage community. Text may have been adapted or revised in its transfer from its original format to the wiki.

Contents [hide]

Wiki

A Collaborative Knowledge Resource

Log in

Search MediaWiki

Navigation | Specialty Groups | Content Areas

Category | Discussion | View source | View history

Help

Category:Exhibit Case Design

Main Catalogs Page > Preventive Care > Exhibition Standards & Guidelines > Exhibit Case Design

(Redirected from Exhibit Case Design)

Contents [hide]

Designing a Conservation-Grade Case [edit | edit source]

- **Design cases as protective enclosures**. Take advantage of a well-designed case to control the microenvironment of sensitive collections. A case designed with the participation of an exhibit conservator is an efficient and often cost- effective way to meet conservation criteria for an object.
- **Establish performance criteria**. Determine what conservation features will be built into each case, and clearly identify performance criteria for each feature. Design the case to provide this performance.
- **Build and test complex case designs as prototypes when possible**. Modify the case design until acceptable performance is achieved.
- **Provide detailed, explicit drawings and specifications**. Inspect cases during fabrication to ensure that the fabricators stick to specifications and construction tolerances.
- **Verify performance for the fully assembled case** in its final location to ensure that conservation criteria have been met. Such testing should occur before object installation to allow for adjustments.

> Exhibit case design can offer practical solutions to implementing conservation criteria.

Conservation and Case Design [edit | edit source]

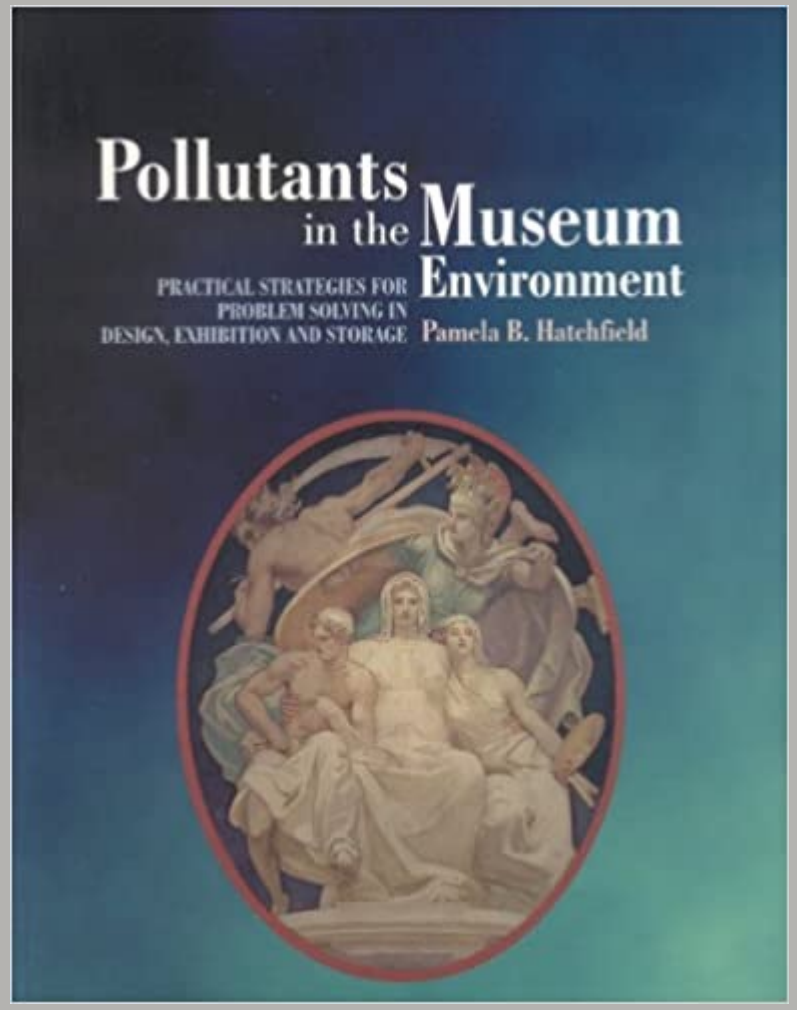
Displaying three-dimensional objects inside an exhibit case and framing two-dimensional materials provide protection that cannot be matched by open display. A sealed or ventilated enclosure creates a microenvironment that can be designed to fulfill a variety of conservation criteria. The choice between sealed and ventilated cases depends on the circumstances of the

