Fibers and Fabrics

UNITED STATES DEPARTMENT OF COMMERCE PUBLICATION

A Consumer's Guide from the National Bureau of Standards

NBS CIS 1

Fibers and Fabrics

by Josephine M. Blandford
and Lois M. Gurel

INFORMATION ABOUT NATURAL AND MAN-MADE FIBERS AND FABRICS TO MEET YOUR PARTICULAR NEEDS.

NBS CONSUMER INFORMATION SERIES 1
Editor: James E. Payne

Issued November 1970

FROM THE NATIONAL BUREAU OF STANDARDS
U.S. DEPARTMENT OF COMMERCE

U.S. DEPARTMENT OF COMMERCE
Maurice H. Stans, Secretary
Rocco C. Siciliano, Under Secretary
Myron Tribus, Assistant Secretary for Science and Technology
NATIONAL BUREAU OF STANDARDS
Lewis M. Branscomb, Director

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
Price 65 cents.

FOREWORD

Technology is changing not only the products you buy, but the marketplace as well. Unfortunately, this is not an unmixed blessing.

Products are constantly being improved, but designs are complicated, quality is variable, and good advice is hard to get. Modern stores and merchandising bring you a wide variety of products; but the large number of choices and the lack of dependable information often make shopping a confusing and frustrating experience.

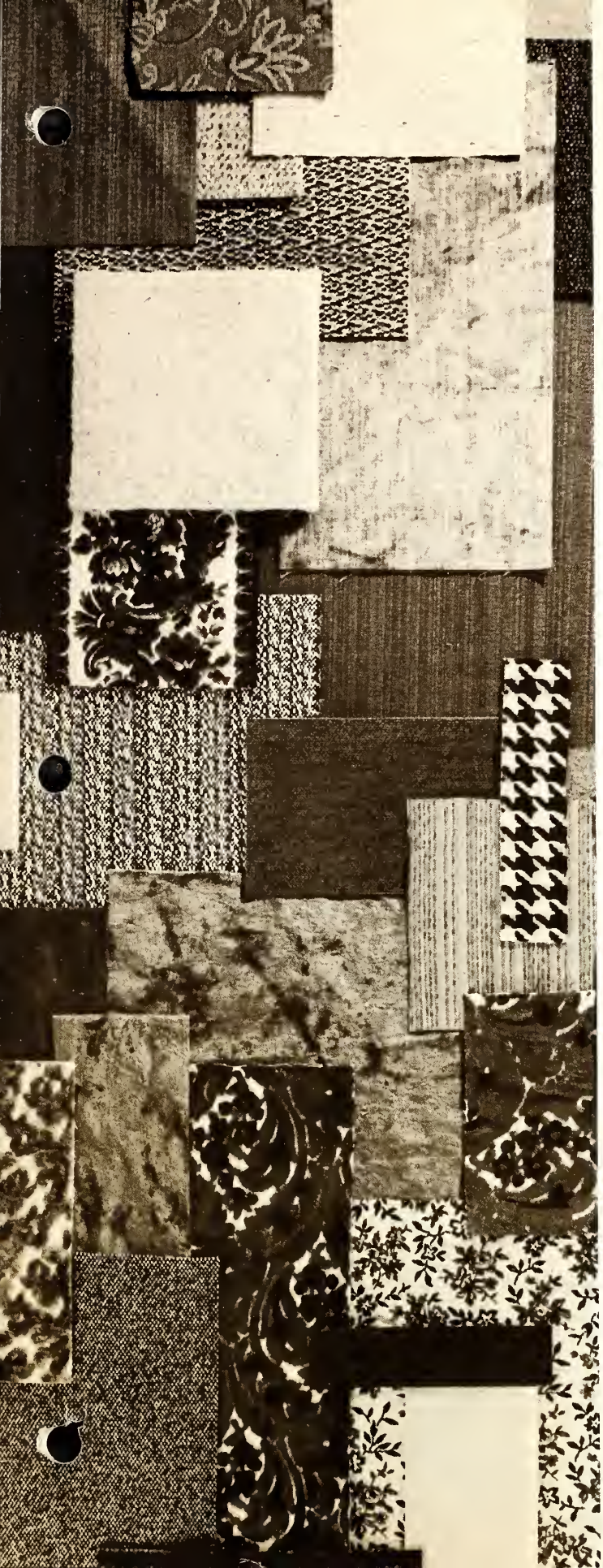
A generation ago the merchant was likely to be a friend of the family. Products were out in the open where they could be seen, touched, smelled, or tasted, and decisions about quality were comparatively easy to make. Today, stores are more impersonal; most of the items are pre-packaged, or made of unfamiliar materials, or so complicated only an expert can understand how they work.

If you are like most consumers you need more information—accurate, understandable, believable information which will help you make wise choices, and get more use and satisfaction from what you buy.

Your principal source of such information will be from manufacturers and vendors themselves. But the technical work at NBS brings our experts in contact with many subjects of potential interest to the citizen, who supports our work with his taxes. The Consumer Information Series is designed to share this knowledge and experience with you. The National Bureau of Standards does not test or recommend products, but our research on measurement and standards produces information in many areas which can be of practical value to you.

At the request of the President and the Secretary of Commerce, we are pleased to make this information available.

Lewis M. Branscomb, Director



CONTENTS

INTRODUCTION

A guide to the exciting world of fibers and fabrics

Today's fabrics and textile products offer many attractive choices, but the great variety of new fibers, blends, fabrics and finishes can be very confusing. This booklet brings together much of the information you need to select and care for fabrics, apparel, furnishings, and other textile products for the home.

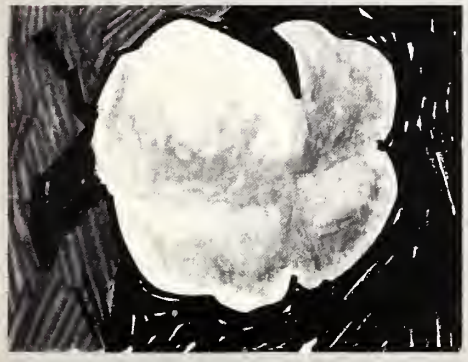
FIBERS AND FABRICS will help you, for it characterizes the properties, methods of care, and major uses of the consumer textile fibers produced in the United States. But you should not depend on any one source for all of your facts. Read hang tags and labels carefully. Manufacturers are required by law to identify the fiber content of fabrics. They are increasingly helpful in identifying finishes and fabric types, and providing information on their care.

No one fiber, fabric or finish is perfect; all have advantages and disadvantages. The important thing is to know what you are getting and how to care for it before you make your purchase. A wrong choice can cause you trouble and cost you money.

In some cases, you may have to discover for yourself, by trial and error, how to use and care for a fabric or a textile product. In that event, what you learn from FIBERS AND FABRICS about the critical role of such factors as temperature, bleaches and handling will be of great value.

Since you may not recognize the fibers by name, a few familiar trademarks are given for each fiber. The trademarks used were derived from a Federal Trade Commission listing. Our list is not intended to be complete—there are literally hundreds of trademarks for fibers—nor does it constitute a recommendation or endorsement by the National Bureau of Standards. Trademarks are included solely to help you identify the fibers by relating their generic name to trade names familiar to you. Trademarks appearing in this booklet are enclosed in quotes.

The Natural Fibers



COTTON

Cotton is a natural cellulose fiber obtained from the boll of the cotton plant. Its quality is dependent on fiber length, fineness, color and lustre. Long cotton fibers can be spun into fine, smooth, lustrous and comparatively strong yarns from which the better quality cotton fabrics are made. The short fibers produce coarser yarns for use in durable fabrics which are less fine, smooth, and lustrous.

Cotton is still the world's major textile fiber, and is used alone or in blends in an infinite variety of apparel, household and industrial products. New finishes have extended cotton's usefulness in the "easy-care" field and in many other applications. Some of the most common are resin finishes used in wash-and-wear, and chemical finishes which make cotton fabrics water repellent or fire retardant.

