Consumer Choices

Understanding apparel and furnishing textiles

If you understand the fibers and methods used to make apparel and furnishing textiles, you can make wise consumer choices.

Choosing apparel and furnishing textiles that will look good, be easy to care for, and last as long as you want them to can be both enjoyable and confusing. To help you make better choices, this publication introduces commonly-used fibers and summarizes the components of finished textile products.

Fibers

Fibers, whether natural or synthetic, must be processed through several steps to become fabrics. Cotton, linen, and ramie are natural fibers grown from plants. Acetate, lyocell, and rayon are cellulose fibers manufactured from wood pulp. They may be referred to as natural based on the raw material, although they have many synthetic fiber performance characteristics because of the processes that create them. Silk and wool are natural protein fibers from silkworms and certain breeds of goats, rabbits, and sheep. Synthetic fibers are made from petrochemicals. Fiber trademark names are often used with specialized performance wear, for example Lycra spandex found in swimwear or biking shorts, but are often omitted from other apparel labels.

Synthetic fibers are trademarked by manufacturers but must be identified on consumer products according to *generic classes* based on their chemical composition, as specified by the Textile Fiber Products Identification Act (TFPIA). The synthetic fiber generic classes most often found in apparel and furnishing textiles are acetate, acrylic, elastrelle-p, lastol, lyocell, nylon, olefin, PLA, polyester, and spandex (urethane). Modacrylic, saran, and vinyon are less common in consumer goods. The generic class names for natural fibers are the same as their common names (cotton, linen, and so on).

Fiber content affects a fabric's absorbency, abrasion resistance, chemical resistance, flammability, strength, sun resistance, and elastic characteristics including drape, and wrinkle resistance and recovery. (See table 1 on page 2.) However, some characteristics can be modified by the way fibers are spun into yarn, fabricated, or finished.

Most synthetic fibers are thermoplastic—they're easily deformed by heat. For example, they will become wrinkled in the washer's spin cycle when washed in hot water, and can be melted by a hot iron. But synthetic fiber characteristics can be altered by spinning them in unusual cross-sectional shapes. Tri-lobal fibers show less soil and wick moisture better than fibers having round cross sections. Hollow-core fibers have empty channels in their centers to give more loft without weight for fiber-fill pillows or insulative outerwear garments. Microfibers are spun in extremely fine filaments. An example is ultra-thin polyester that feels soft but can be made into fabrics that are lightweight yet strong.

Recently the Federal Trade Commission amended the TFPIA rules to establish new generic names for chemical classes and/or sub-classes of fibers that differ significantly in chemistry, structure, or performance properties from the original generic classes. Four examples are: elastrelle-p–a multi-component polyester stretch fiber; lastol–an ethylene stretch fiber with heat and chemical resistance; lyocell–a washable manufactured cellulosic; and PLA–a polyactide fiber made of corn or sugar beets. As textile chemistry advances, additional generic names can be expected.

Nonwovens

Nonwoven fabrics are formed directly from fibers. They may be bound together through entanglement (needling) processes, or sealed

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Generic fiber name	Abrasion resistance	Sunlight resistance	Wrinkle resistance	Flammability	Absorbency
Natural fibers					
Cotton	Good	Good	Poor	Burns rapidly	Excellent
Linen (flax) and Ramie	Flat=Good Flex=Poor	Good	Poor	Burns rapidly	Excellent
Silk	Good	Poor	Good	Burns slowly	Good
Wool	Moderate	Moderate	Excellent	Slow to ignite	Good; slow
Manufactured fibers					
Acetate	Poor	Moderate	Good dry, poor wet	Burns rapidly	Good
Acrylic	Moderate	Excellent	Good	Burns, melts, drips flaming melt	Poor; quick drying
Elastrelle-p	Good	Good	Excellent	Variable; melts	Poor; quick drying
Lastol	Excellent	Moderate	Good	Melts, burns	Poor; quick drying; wicks moisture
Lyocell	Poor	Moderate	Moderate	Burns rapidly	Excellent
Modacrylic	Moderate	Excellent	Good	Flame resistant	Poor
Nylon	Excellent	Slowly loses strength	Excellent	Variable; can be flame resistant	Poor; quick drying; wicks moisture
Olefin	Excellent	Slowly loses strength	Good	Melts, burns	Poor; quick drying; wicks moisture
PLA	Moderate	Good	Excellent	Variable	Poor; quick drying
Polyester	Excellent	Good behind glass	Good to excellent	Variable; can be flame resistant	Poor; quick drying; wicks moisture
Saran	Excellent	Excellent, but may darken	Good	Doesn't burn; melts and chars	Poor; quick drying
Spandex	Moderate	Good; sun discolors	Excellent	Burns easily	Poor; quick drying
Rayon	Moderate	Moderate	Poor to moderate	Burns very rapidly	Excellent
Vinyon	Fair	Moderate	Moderate	Doesn't flame, but melts easily	Poor; quick drying

Table 1. Fiber facts

Fibers are ranked according to this scale: excellent, good, moderate, fair, poor.

in web-like structures with chemicals or heat. These nonwoven processes may be used in blankets, fleece, interfacings, and indoor-outdoor carpets. Needlepunched fabrics can vary in thickness, stiffness, and softness, but often are not very drapeable. Spun-bonded materials of olefin fibers are used in some protective gear.