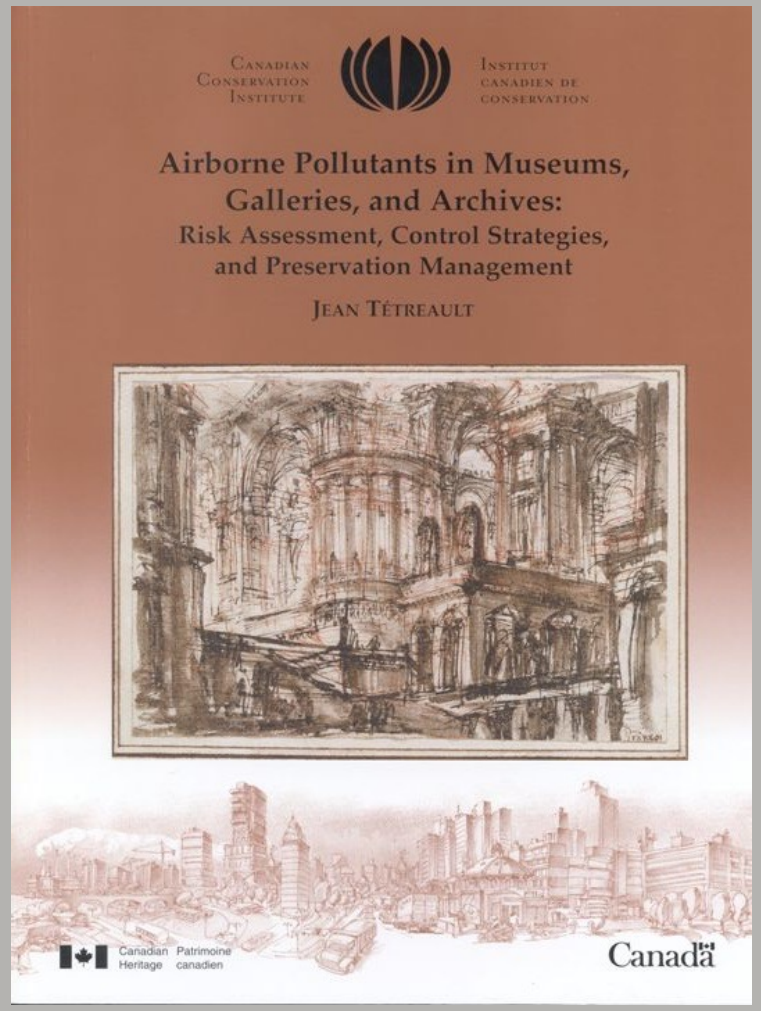
https://www.conservation-wiki.com/wiki/Exhibition_Standards_%26_Guidelines