PROPERTIES

absorbency color fastness dyeability resistance to: heat moths perspiration softness strength, wet or dry	good to excellent
dimensional stability pressed-in crease retention resistance to: mildew sunlight wrinkling wash-and-wear qualities	fair to poor (unless) treated)

Cotton ignites readily and is not self-extinguishing, but it can be treated and made flame resistant to some extent, with some loss of durability and aesthetics. Effect of heat: yellows slowly at 245° F.

Resin finishes may improve such qualities as dimensional stability, crease retention and wrinkle resistance. See GLOSSARY, page 27, for definitions of terms.

CARE

Cotton can be:

sterilized.

machine washed and tumble dried.

dry cleaned.

bleached with chlorine or peroxide bleaches, but excessive or prolonged use of bleach may weaken the fabric. Some cotton finishes may cause the fabric to yellow when exposed to chlorine bleach.

ironed (but "easy-care" finishes may not require it.) A safe ironing temperature is 400 ° F.

Cotton fabrics should be pre-shrunk for home sewing purposes.

USES

apparel
carpets and rugs
home furnishings
household textile products

LINEN

Linen is produced from the fibrous materials in the stem of the flax plant. These fibers, in a great variety of thicknesses, tend to cling together, giving linen its characteristic "thick-thin" quality. Relative to cotton, linen is expensive due to its limited production and the hand labor still involved in processing it.

The quality of linen is determined by the length and fineness of the fibers and the degree of bleach, if white, or the fastness of the dyes, if colored.

Terms like "silk-linen" can be misleading when they refer to the linen-like appearance rather than the fiber content of the fabric. Labels and hang tags should reveal whether these fabrics are made of pure linen, blends of linen with other fibers, or some other fiber which resembles linen.

PROPERTIES

absorbency colorfastness dimensional stability durability launderability resistance to: heat moths perspiration	good to excellent
pressed-in crease retention resistance to: mildew sunlight wrinkling	fair to poor

Linen ignites readily and is not self-extinguishing, but it can be treated to make it flame resistant to some extent with some loss of durability.

Linen does not lint. It has poor resistance to flex abrasion, and may crack or show wear along seams and edges where fibers are bent.

CARE

Linen can be:

machine washed and tumble dried.

dry cleaned.

bleached if white, (although bleaching tends to weaken linen fibers).

ironed, with best results when damp.

A safe ironing temperature is 400 ° F. Lustre (sheen) can be increased by ironing on the right side of fabric when it is damp. Creases should not be pressed in, and table linens should be rolled on cardboard rollers rather than folded, since sharp angles may cause linen fibers to break.

USES

apparel

handkerchiefs

home furnishings

table linens

towels

SILK

Silk, the only natural continuous filament fiber, is obtained by unreeling the cocoon of the silkworm. Used alone, "silk" refers to a *cultivated* silk from carefully tended silk worms. *Raw* silk contains the gum which bound the fibers to the cocoon. *Wild* or *Tussah* silk comes from uncultivated silk worms. Uneven in texture and tan in color, it cannot be bleached. *Duppioni* silk comes from two or more cocoons that were joined together. These "thick-thin" filaments are used in making shantung. *Spun* silk is made from pierced cocoons or *waste* silk, the tangled fibers on the outside of the cocoon.

"Silk," "pure silk," "all silk," or "pure dye silk" must contain no metallic weightings and no more than 10 percent by weight of dyes or finishing materials (black silk, 15 percent.) Weighted silk contains metallic salts; labels must indicate the percentage of weighting. It may be cheaper and more drapeable but less serviceable.

PROPERTIES

absorbency colorfastness dimensional stability drapability dyeability hand and appearance strength, dry wrinkle resistance	good to excellent
pressed-in crease retention resistance to: ageing abrasion heat perspiration sunlight strength, wet	fair to poor

Silk does not ignite readily, but materials added to silk to change its color or other properties may in some instances create a flammability hazard.

Silk is weakened by sunlight and perspiration; yellowed by strong soap, age and sunlight.

CARE

Silk can be:

hand laundered, though certain dyes "bleed" color when washed.

dry cleaned.

ironed with a warm iron. A safe ironing temperature is 250-275 ° F.

White silk can be bleached with hydrogen peroxide or sodium perborate bleaches, but chlorine bleaches should not be used.

USES

apparel

home furnishings

WOOL

Wool fibers are obtained from the fleece of the sheep or lamb, or from the hair of the Angora or Cashmere goat, the camel, vicuna, alpaca or llama. Silky Angora hair is called "mohair."

"Wool," "new wool," or "virgin wool" is made of fibers that have never been used or reclaimed. It is usually stronger and more resilient. "Reprocessed wool" fibers have been reclaimed from unused wool products (mill end pieces, for example). "Reused wool" fibers have been reclaimed from used textile products.

"Woolen" fabrics are made from wool yarns containing both long and short fibers. Woolen fabrics are soft, resist wrinkling, but do not hold a sharp crease. "Worsted" yarns, made from the longer fibers, are firm and smooth. Worsted fabrics are more durable. They tailor well, take a sharp crease, but may become shiny with use.

PROPERTIES

absorbency colorfastness dyeability pressed-in crease retention (worsted) resiliency shape retention sunlight resistance warmth wrinkle recovery wrinkle resistance	good to excellent
pilling resistance to: bleaches friction moths perspiration strong soaps wash-and-wear qualities water repellancy	fair to poor

Wool, in some constructions, is not readily ignited and is self-extinguishing. Effect of heat: becomes harsh at 212 ° F, scorches at 400 ° F, and chars at about 572 °F. Wool may be allergenic.

CARE

Wool can be:

laundered, but only with extreme care using cool water, mild detergent, and gentle action. Never rub. Felting occurs when wool is subjected to heat, moisture, and mechanical action. Laundered garments should be dried on a flat surface, or spread over two or three lines to distribute weight. Wool products should be handled carefully when they are damp or wet.

dry cleaned.

pressed with a cool iron and steam.

Hanging garments over a bathtub filled with hot water will sometimes remove wrinkles.

Garments should be brushed after wearing, and allowed to rest 24 hours before they are worn again. Wool absorbs odors, so garments should be hung where air can circulate around them. Wool articles should be moth-proofed before storing.

