



Conserve O Gram

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Synthetic Fibers In Costume Collections

Museums with 20th century costume collections likely have pieces composed of synthetic fibers. Once synthetic fibers begin to degrade, there is little that can be done to conserve the piece. Preventive conservation is the best way to ensure preservation of costumes with synthetic materials.

The term *synthetic* describes any manufactured fiber made from chemical synthesis. Synthetic materials vary in their properties. Many are engineered to imitate and replace natural materials. The benefit of engineered fibers is that special qualities can be added and undesirable traits eliminated. Synthetic fibers can provide specific characteristics such as high absorbency or the ability to hold pleats. The most common synthetic fibers in 20th century collections are nylon, polyester, acrylic, and polyurethane.

Fiber Identification

Synthetic materials can be difficult to identify since they vary in appearance and composition. The easiest way to begin identification is to check for a manufacturer's label on the inside of the garment. Conservators use microscopic analysis, burn, and feel tests for further identification.

Nylon

The invention of nylon in 1931 created a revolution because it was the first non-cellulose fiber made directly from petrochemicals or

coal. The first commercial production of nylon was in 1939 for women's hosiery. During World War II, the government redirected nylon from use in consumer products to the military for tents, parachutes, tires, and ropes. Nylon is the second most used synthetic fiber in the United States. Some of the characteristics of nylon include:

- abrasion resistance
- washability
- resistance to oil and most chemicals
- low moisture absorbency
- resiliency
- resistance to mildew, mold, and moths

Nylon yellows with age.

Some common uses of nylon include the following:

- blouses
- lingerie
- swimwear
- ski apparel
- raincoats

Some trade names for nylon are:

- Antron
- Durasoft
- Supplex

Polyester

The first commercial production of polyester was in 1953. Polyester wash and wear wrinkle-free garments were popular during the 1960s and 1970s. Modern polyesters resemble

silk, wool, and cotton, making it difficult to distinguish them from natural fibers. Other fibers are often blended with polyester further making identification difficult. Polyester is the most used synthetic fiber in the U.S. Some characteristics of polyester include the following:

- strength
- resiliency
- resistance to most chemicals
- quick drying
- washability
- resistance to mildew
- wrinkle resistance
- retains heat set pleats and creases

Oil stains are difficult to remove from polyester fabrics.

Some major uses for polyester fibers include:

- blouses
- shirts
- dresses
- ties
- suits

Trade names for polyester are:

- Dacron
- Fortrel
- Thermoloft
- Microloft

Acrylic

The first commercial production of acrylic fiber in the U.S. was in 1950. Acrylic fibers are made from acrylonitrile, a petrochemical. The combination of acrylonitrile with small amounts of other chemicals improves the ability of the fiber to absorb dyes. Acrylic fibers are unique among synthetic fibers because they have an uneven surface. Some characteristics of acrylic include:

- wool-like feel
- softness and warmth
- shape retention
- resiliency
- quick drying
- resistance to moths
- resistance to sunlight
- resistance to oil and chemicals
- washability

Acrylic fabrics suffer from piling and abrasion problems.

Some major uses for acrylic fiber include:

- sweaters
- socks
- sportswear
- blankets

Trade names for acrylic fibers include:

- Orlon
- Acrilan
- Creslan

Polyurethane

The first commercial use of polyurethane was in the early 1950s. Polyurethane materials include bonded fabrics, spandex, synthetic suede, leather look fabrics and water repellent materials. A popular material in the 1960s and 1970s was the "wet-look" fabric, usually composed of polyurethane laminated materials. Many examples in collections include coats, jackets, belts, shoes, and purses.

Polyurethane is one of the more problematic synthetic materials because it is degraded by exposure to light, heat, and chemicals. Materials can show deterioration such as:

- discoloration
- cracking

- delamination of layers
- distortion (bubbling) of the exterior fabric

Solvents used for dry-cleaning can soften adhesives holding the layers together. As the material breaks down it often becomes sticky due to plasticizers migrating to the surface. Plasticizers can stain adjacent materials and corrode metals. Polyurethane materials are especially susceptible to deterioration by fungi.

Polyurethane bonded fabrics were popular in the 1960s. Deterioration of bonded fabrics usually occurs when the polyurethane foam starts to break down causing the backing to separate from the base fabric. Polyurethane foams can yellow, become brittle, and crumble. Multi-layered garments can be discolored if the underlying layer of polyurethane has yellowed.

Spandex

Spandex, a type of polyurethane, was first produced in 1959. During the 1960s, spandex replaced rubber in bathing suits and underwear. Some characteristics of spandex include:

- light weight
- resistance to body oils
- abrasion resistance
- strength and durability
- can be stretched repeatedly and still recover its original length and shape

Common uses of spandex include the following:

- swimwear
- jackets
- ski apparel
- exercise wear
- support hose

Trade names for spandex include:

- Lycra
- Cleerspan
- Dorlastan
- Glospan

Preservation of Synthetic Materials

Textiles are among the most sensitive in museum collections with a particular vulnerability to light, humidity, and temperature. Modern costumes were not made for longevity and were only expected to last for a season rather than a lifetime.

Preventative maintenance includes monitoring the collection, and examining and recording the condition of the objects on a regular basis. It is important to limit light exposure, reduce UV, and maintain a stable environment of 50-55% RH and temperature of 68°-72°F.

If the costume has an odor, isolate the piece from the rest of the collection. Fabrics with coatings may become sticky when the plasticizer starts to break down. The plasticizers can migrate to the surface and stain adjacent objects. In these instances, use a barrier material such as a PTFE (Teflon) coated fabric between layers of the sticky fabrics to prevent adhesion to itself. If the decomposition of the costume is too far advanced, it may be necessary to document and remove the piece from the collection.

References

Landi, Sheila. *The Textile Conservator's Manual*. London: Butterworth & Co. Ltd., 1985.

Needles, Howard L. *Handbook of Textile Fibers, Dyes and Finishes*. New York: Garland Press, 1981.

World Wide Web Resources

Ball, Stephen, Ann French and Barbara Heiberger. "Conservation of Costume Collections." <http://www.museums.gov.uk/pdf/conserv/Costume_Collections.pdf>.

Fabriclink. <<http://www.fabriclink.com>>.

Fibersource. <<http://www.fibersource.com>>.

Warshall Peter. "Inventory of Synthetic Fibers." <<http://www.wholeearthmag.com/ArticleBin/113.html>>.

Materials and Supplies

PTFE (Teflon®) coated fabric is available from the following suppliers:

Chemfab
150 Gaylord St.
Elk Grove Village, IL 60007
(847) 490-9800
<<http://www.chemfab.com>>.

Hugh Courtright & Company, Ltd.
2600 Whiting Way
Monee, IL 60449
(708) 534-8400
<<http://www.right-tape.com>>.

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