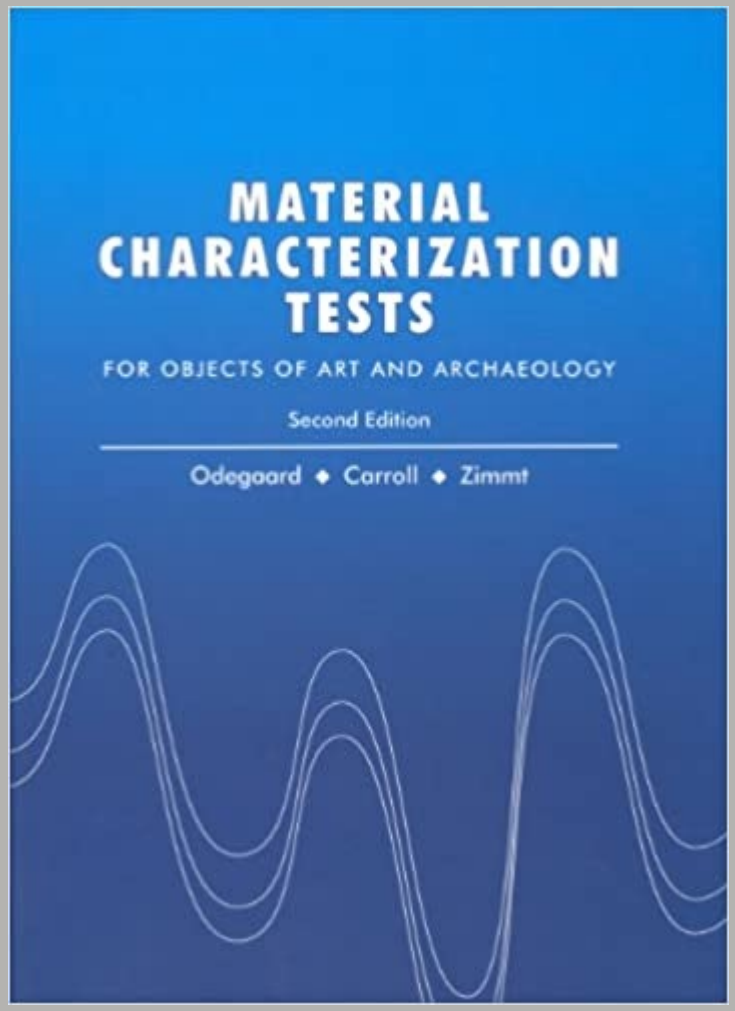
OUTLINE

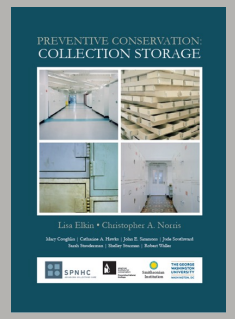
1. Introduction - Framing the challenge
2. Assessing vulnerability
3. Assessing threats
4. Assessing context
5. Evaluating products

Evaluating Products









Collection Storage

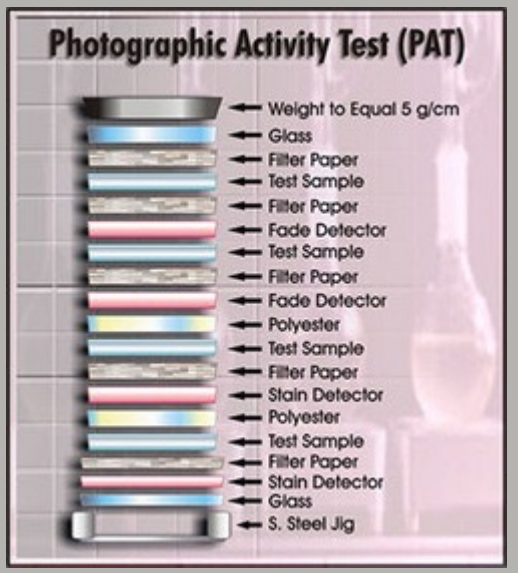
VI. Storage Equipment and Materials

©MFA, Boston 2015

- Chapter 28: **Storage Furniture** - Barbara P. Moore, Jeffrey C. Weatherston, Russell D. White, and Stephen L. Williams
- Chapter 29: **Support and Rehousing for Collection Storage** - Rachael Perkins Arenstein, Lisa Goldberg, and Eugenie Milroy
- Chapter 30**: Evaluating Materials Used for Collection Storage** - Pamela Hatchfield
- Chapter 31: **Wood and Related Products** - Pamela Hatchfield
- Chapter 32**: Paper-Based Storage Materials** - Fenella G. France
- Chapter 33: **Plastic Storage Products** - R. Scott Williams
- Chapter 34: **Marking Collections** - Nora Sharon Lockshin

Evaluating Products

- Microchemical Tests
  - pH, lead acetate, and Beilstein tests
- Accelerated Aging
  - Colorfastness
  - Oddy Test
  - Paper Oddy test
  - Photographic Activity Test (PAT)
- Instrumental analysis
  - GC-MS, SPME