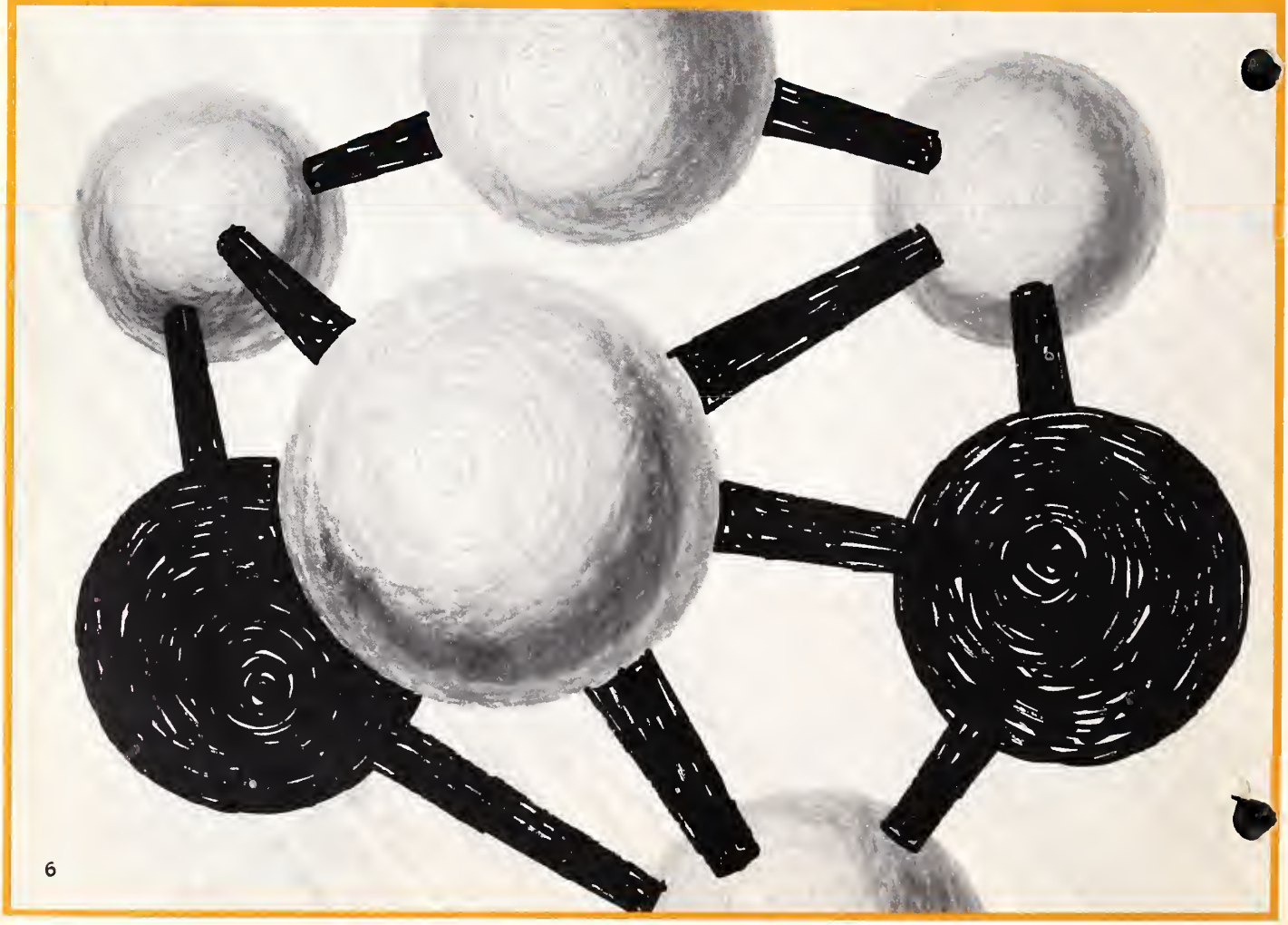
USES

apparel

blankets

carpets

The Man-Made Fibers



ACETATE

Although acetate is made from cellulose, it is considered a man-made fiber because in production the cellulose is changed by chemical means. It is closely related to rayon; in fact, it was called acetate-rayon until a 1952 Federal Trade Commission ruling separated the two fiber groups into "acetate" and "rayon."

Acetate is produced in both filament and spun yarns, and combines well with a large number of other fibers. Its lustre, silkiness, body, good draping qualities, and crisp "hand" have made fashion fabrics such as bengaline, taffeta, satin, faille, crepe, brocade, double knit and tricot the major uses of acetate.

Solution-dyed or spun-dyed acetate has excellent colorfastness to light, perspiration, atmospheric contaminants, and washing.

PROPERTIES

- appearance (silk-like)
- dimensional stability (if dry cleaned)
- drapability
- hand (crisp or soft)
- resistance to: mildew, moths

} good to excellent

- absorbency
- colorfastness
- pressed-in crease retention
- resistance to: abrasion, wrinkling
- strength, dry and wet
- washability
- wash-and-wear qualities

} fair to poor

Acetate ignites readily and is not self-extinguishing, but it can be made flame resistant, with some loss of other properties. Effect of heat: sticks at 375-400 ° F, softens at 460-490 ° F, and melts at 500 ° F.

CARE

Acetate can be:

hand laundered, in some constructions, using warm water and gentle agitation. Garments should not be soaked, wrung out, or twisted.

dry cleaned.

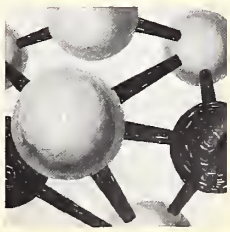
ironed with a cool iron: acetate fibers melt at high temperature. A safe ironing temperature is 250-300 ° F.

Garments made of acetate should be protected from nail polish, paint remover, and some perfumes since these substances dissolve the fibers.

USES

apparel
home furnishings
linings
tricot-bonded fabrics

Trademarks:
"Acele"
"Avisco"
"Chromspun"
"Celanese"
"Celaperm"
"Celara"
"Estron"



TRIACETATE

Chemically, triacetate is quite similar to, and has many properties in common with, acetate: lower strength when wet and low resistance to abrasion, but excellent appearance, drapability and resistance to moths and mildew.

Triacetate's chief difference and most valuable characteristic is resistance to damage by heat. This property permits the heatsetting treatments which are responsible for triacetate fabrics' outstanding features of durable crease and pleat retention, dimensional stability, and resistance to glazing during ironing.

Also, because triacetate is comparatively insensitive to high temperature, it can be made into products which launder easily, dry quickly, and require very little special care.

PROPERTIES

appearance dimensional stability drapability hand resistance to: heat wrinkling wash-and-wear qualities	good to excellent
absorbency resistance to abrasion strength	fair to poor

Triacetate ignites readily and is not self-extinguishing, but can be made flame resistant with some loss of other properties. Effect of heat: melts at 572 ° F, but will not stick at 560 ° F.

CARE

Triacetate can be:

machine washed and tumble dried.

ironed, if necessary, with a hot iron.

A safe ironing temperature is 450 ° F.

USES

bonded and tricot fabrics

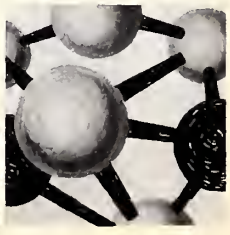
knits

permanently pleated garments

sportswear

Trademark:

"Arnel"



ACRYLIC

Wool-like qualities and easy care are acrylic's major contributions to textiles. Although acrylic fibers can be made into crisp fabrics, they are associated mainly with the soft, high bulk, textured yarns used in sweaters and fur-like fabrics.

In comparison to wool, acrylic fabrics are stronger, easier to care for, softer, do not felt, and provide more warmth for less weight. The versatility of this fiber is illustrated by the fact that while it is more durable than rayon or acetate, it can be made to perform more like wool than can nylon or polyester.

Acrylic is not harmed by the common solvents and is resistant to weathering, bleaches, and dilute acids and alkalis. Because of these qualities, its use—alone or in blends—ranges from fine fabrics to work clothing and chemical-resistant fabrics.

PROPERTIES

colorfastness dimensional stability hand (wool-like) moth and mildew resistance pressed-in crease retention resiliency sunlight resistance warmth wash-and-wear qualities wrinkle resistance	good to excellent
abrasion resistance pilling resistance strength	fair to poor

Acrylic ignites and burns readily. Effect of heat: sticks at 420-490 ° F. Acrylic can be heat set (pleats and creases), has low absorbency, and is subject to static build-up.

CARE

Acrylic can be:

machine washed and tumble dried at low temperatures.

dry cleaned.

ironed. A safe ironing temperature is 300-325 ° F.

bleached with either chlorine or peroxide bleaches.

USES

apparel (a major use is in sweaters)

blankets

carpets

fleece and fur-like fabrics

home furnishings

work clothing

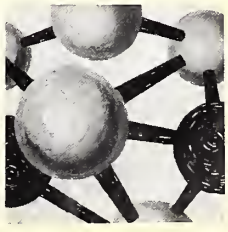
Trademarks:

"Acrilan"

"Creslan"

"Orlon"

"Zefran"



ANIDEX

Anidex is the newest of the elastic fibers. Its exceptional resistance to chemicals, sunlight and heat, excellent "hand," and ease-of-care properties make it possible to combine anidex successfully in blends with both natural and man-made fibers. For example, wool, cotton, linen, nylon, or silk may be blended with anidex without changing the natural look and feel of the basic fabric.