Films

Fabrics are formed directly from polymers, which may be extruded as films or foam/matrix structures. Examples include waterproof rain fabrics, shower curtains, rubber gloves, and some imitation leathers and suedes. Films may get stiff in cold weather, but repel dirt and water, can be wiped clean, and may be disposable.

Yarns

Yarns are used in conventional woven or knitted fabrics. Natural fibers grow to lengths that range from 1/4 inch to more than 12 inches. *Staple* is the term used to describe short fibers. Staple fibers are twisted together, or spun, to form the continuous lengths of yarn needed for knitting or weaving. Synthetic fibers are formed in continuous lengths and may be filament or multifilament. They then may be cut into appropriate staple lengths to use in fabric blends with natural fibers. Filament fibers can be crimped, tangled, and/or texturized to provide more bulk and elasticity.

Yarns may have several strands or plies of fiber twisted together. Ply yarns are strong. When several plies are twisted together, the result is a cord or rope. An endless variety of fancy yarns can be produced by varying the speed of the twist or combining plies of different types in different ways. Often a fancy yarn has three plies: a base yarn for strength, a fancy one for interest, and a binder that is twisted around to hold the fancy one in place.

Yarn structure influences fabric characteristics such as absorbency, luster, strength, smoothness, stretch, warmth, and wrinkle resistance. Staple yarns are softer and more absorbent for towels, and warmer for sweaters. Filament

yarns have superior luster and strength for nylon hose and sheer curtains. Filament yarn size is measured as denier. Higher denier yarns are heavier and tougher, suitable for upholstery and carpets, while lower denier yarns are smaller and suitable for thin, sheer fabrics.

Blends

Blended fabric uses more than one fiber class or type to improve performance. For example, a 65 percent cotton/35 percent polyester blend shirt has cotton for absorbency and polyester for wrinkle resistance. An *intimate blend* has two or more fiber classes in the same yarn. Woven fabrics also can be blended using different fibers or fiber types in the warp than in the filling. With the exception of spandex, at least 15 percent of a fiber usually is needed to influence the character of a fabric. For example, adding 15 percent nylon to wool will improve the wool's strength, but adding five percent cashmere will do little to improve softness and merely will add the prestige of the high-status fiber. However, just three percent spandex in a blend will make the fabric more elastic—so athletic socks will stay up.

Fabrication

Fabrication method affects fabric characteristics such as appearance, abrasion resistance, comfort (warmth and softness), stretchability, and wrinkle resistance. Common methods are:

• *Knitting* uses hooked needles to interloop yarns, forming stretchy fabrics. Hand knitting uses a single set of needles. Home or manufacturing machines used in knitting use multiple needles to form either warp knit and/or filling knit fabrics. Loops in the direction of the fabric selvage (length) are called wales, while crosswise rows of loops are called courses. Gauge describes the fineness of the knit stitch. Warp and double knit fabrics stretch less and do not unravel or run as easily as filling or jersey knits. Raschel knit is used to form lace-like fabrics. However, if snagged, damage is potentially greater in raschel knit fabrics than in true lace, which is knotted.

• *Weaving* requires two or three yarn sets that are interlaced at right angles in repeating patterns. The basic weaves are plain, twill, and satin. These weaves identify different interlacing patterns. (See figure 1.) Fancy weaves include dobby, jacquard, leno, and pile (velvet). Plain and twill weaves are superior in durability and often are used in work clothes fabrics. A plain weave nylon upholstery fabric probably is most durable, but its availability varies with fashion. Satin weaves are very lustrous, but easily snagged and abraded. Acetate satin may be sufficiently durable for a prom dress worn once, but is a poor choice for lining a coat that will be worn repeatedly. Thread count is the sum of warp and filling yarns in a square inch of fabric and is a measure of quality noted on woven muslin and percale sheets. Sheets with thread counts of 160 to 180 are considered high quality and durable. The 200 count percales are smoother, but their fine, thin yarns wear through sooner.