Images: https://photographicpreservation.weebly.com/photographic-activity-test.html
https://www.loc.gov/preservation/scientists/projects/detail/storage_eval01.html

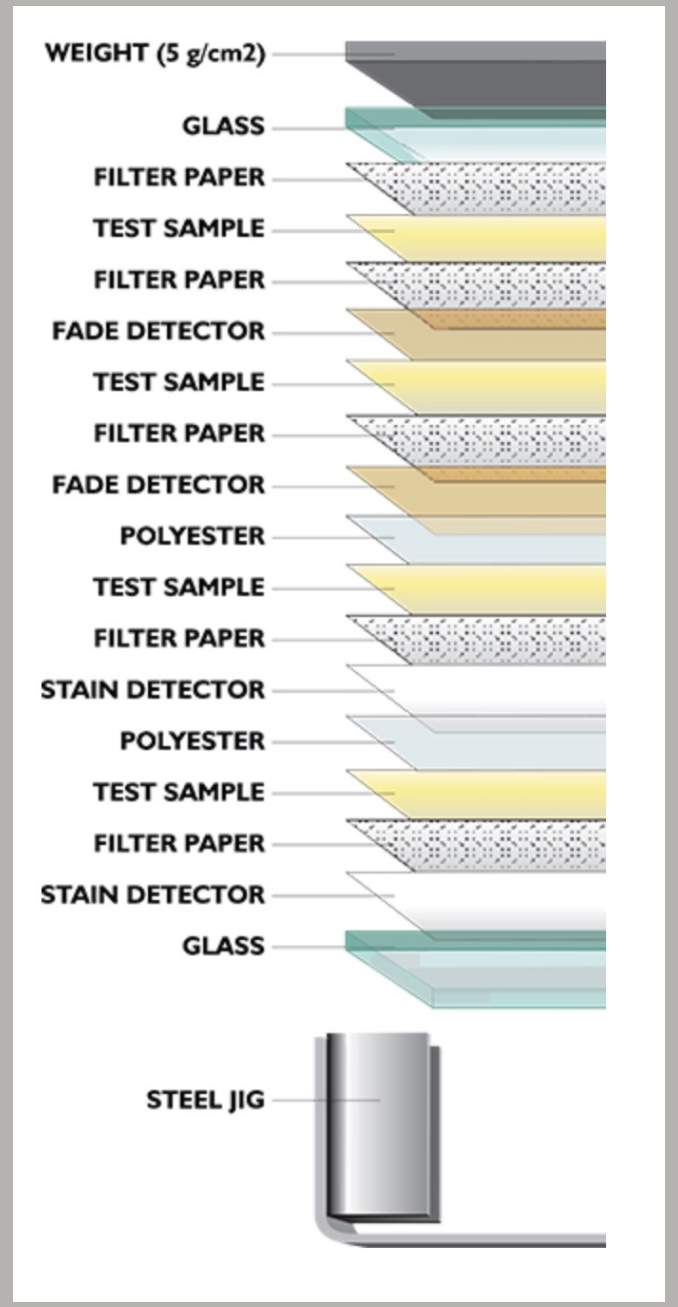
Evaluating Products

- Microchemical Tests
  - pH tests
  - Lead acetate test to detect sulfur
  - Beilstein test to detect chlorine

Images: Catherine Stephens https://www.conservation-wiki.com/wiki/Microchemical_Testing