A major application of these fabric blends is in woven and knit fabrics where anidex contributes properties of stretch and recovery. In apparel, the blend fabric permits freedom of body movement while reducing or eliminating sagging or bagging. When used in upholstered furniture, anidex blends provide greater freedom of design because the fabric can stretch to conform to the contours of the furniture.

PROPERTIES

flexlife	excellent
resistance to:	excellent
ageing	excellent
body oils	excellent
chlorine bleaches	excellent
cosmetic lotions	excellent
drycleaning solvents	excellent
heat	excellent
household detergents	excellent
light	excellent
normal atmospheric fumes	excellent
holding power	moderate
strength	moderate

Anidex fibers retain their color and physical properties with age unless exposed to temperatures above 325 ° F for long periods of time.

Anidex does not ignite readily but will burn when ignited. Since anidex is usually 5 to 10 percent by weight of the fabric being considered, its flammability and heat effects are largely dependent on the fibers with which it is combined.

CARE

Anidex can be:

machine washed and tumble dried at "normal" settings.

bleached with chlorine bleaches (recommended by fiber manufacturer).

pressed at temperatures up to 350 ° F if in the core-spun form. (Recommended safe ironing temperature, 320 ° F.)

USES

hosiery

knit and woven outerwear

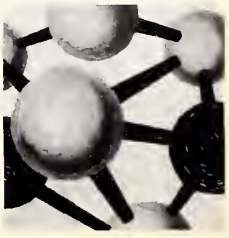
lingerie

stretch fabrics

upholstery fabrics, knit and woven

Trademark:

"ANIM/8"



GLASS

Glass fibers have many properties which make them particularly suitable for industrial and home furnishing products; however, because of their heavy weight, low abrasion resistance, and poor bending strength they are not suitable for apparel textiles.

In batting form, glass fibers provide excellent insulation. Fabrics made from glass fibers are used as reinforcement for molded plastics in boats and planes, and for curtains and draperies where fire resistance and easy care are important.

The most important recent advance in the glass fiber industry has been the development of ultra-fine, continuous filament "Beta" yarns. These yarns are stronger than regular glass yarns, and can be bent in a sharper angle without breaking. They are soft and pleasant to the touch, yet durable.

PROPERTIES

colorfastness dimensional stability resistance to: chemicals heat mildew moths sunlight weather wrinkling strength	good to excellent
resistance to abrasion (except for the new continuous filament yarns)	fair to poor

Glass fibers are non-absorbent and naturally non-flammable except when they are treated with flammable resinous finishing materials.

CARE

Glass fiber cloth can be:

machine washed if agitated gently, but hand washing is safer. It should not be spin dried, twisted, or wrung out. No ironing necessary. If machine washed, rinse out washer thoroughly before loading with apparel.

drip dried until most of the moisture is removed, then hung on rods to complete drying.

Dry cleaning is not recommended. Draperies should be hung so that they do not touch the floor or the window sill.

USES

curtains

draperies

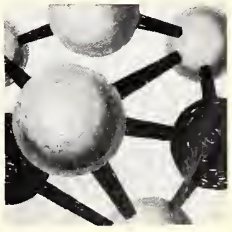
Trademarks:

"Beta Glass"

"Fiberglas"

"PPG"

"Vitron"



METALLIC

"Metallic," as defined by the Federal Trade Commission, is any manufactured fiber composed of metal, plastic-coated metal, metal-coated plastic, or a core completely covered by metal.

The history of pure metal yarns goes back for thousands of years, but their uses were restricted because they were heavy, brittle, expensive, and easily tarnished. New processes, developed to overcome these characteristics, generally consist of covering metallic threads with plastic, or the use of heat or adhesives to bond thin layers of metal foil between two sheets of plastic film.

These lustrous yarns are finding increasing use in many types of apparel and household furnishings, and in some industrial fabrics.

PROPERTIES

appearance and feel of metal	excellent
resistance to:	
chlorine	(varies somewhat with films and adhesives used)
salt water	
weathering	

Metallic yarns and fabrics are non-absorbent and non-tarnishing. They are extremely sensitive to heat because their plastic components cause them to soften and shrink.

CARE

Metallic fabrics can be:

washed, when the amount of metallic yarns is small, the other fibers present in the fabric, and the construction of the garment permit.

cleaned, generally when used as a decoration for another material, by the same methods used for the base material.

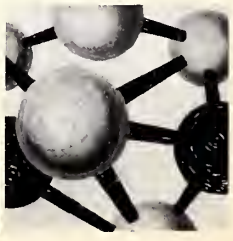
ironed at a temperature low enough to keep the plastic coating from melting (a "cool" iron unless otherwise specified by the manufacturer).

Read hang tags and labels for specific care instructions.

USES

apparel
braid
decorations
home furnishings
hosiery

Trademarks
"Chromeflex"
"Durastran"
"Lamé"
"Lurex"
"Nylmet"



MODACRYLIC

Modacrylic, as its name indicates, is modified acrylic fiber. It possesses many properties in common with acrylic. The heat sensitivity of modacrylic fibers permits them to be stretched, embossed and molded into special shapes, and to be used in fabrics or fabric blends which require no ironing.

Dense, fur-like fabrics are also possible because of its heat-sensitivity. The fibers may be produced with different heat shrinkage capacities. When such fibers are combined in the surface of a pile fabric and heat is applied, the fibers shrink to different lengths forming a surface pile which resembles the hair and undercoat fibers of natural fur.

Since modacrylic fibers are self-extinguishing, they are often blended with other fibers to reduce the flammability of carpets and other textile items.

PROPERTIES

colorfastness
resiliency
resistance to:
- chemicals
- moths and mildew
- sunlight
- wrinkling

softness
warmth
wash-and-wear qualities

} good to excellent

dimensional stability
resistance to:
- abrasion
- pilling

strength

} fair to poor

Modacrylics are flame resistant and generally self-extinguishing. Effect of heat: soften at comparatively low temperatures, shrink at 260 ° F, stiffen and discolor when exposed to pressure and temperatures above 300 ° F.

CARE

Modacrylics can be:

machine washed in warm water and tumble dried at low temperatures. Remove article from machine as soon as tumble cycle stops.

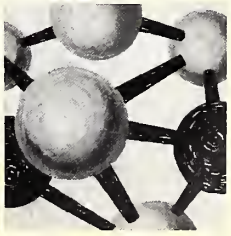
ironed, if necessary. A safe ironing temperature: 200-250 ° F.

dry cleaned. The fur cleaning process is recommended for deep pile fabrics.

USES

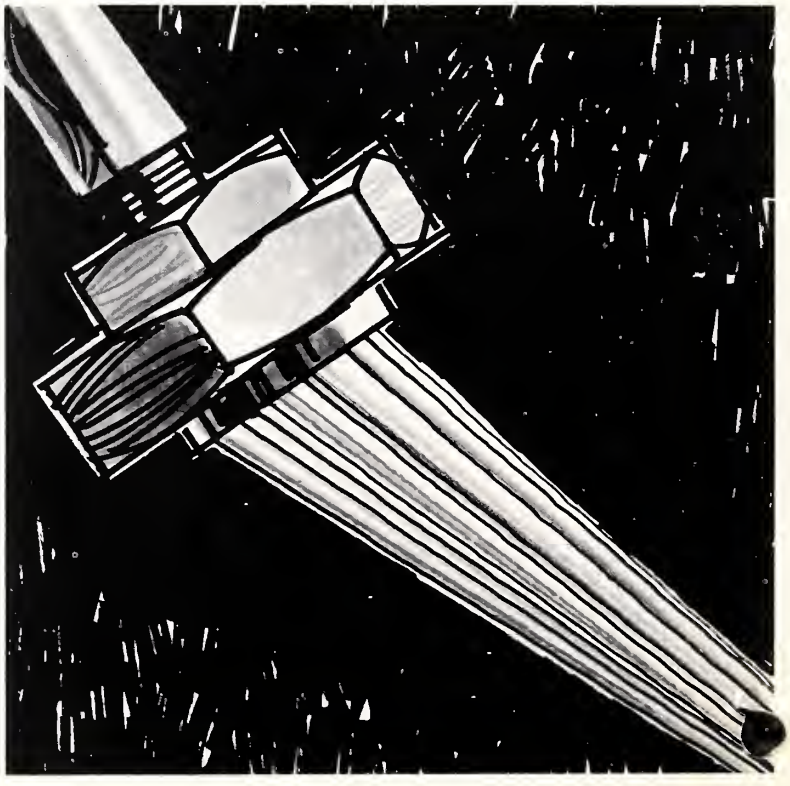
blankets
carpets
dolls' hair
draperies
fur-like pile fabrics
knitwear
wigs