• *Tufting* is a process that inserts face yarns into a woven backing where they are sealed in place with adhesives. Quality is judged by the closeness and height of the tufts as well as the quality of the backings and face yarns. Tufting is used in rugs and carpets.

• *Stitch-through* or malimo is a process in which a fiber web or yarns are laid down and chain-stitched together. It is used more often for curtain and drapery fabrics than for apparel. These open-looking fabrics often have clear filament stitching that holds and lets light filter through soft-textured, fancy effect yarns.

• *Quilting* involves stitching fiber filling between two outer fabrics. Such fabrics are very warm and are used in bedding and outerwear.

• *Laminating* or bonding seals two or more layers together with foam or a bonding agent. Some waterproof breathable fabrics are bonded with a one-way film to keep out liquid water while allowing perspiration to escape.

• Other fabrication methods include *knotting* (used in laces), and *braiding* (used in shoe laces).

Finishes

The last step in manufacturing textiles is applying finishes. Finishes may change appearance and texture. For example, flocking gives a fuzzy texture. Some finishes change the functional characteristics of the fabric, such as moth resistance, water repellency, or flame resistance. Finishes may be given trade names by manufacturers, but many common finishes, such as singeing on polyester blends to minimize pilling, are routine and are not noted on consumer product labels. Fabrics with functional finishes usually are labeled because finishes are costly for manufacturers to apply.

Color and dyeing

New strains of cotton that produce colored cotton bolls on the plant currently are available.

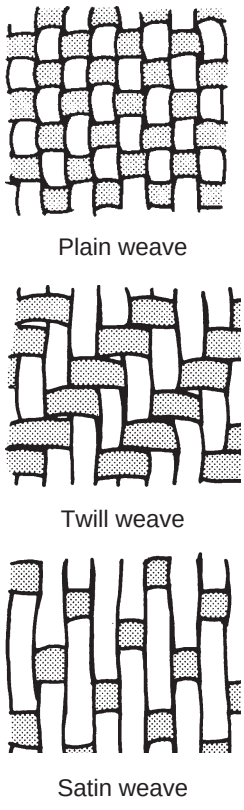

Figure 1. Weaves

They are promoted as "naturally colored" and perhaps "organically grown" if no pesticides were applied. Otherwise, color can be applied at any step during manufacturing, or after the fabric, garment, or textile product is made. Before fabrics are dyed they are called grey goods. Carpets often are tufted as grey goods, kept in inventory, then dyed to order. Printed fabrics employ a variety of technologies originating with the historical hand block print process. Direct-roller printing, screen, and heat transfer printing are commonly used. A newer technology, computer digital printing, is not yet available on the mass market, but designers use it creatively to print one-of-a-kind garments and fabric samples.

Colorfastness depends on both the dye's attraction to the fiber used in the fabric and the application process used. A fabric dyed or printed with a fugitive dye, such as indigo commonly used in jeans, will continue to bleed and fade in color with each laundering. Usually washable fabrics are colorfast to laundering, dry cleanable fabrics resistant to dry cleaning, and furnishing fabrics resistant to sunlight and fume fading. Nevertheless, exceptions occur and consumers can have bad experiences because there are no labeling requirements related to colorfastness. It pays to complain to the retailer and manufacturer if you have a bad experience. They should have a chance to satisfy you and "make it right."

Regardless of the manufacturing process used, it is almost impossible to alter or set color accurately in finished products with commonly available home dyes. Use of home dyes for craft purposes can be satisfying and enjoyable. But considerable risk is involved in using home dyes. The result cannot be predicted with certainty. Despite widely circulating "common knowledge" to the contrary, salt, vinegar, and alum do not "set" dyes and do not prevent further bleeding or color loss.

Care

Care that is recommended for most apparel textiles is indicated on a Permanent Care Label that is attached to the garment in accordance with the Federal Trade Commission Rule. Furnishing textiles often have care labels, however this is voluntary. Labels indicate whether items are washable or dry cleanable and give warnings about certain chemicals such as bleach. Care recommendations are based not only on fiber content, yarn, fabrication, and finishes in the textile, but also on construction features of the finished garment or textile product. Often the combination of components with differing shrinkage characteristics results in products that cannot be washed. Occasionally products appear on the market that truly must be considered disposable because care methods appropriate for one component will damage another. An example is a white fake leather jacket with a rabbit fur collar and an acetate lining.

As you consider your choices in apparel and furnishing textiles, consider the fiber, yarn, fabrication, and finish. Textile product performance varies. You'll have greater satisfaction by making a thoughtful choice.

For more information:

Federal Trade Commission, for information about the Textile Fiber Product Identification Act and its modifications: http://www.ftc.gov/os/statutes/textilejump.htm

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