Evaluating Products

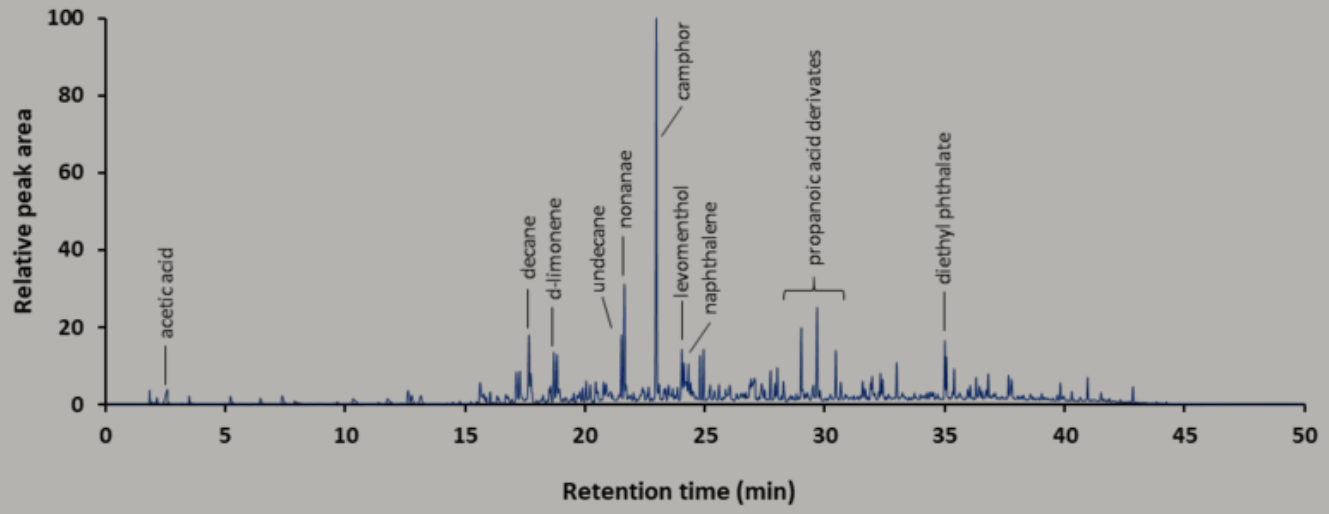
- Accelerated Aging
  - Colorfastness
  - Oddy Test
  - Paper Oddy Test
  - Photographic Activity Test (PAT)



Images (left to right): Alayna Bone, Metropolitan Museum of Art; https://blog.pollyoleary.co.uk/2018/12/lightfastness-testing-2-results-2018.html; www.imagepermanenceinstitute.org/tests/pat.html

Evaluating Products

- Instrumental analysis
  - GC-MS (Gas chromatography- mass spectrometry)
  - SPME (Solid Phase Micro-extraction)



Images: Alba Alvarez Martin and Catherine Stephens

Materials Testing Results

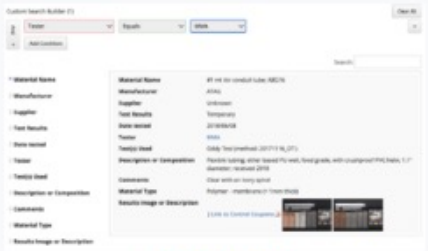
To **Materials Testing Results Main Page**
To Testing Protocols
To About the Oddy Test

DISCLAIMER

Oddy testing information and protocols are provided for informational purposes only. Neither AIC nor participating institutions endorse particular methods, products, businesses, or services. The following protocols are not vetted or peer-reviewed and should be assessed by each individual user for the accuracy of the results.

TABLE VIEW

All testing results area available here in the classic table view with sortable columns. In the upper left you may select to see 10, 20, 50 or 100 results at a time. In the upper right use the SEARCH field to filter results by any term.



CARD VIEW

All testing results are available here viewed as cards. Sort the cards using the column headers along the left margin. You may view 10 results at a time. Conduct a simple search to filter results using the SEARCH field at the upper right. Advanced searches can be carried out using the Custom Search Builder by adding conditions at the upper left.