Trademarks:
"Dynel"
"Verel"



Fibers . . . into fabrics

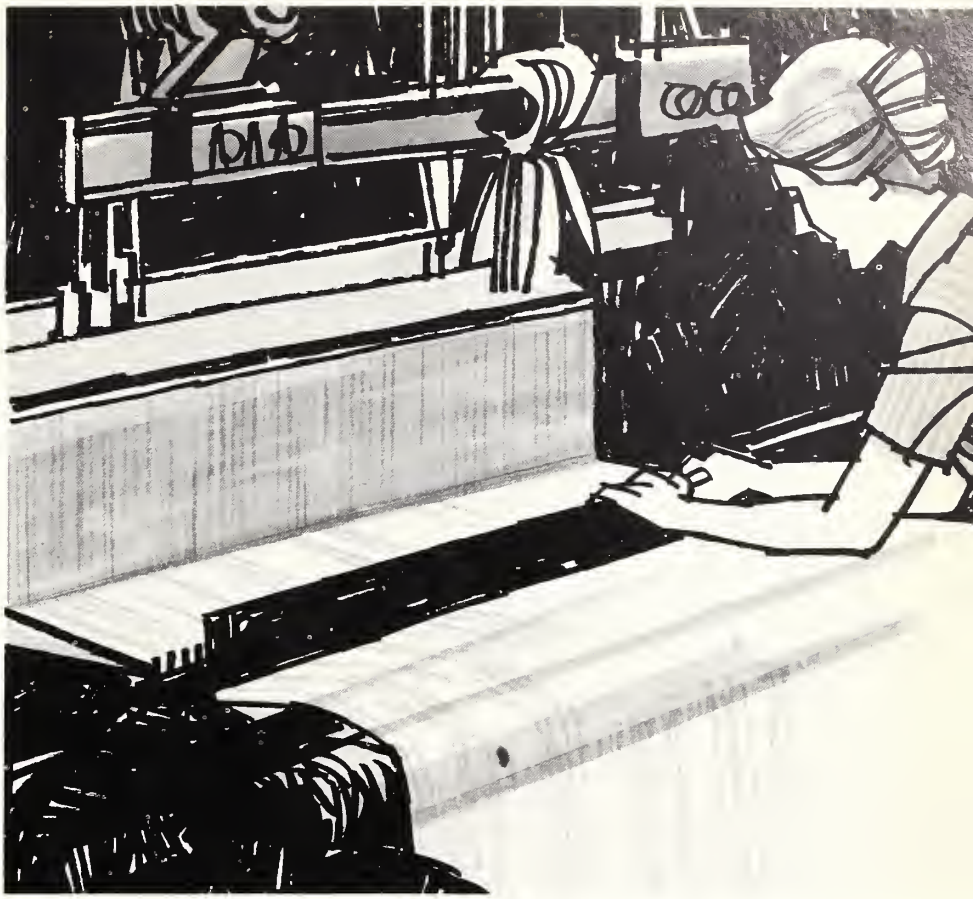
Man-made fibers have transformed and extended the textile industry. Fabrics are now available in an almost infinite variety of textures, colors, designs and performance properties. Today you can decide on the qualities you want in clothing or home furnishings, and find just the fabric you need.



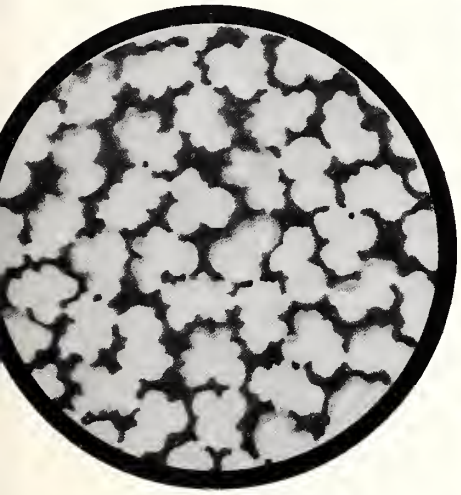
Chemical solutions extruded through holes in the spinneret, right, form continuous filaments which are then twisted into yarns for fabrics.

View of a man-made fiber plant, left, illustrates the complexity of the processes necessary to "tailormake" fabrics to meet your needs.

Woven fabrics, composed of either natural or man-made fibers, are made on looms. At right, the warp yarn is in place, ready for weaving.



Man-made yarns, right, being rewound on cones ready for shipment to textile mill. Above, wood chips which are raw material for acetate.



The microphotograph, above, shows a cross-sectional view of one of the man-made fibers which has been magnified 400 times.

NYLON

Nylon, the strongest of all man-made fibers in common use, was the first truly synthetic fiber to be developed. Since 1939, when nylon was first introduced in women's hosiery, many different forms have come on the market.

Nylon's outstanding characteristic is its versatility. It can be made strong enough to stand up under the punishment tire cords must endure, fine enough for sheer, high fashion hosiery, and light enough for parachute cloth and backpacker's tents. Nylon is used alone and in blends with other fibers where its chief contributions are strength and abrasion resistance.

Nylon washes easily, dries quickly, needs little pressing and holds its shape well since it neither shrinks nor stretches.

PROPERTIES

colorfastness
dimensional stability
elasticity
resiliency
resistance to:
  abrasion
  mildew
  moths
  perspiration
strength

} good to excellent

absorbency
resistance to:
  pilling
  sunlight
  wrinkling

} fair to poor

Nylon can be heat set (pleats and creases). It is not readily ignited but when ignited, particularly in combination with other fibers, it burns, melts, and drips. Effect of heat: yellows and creases slightly at 300 ° F after five hours exposure, and melts or sticks at 420-500 ° F depending on the type of nylon.

CARE

Nylon can be:

machine washed and tumble dried at low temperature.

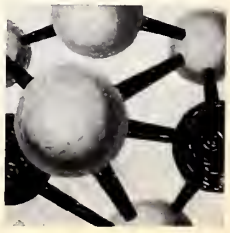
bleached with chlorine bleach.

ironed. A safe ironing temperature, 300-375 ° F, (depending on type).

USES

apparel
home furnishings
hosiery
household textile products
rugs and carpets
stretch fabrics
tents
textured yarns

Trademarks:
"Antron" "Enkalon"
"Cantrece" "Nyloft"
"Caprolan" "Qiana"
"Cumuloft"



OLEFIN

The olefin fibers, polyethylene and polypropylene, are petroleum products which are derived from ethylene and propylene gases. They have the lightest weight of all fibers, are non-absorbent and difficult to dye.

The shortcomings of these fibers, namely their sensitivity to light and to heat, and their difficulty in dyeing, have been largely overcome by the use of heat and light stabilizers, and by solution dyeing, More recently, the modification of fiber structure has made it possible to dye olefin by the use of standard techniques.

In general, the properties of polyethylene (first of the olefins) and polypropylene are similar. It is doubtful that you will find polyethylene in apparel products. Polypropylene, however, is used in a variety of textile products, including apparel.

PROPERTIES

resistance to: abrasion, ageing, chemicals, mildew, perspiration, pilling, stains, sunlight, weather, wrinkling	good to excellent
absorbency, dyeability	fair to poor

Olefin is very light in weight and provides better thermal insulation than wool. Olefins which have been given a wash-resistant, anti-oxidant treatment do not ignite readily but, once ignited, they burn, melt and drip. Effect of heat: polypropylene softens at 285-300 ° F, melts at 320-350 ° F, and shrinks at temperatures above 212 ° F; polyethylene is more heat sensitive. It shrinks at temperatures above 225 ° F, and melts at 230-250 ° F, depending upon fiber type.

CARE

Olefins can be:

machine washed in lukewarm water.

tumble dried at low temperatures EXCEPT when the fiber is used as the batting or filler in quilted pads and other items and is not treated with a wash-resistant anti-oxidant by the manufacturer. In these forms, the heat from the dryer builds up in the fiber filling and cannot escape. Under these conditions, the temperature may reach the kindling point of the fiber, resulting in fire.

bleached at low water temperatures (below 150° F).

drycleaned.

Articles made of 100 percent olefin cannot be ironed, but blends may be ironed at low temperatures (250 ° F or lower).

USES

apparel

blankets

floor coverings (including indoor-outdoor carpets)

household textile products

nonwoven products

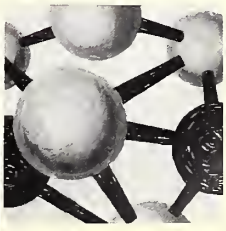
upholstery

Trademarks:

"DLP"

"Herculon"

"Vectra"



POLYESTER

With the advent of the polyester fiber, the centuries old dream of "wash-and-wear" ("easy-care") clothing became a reality. Polyester does not shrink or stretch appreciably during normal use. Heat-set pleats and creases stand up extremely well under everyday wear, even when the wearer is very young and very active. Water-borne stains may be quickly and simply removed.

Because of polyester's outstanding wrinkle resistance and dimensional stability, it is used extensively in blends with other fibers, notably with cotton, rayon and wool. The combination produces a fabric which retains the major characteristics of the base fiber, with the added benefits of increased strength and improved crease retention. Currently, a major use of polyester is in cotton blends used in durable-press textiles.

PROPERTIES

colorfastness dimensional stability pressed-in crease retention resiliency resistance to: abrasion mildew moths perspiration sunlight wrinkling strength wash-and-wear qualities	good to excellent
absorbency resistance to: oily stains pilling (spun yarns)	fair to poor

Polyester can be heat set (pleats and creases). It does not ignite readily, but when ignited, it burns, melts and drips. In blends, particularly with cellulosic fibers, it burns readily. Effect of heat: sticks at temperatures above 445 ° F, and melts above 480 ° F, the exact temperature depending on the type of polyester.

CARE

Polyester can be:

machine washed and tumble dried. Articles containing fiberfill may also be machine washed and dried, depending on the cover fabric.

bleached with chlorine bleaches.

ironed. Safe ironing temperature: 300-350 ° F.

dry cleaned.

USES

apparel, including durable-press (permanent-press).

carpets

curtains

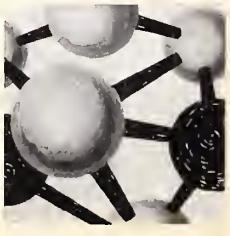
fiberfill for pillows, sleeping bags, ski jackets, cushions

home furnishings

thread: filament, spun and core-spun

Trademarks:

"Avlin" "Kodel"
"Dacron" "Trevira"
"Fortrel" "Vycron"



RAYON

Rayon was the first of the man-made fibers. Although made from cellulose, the raw materials are converted chemically and then regenerated into cellulose fibers. The two main types of rayon, *viscose and cuprammonium,* differ in the way the cellulose is processed and regenerated, but their properties are similar. The cuprammonium process favors yarns of finer diameter used mainly in sheer and semi-sheer fabrics. In recent years several "new" rayons have been developed to overcome some of the limitations of the regular viscose and cuprammonium rayons. The major distinctive feature of these new fibers is greater strength, particularly when wet.

Rayon is one of the least expensive "man-made" fibers, and since it combines well with practically all other fibers, it is used extensively in blends. It has advantages of comfort, efficiency and lustre.

PROPERTIES

absorbency colorfastness to: dry cleaning perspiration sunlight washing drapability dyeability hand and appearance	good to excellent
dimensional stability resiliency resistance to: abrasion mildew wrinkling wash-and-wear qualities wet strength	fair to poor

Rayon ignites readily and is not self-extinguishing, but it can be made flame resistant. Effect of heat: decomposes after prolonged exposure at 300-400 ° F, depending on fiber type.

CARE

Rayon can be:

washed by hand with lukewarm water, unless manufacurers specify otherwise. Squeeze gently; do not wring or twist.

machine washed and tumble dried.

bleached with chlorine bleach, unless resin finished. Some resin finishes used on rayon discolor in the presence of chlorine bleach.

ironed with a moderate iron. Safe ironing temperature: 300-350 ° F. Rayon will scorch, but not melt if the iron is too hot.

dry cleaned.

USES

apparel

home furnishings

household textile products

linings

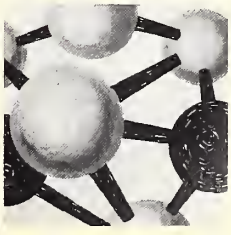
rugs and carpets

Trademarks—viscose and cuprammonium rayons:

"Avisco" "Cupioni"
"Bemberg" "Fibro"
"Celanese" "Jetspun"
"Coloray" "Strawn"

Trademarks—newer rayons:

"Avril" "Rayflex"
"Avron" "Suprenka"
"Fortison" "Vincel 64"
"Nupron" "Zantrel"



RUBBER

Natural rubber comes from the latex of certain plants, while man-made rubber is a chemical compound produced from petroleum. Both are defined as "rubber" by the Federal Trade Commission. Rubber fibers are generally used as a core around which other fibers are wrapped to protect the rubber from abrasion. Rubber core yarns are used where stretch or elasticity is required. Either natural or man-made fibers may be used in manufacturing rubber yarns.

Man-made rubber, sometimes called "elastomer," is a synthetic rubber compound which has the physical properties of natural rubber such as high stretchability and recovery. Man-made rubber (see anidex and spandex) can be stretched repeatedly to at least twice its length, yet when the force is removed it will snap back to approximately its original length.

NATURAL RUBBER PROPERTIES

elongation	high
elasticity holding power	good
resistance to: body oils cosmetics light perspiration strength	low

Rubber does not ignite readily but when ignited, it burns and produces dense smoke. Effect of heat: at 300-400 ° F, it becomes permanently soft and sticky.

When used in recommended amounts, the effect of bleaches on some rubbers is minimal. When used in high concentrations, however, chlorine will cause some surface embrittlement, and peroxide some surface softening.

CARE

Products made of rubber yarns should be laundered in accordance with the manufacturer's recommendations. If omitted, wash with water at a low temperature. Avoid high concentrations of bleaches, heat, and exposure to sunlight. Do not dry clean or dry in automatic dryers.

USES

elastic webbings, bands, tapes, core threads

elastic fabrics

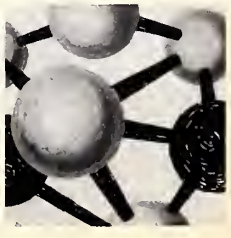
girdles and other foundation garments

swimwear

Trademarks:

"Lactron"

"Lastex"



SARAN

Saran has many desirable characteristics, among them: low absorbency, high resiliency, and little reaction to chemicals. However, because of its low resistance to heat, and poor stability, saran's use in apparel fabrics is very limited.