Project:Combined Materials Testing Results (Simple)

Combined Materials Testing Results (Simple)

Edit | Search Builder

Show 10 entries

Search:

Material name	Manufacturer	Supplier	Test result	Copper result	Silver result	Lead result	Date tested	Tester	Test used	Comments	Description of tested material	Composition of tested material	Color	Material type	Use type	Intended use	Is in use	Result docs
"st Margaret" Brocade		Hayes Finch					2009-09-16	BM	Oddy test	sample prep: N/A, test #6606	RED	RED	Red	exhibition/woven, fabric	exhibition/woven, fabric			
#1 Mt Air Conduit Tube; A8g16	Atag	Unknown					2018-06-08	MMA	Oddy test (method: 20171116_OT)	Clear with an ivory spiral	Flexible tubing: ether based PU wall, food grade, with crushproof PVC helix; 1.1" diameter; received 2018	Flexible tubing: ether based PU wall, food grade, with crushproof PVC helix; 1.1" diameter; received 2018	Clear with an ivory spiral	membrane (< 1mm thick), polymer	membrane (< 1mm thick), polymer			Control coupon 
#5 Mt Awg Jacketed Electric Cable; 28171a Multi-conductor 600v Type Tc-er Cable	Belden	Unknown					2018-06-08	MMA	Oddy test (method: 20171116_OT)		Jacketed Wire: 2/0 AWG multi-conductor stranded (19 x 11) bare copper conductors, 6 AWG bare copper ground wire, PVC/nylon insulation, PVC jacket; received 2018	Jacketed Wire: 2/0 AWG multi-conductor stranded (19 x 11) bare copper conductors, 6 AWG bare copper ground wire, PVC/nylon insulation, PVC jacket; received 2018	Black	composite, other	composite, other			Control coupon 
0.020" Black									Oddy test		thin silicone rubber sheet; durometer: 20; thickness: 0.020"; manufacturer can dye-cut this sheeting if they are supplied	thin silicone rubber sheet; durometer: 20; thickness: 0.020"; manufacturer can dye-cut this sheeting if they are supplied						Control coupon - GCMS 

Project:Combined Materials Testing Results (Search Builder)

Combined Materials Testing Results (Search Builder)

Edit | Simple view

Custom Search Builder (1)

Clear All

And | Data | Condition | Value

Add Condition

Search: board

- Material name
- Manufacturer
- Supplier
- Test result
- Copper result
- Silver result
- Lead result
- Date tested
- Tester
- Test used
- Comments
- Description of tested material
- Composition of tested material
- Color
- Material type

Material Name	1/32" Fda Clear Silicone Sheet, Colorless
Manufacturer	Unknown
Supplier	Canal Rubber
Test result	Temporary
Copper result	tarnish on the copper is very slight red tarnish boarding on Permanent
Date tested	2019-02-27
Tester	MMA
Test(s) Used	Oddy test (method: 20180821_OT), SPME GCMS
Comment	Colorless; tarnish on the copper is very slight red tarnish boarding on Permanent
Description of tested material	1/32" Thick food safe silicone sheet; colorless; Purchased: January 2019 from Canal; washed with distilled water and wiped dry
Composition of tested material	1/32" Thick food safe silicone sheet; colorless; Purchased: January 2019 from Canal; washed with distilled water and wiped dry
Color	Colorless
Material type	membrane (< 1mm thick), polymer
Use type	membrane (< 1mm thick), polymer

Results Image or Description

Control coupon · GCMS

Conclusion

- Test results should not be used out of context
- A lot of information can be determined about products without testing
- There are a lot of helpful resources

Acknowledgements

- Rachael Perkins Arenstein, A.M. Art Conservation
- ARCS, Courtney Becraft, Robin Kilgo
- Eugenie Milroy, A.M. Art Conservation
- Jean Tétreault, and Simon Lambert, CCI
- Rob Waller, Protect Heritage Corp.
- Rebecca Kaczkowski, Smithsonian Institution
- Rebecca Newberry
- AIC 2020 Plastics Panel: Molly McGath, Catherine H. Stephens, Gina Watkinson, Kate Wight Tyler, Paige Schmidt
- Michele Derrick
- Robert Krueger, Cascadia Art Conservation
- Felicity Campbell, Paintings Conservator
- Gwen Spicer, Spicer Art Conservation
- National Museum of the American Indian

Samantha Springer

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