In household and industrial applications, saran is used to produce a variety of products. In multifilament form, it is used for carpet pile, protective clothing, blankets, imitation fur, upholstery, and drapery fabrics. In monofilament form, it is used chiefly in automotive upholstery, curtains, screening, luggage, and outdoor furniture.

Since saran is virtually impervious to weathering, it finds many outdoor uses on the lawn and patio, and in the camp. It is highly resistant to chemicals in the atmosphere.

PROPERTIES

resiliency	good to excellent
resistance to: abrasion, chemicals, fading, mildew, staining, sunlight, water, weathering	good to excellent
absorbency	fair to poor
resistance to heat	fair to poor
strength	fair to poor
washability	fair to poor

Saran does not support combustion. When combined with flammable fibers, saran acts as a retardant. Effect of heat: softens at temperatures about 212 ° F and melts at 340 ° F.

CARE

Saran can be:

- washed with soap or detergent.
- bleached with chlorine bleach, but the water must be at a temperature of 100 ° F or below.

USES

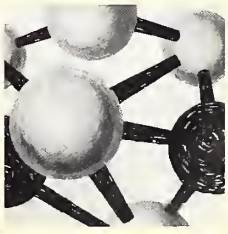
- awnings
- carpets, indoor-outdoor
- garden furniture
- handbags and luggage
- home furnishings
- screening
- shoes

Trademarks:

"Lus-Trus"

"Saran 25S"

"Velon"



SPANDEX

Spandex is a man-made fiber with great elasticity. Garments containing spandex corespun yarns retain their holding power better than other garments of similar weight made with covered natural rubber yarns. Foundation garments containing spandex are usually soft, and provide great freedom of movement.

Currently, however, few garments are made of 100 percent spandex, since only a small amount of spandex is required to provide the desired holding power and superior recovery characteristics.

In home sewing on spandex fabrics, there is little danger of damage from "needle cutting." This feature eliminates one of the problems the housewife encounters when she makes her own foundation garments and swim suits.

PROPERTIES

elasticity
resistance to:
- cosmetic lotions and body oils
- flexing
- sunlight

} excellent

Spandex yellows with age and at temperatures above 300 ° F. It does not ignite readily, but when ignited, it melts and burns. Effect of heat: it has dimensional stability at 300 ° F, sticks at 345-450 ° F, depending on fiber type, and melts at 445-590 ° F, also depending on fiber type.

CARE

Spandex can be:

machine washed and tumble dried at low temperatures.

bleached, except with chlorine bleaches.

ironed, if necessary. Safe ironing temperature: below 300 ° F; but iron quickly, and do not leave the iron in the same position too long.

dry cleaned.

USES

apparel

elastic waist bands

form persuasive garments

foundation garments

surgical hose

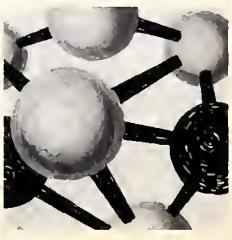
Trademarks:

"Glospan"

"Lycra"

"Spandelle"

"Unel"



VINYON

Vinyon is a limited-use fiber. Because of its low strength and high extensibility it is not a good fiber to spin into yarns. However, it may be blended with other fibers in the manufacture of fabrics having a high degree of resistance to chemicals, oils, and some of the solvents.

Because of its low strength and extreme sensitivity to heat, the principal use of vinyon is as a binder agent which softens, shrinks and bonds to other fibers under pressure and in the presence of heat and appropriate solvents. These unusual properties have led to the extensive use of vinyon in the manufacture of embossed carpets, pressed felts, bonded fabrics, and rubber-coated elastic fabrics. Some of the more interesting nonwoven fabrics owe their existence to vinyon.

PROPERTIES

elasticity	excellent
resistance to: alcohols, bacteria, chemicals, fungi, gasoline, mildew, moisture, moths, water	excellent
resistance to: heat	poor

Vinyon does not support combusion. Effect of heat: Shrinks when heated above 150 ° F. becomes tacky at 185-215 ° F, and melts around 260 ° F.

CARE

Vinyon can be:

washed in warm water with a mild detergent and drip dried. Do not tumble dry or iron.

USES

bonding agent in nonwoven textiles

embossed carpets

pressed felts

shower curtains

waterproof clothing

work clothes

Trademarks:

"Avisco Vinyon HH"

"45"

FIBER BLENDS AND COMBINATIONS

Since no single type of fiber is likely to meet all of your needs, textile technology, by blending or combining two or more fibers, has been able to produce new fabrics which maximize the best features of the combined fibers and minimize less desirable ones.

Although the terms "blends" or "combinations" are often used interchangeably, there is a difference between the fabrics to which they apply. In a blended fabric, two or more fibers are blended before spinning them into yarns. In a combination (or union) fabric, individual yarns composed of one fiber are combined during weaving with yarns composed entirely of another fiber; for example, a fabric composed of rayon warp and cotton filling yarns.

The choice of fibers with their end-use in mind, although essential in the production of all textile products, is of particular importance in the production of blends. Here, the objective is a product with more desirable characteristics than could be achieved by the use of any single type of fiber.

Cotton and rayon, for example, are combined with other fibers to increase absorbency and comfort, decrease static build-up, improve dyeability, and reduce production costs. Acrylics improve softness and warmth without adding weight. Nylon adds strength. Polyester contributes several properties to blends, including wash-and-wear qualities of abrasion resistance, wrinkle resistance and dimensional stability. Acetate improves drapability and texture.

The proportions of fibers in a blend vary with fiber properties and the intended end-use of the fabric. A general rule is that for satisfactory performance a fabric should contain at least 50 percent of that fiber having the major characteristic desired.

There are, however, many exceptions to this rule. Only 15 percent of nylon improves the utility of wool fabrics; small quantities (10 percent or less) of elastic fibers such as rubber or spandex give stretch properties to apparel products; and the addition of 30 percent of modacrylic fibers reduces the flammability of acrylic carpets.

The Textile Fiber Products Identification Act of 1960 requires that the content of each fiber in a textile product, expressed as a percentage of the total weight of all fibers present, be clearly listed on the label or hang tag.

Such labeling information is without meaning, however, unless you know something of the properties of the individual fibers present, what they contribute to the product, and the suitability of the product to your particular needs.

Care of fabric blends and combinations can be a problem. No hard and fast general rules are possible, however, because of the wide variety of types and amounts of fibers used. Save hang tags and labels which provide care instructions, and follow the instructions conscientiously. If care instructions are not given, handle the product according to the care procedures recommended for the most sensitive fiber in the mixture or blend. (See section on Wash-and-Wear.)

WASH-AND-WEAR

"Wash-and-wear" garments tend to retain their original shape and appearance after repeated wear and laundering, with little or no ironing. "Durable-press" (permanent-press) is considered the ultimate in wash-and-wear. Wash-and-wear performance depends on several factors, including the types and amounts of fibers, fabric structure, finish, construction, and washing and drying methods.

Durable-press finishes are also applied to products such as bed and table linens. Fabrics usually are cotton or rayon blended with polyester, acrylic, acetate or nylon, and may be lightweight and sheer like organdy, or heavy like corduroy.

Correct size is important in durable-press garments because alterations are difficult. Original hem and seam lines cannot be removed by home ironing. A "fishy" odor may indicate a finish which has not been fully cured.

CARE

To get the best service from wash-and-wear:

wash frequently; heavy soil is hard to remove.

pre-treat oily stains before washing by rubbing a small amount of concentrated liquid detergent into the spot. Stains that remain after the first washing will generally be removed after repeated laundering.

garments may be laundered in any of the following ways, except that the manufacturer's labeling instructions should be followed when given:

1. *Preferred method:* machine wash and tumble dry; remove from dryer immediately after dryer stops and put on hangers to avoid wrinkling.
2. machine wash and drip dry; remove items from washing machine before spinning cycle; line dry.
3. hand wash and drip dry; remove from rinse water without wringing or twisting; line dry.
4. *Least preferred method:* machine wash and line dry after spinning: the spinning cycle adds wrinkles that are difficult to remove.

A fabric softener added to the final rinse water will decrease static build-up and aid wrinkle resistance.

Trademarks:
Wash-and-wear:
"Belfast"
"Sanforized-Plus"
"Tebilized"
"Wrinkl-Shed"

Durable-press:
"Coneprest"
"Dan-Press"
"Koratron"
"Penn Prest"

ALPHABETICAL LISTING OF REFERENCED TRADEMARKS

Trademark	Generic Name
"Acele"	acetate
"Acrilan"	acrylic
"ANIM/8"	anidex
"Antron"	nylon
"Arnel"	triacetate
"Avisco"	acetate
"Avisco"	rayon
"Avisco Vinyon HH"	vinyon
"Avlin"	polyester
"Avril"	rayon
"Avron"	rayon
"Belfast"	wash-and-wear
"Bemberg"	rayon
"Beta Glass"	glass
"Cantrece"	nylon
"Caprolan"	nylon
"Celanese"	acetate
"Celanese"	rayon
"Celaperm"	acetate
"Celara"	acetate
"Chromeflex"	metallic
"Chromspun"	acetate
"Coloray"	rayon
"Conepress"	durable-press
"Creslan"	acrylic
"Cumuloft"	nylon
"Cupioni"	rayon
"Dacron"	polyester
"Dan-Press"	durable-press
"DLP"	olefin
"Durastran"	metallic
"Dynel"	modacrylic
"Enkalon"	nylon
"Estron"	acetate
"Fiberglas"	glass
"Fibro"	rayon
"Fortisan"	rayon
"Fortrel"	polyester

Trademark	Generic Name
"45"	vinyon
"Glospan"	spandex
"Herculon"	olefin
"Jetspun"	rayon
"Kodel"	polyester
"Koratron"	durable-press
"Lactron"	rubber
"Lamé"	metallic
"Lastex"	rubber
"Lus-Trus"	saran
"Lurex"	metallic
"Lycra"	spandex
"Nupron"	rayon
"Nylmet"	metallic
"Nyloft"	nylon
"Orlon"	acrylic
"Penn Prest"	durable-press
"PPG"	glass
"Qiana"	nylon
"Rayflex"	rayon
"Sanforized Plus"	wash-and-wear
"Saran 25S"	saran
"Spandelle"	spandex
"Strawn"	rayon
"Suprenka"	rayon
"Tebilized"	wash-and-wear
"Trevira"	polyester
"Unel"	spandex
"Vectra"	olefin
"Velon"	saran
"Verel"	modacrylic
"Vincel 64"	rayon
"Vitron"	glass
"Vycron"	polyester
"Wrinkl-Shed"	wash-and-wear
"Zantrel"	rayon
"Zefran"	acrylic

GLOSSARY

Abrasion Resistance The degree of resistance to surface wear by rubbing.

Absorbency The extent to which a textile fiber or product takes in moisture. Garments made of absorbent fabrics tend to be more comfortable because they absorb perspiration.

Bonded Fabric A layered fabric structure wherein a face fabric is joined to a backing fabric, such as tricot, with an adhesive that does not significantly add to the thickness of the combined fabrics.

Cellulose The fibrous substance found in the cell walls of plants.

Core-Spun Yarn (Core Yarn) A yarn consisting of a readily separable core surrounded by fiber.

Crease-Retention, Pressed-in That property of a fabric which enables it to maintain an inserted crease.

Crocking The transfer of color from the surface of a fabric to another surface by rubbing.

Dimensional Stability Tendency of a fabric or garment to retain its shape and size after being subjected to wear, washing, or dry cleaning.

Drapability A term used to describe the way a fabric falls when hung. Fabrics which are soft and pliable are often said to have good drapability.

Durable-Press A process which enables a garment or other textile product to retain substantially the initial shape, flat seams, pressed-in creases, and unwrinkled appearance during use and after laundering or dry cleaning.

Dyeability Affinity for dyestuffs.

Easy Care (Minimum Care) A term applied to fabrics, garments, and household textile articles which can be washed satisfactorily by normal home laundering and used or worn after light ironing. By "light ironing" is meant no starching, no dampening, and a relatively small expenditure of physical effort.

Elasticity Ability to return quickly to substantially the original dimensions after being stretched.

Elongation The increase in length caused by stretching. It is expressed as a percentage of the length before stretching.

Embossing Process of pressing a raised design into a fabric by passing the fabric between hot engraved rollers.

Felt A fabric of interlocking fibers built up by a suitable combination of mechanical or chemical action, moisture and heat, without spinning, weaving, or knitting. As a verb, "felt" means the interlocking or matting of fibers.

Fiber A generic term for the various types of matter (natural or man-made) which form the basic elements of textile fabrics and other textile structures.

Fiberfill Virgin man-made fibers specially engineered as to fineness, cut length and crimp for use as filling materials.

Filament A continuous individual strand which can function as a yarn.

Filament Yarn A yarn composed of two or more continuous filaments assembled or held together by twist or otherwise.

GLOSSARY (continued)

Finishes, Fabric Characteristics given to fabrics by treatments such as mercerizing, embossing, waterproofing and the application of resins.

Flex Abrasion Wear caused by repeated bending and rubbing.

Generic As used in this booklet, the general name for a type of fiber or textile finish.

Hand A term used to describe a composite of textile properties such as flexibility, resiliency, softness or stiffness, texture, and warmth.

Heat Sensitivity Property of a material which causes softening, shrinking, melting or discoloration when heat is applied.

Heat Set The use of heat on man-made fabrics to stabilize size or shape, or to make pleats and creases durable to repeated laundering or dry cleaning.

Lamination The process of joining two or more layers of materials together by flame-bonding or an adhesive.

Mercerizing A treatment applied to cotton and some rayon which adds strength, lustre, absorbency, and an increased affinity for dye.

Nonwoven Fabric Fabric produced by the bonding or interlocking of fibers, or both.

Pilling Resistance Resistance to the formation of pills (bunches or balls of tangled fibers) on the fabric surface.

Resiliency The property of fibers or fabrics that causes them to spring back when crushed or wrinkled.

Sanforized A trademark indicating that fabrics so labeled conform to the shrinkage requirements of the trade name owner not to shrink more than 1 percent in either length or width.

Solution Dyeing The addition of color to the chemical liquid before the fiber is formed through the spinneret, which results in the distribution of dye throughout the fiber.

Spun Yarn A yarn composed of fibers (short length or staple) twisted together.

Staple Length of the raw fiber, both natural and man-made; also a term for short fibers, as opposed to continuous filament.

Sunlight Resistance Resistance to fading and deterioration when exposed to sunlight.

Trade Names (Trademarks; Brand Names) Names which identify the products of a particular manufacturer and are registered with the United States Patent Office.

Tricot A term covering a type of warp-knitted fabric.

Wash-and-Wear A term applied to garments which satisfactorily retain their original appearance after repeated wear and suitable home laundering with little or no pressing or ironing.

Water Resistance Resistance to wetting and penetration of water.

Wrinkle Resistance That property of a fabric which enables it to resist the formation of wrinkles. "Crease Resistance" is a term commonly used for the preferred term "Wrinkle Resistance."

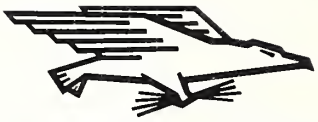
U. S. GOVERNMENT PRINTING OFFICE : 1970 O - 408-926

For further information contact:

National Bureau of Standards
Washington, D.C. 20234
(301) 921-3434

U.S. DEPARTMENT OF COMMERCE
Washington, D.C. 20230

OFFICIAL BUSINESS



POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE

A Consumer's
GUIDE

FROM THE NATIONAL
BUREAU OF STANDARDS
U.S. DEPARTMENT
OF COMMERCE