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Textiles

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Understanding fibers and their performance is essential because fibers are the basic unit of most fabrics. Fibers influence product aesthetics, durability, comfort, appearance retention, care, environmental impact, sustainability, and cost. Successful textile fibers must be readily and continuously available and cost-effective. They must have sufficient strength, pliability, length, and cohesiveness to be processed into yarns, fabrics, and products that satisfy customer needs.

Textile fibers have been used to make fabric for several thousand years. Until 1885, when the first manufactured fiber was produced commercially, fibers were produced by plants and animals. The fibers most commonly used were wool, flax, cotton, and silk. These four natural fibers continue to be used and valued today, although their economic importance relative to all fibers has decreased. **Natural fibers** are those that are in fiber form as they grow or develop and come from animal, plant, or mineral sources. **Manufactured** (or **man-made**) **fibers** are made into fiber form from chemical compounds produced in manufacturing facilities and include such fibers as acrylic used in sweaters and awnings and aramid used in bullet-proof vests and brake liners. See Table 3.1 for a list of natural and manufactured fibers. Several new fibers on the market are made from plant materials, but these new fibers are not considered natural

Natural fibers are in fiber form as they grow or develop and come from animal, plant, or mineral sources. **Manufactured** (or **man-made**) **fibers** are made into fiber form from chemical compounds produced in manufacturing facilities.

Table 3.1 Fiber Classification Chart*

NATURAL FIBERS			MANUFACTURED FIBERS			
Cellulosic	**Protein**	**Mineral**	**Cellulosic**	**Protein**	**Synthetic Fibers**	**Mineral**
Seed: Cotton	Wool	Asbestos	Acetate	Azlon	Acrylic	Glass
Coir	Silk		Bamboo		Aramid	Metal/Metallic
Kapok	Cashmere/Pashmina		Lyocell		Elastoester	Carbon
Milkweed	Llama		Rayon		Elasterell-p	Ceramic
	Alpaca		Seaweed		Fluoropolymer	Stainless steel
Bast: Flax	Vicuña				Lastol	
Hemp	Guanaco				Modacrylic	
Ramie	Angora				Nylon	
Jute	Camel				Olefin	
Kenaf	Mohair				PBI	
Hibiscus	Yak				PBO	
	Fur				PLA	
Leaf: Abaca	Qiviut				Polyester	
Piña	Spider silk				Polyimide	
Sisal					Rubber	
Henequen					Spandex	
Other: Rush					Sulfar	
Sea grass					Vinal	
Maize/corn husks					Vinyon	
Rush						
Palm fiber						
Wicker						

*See individual fiber chapters for more complete lists. Only select fibers are included here.

When examining a fabric with staple fibers, the fabric will have a soft or matte luster and feel fuzzy, and fiber ends protrude above the surface when the fabric is viewed closely. If the fabric is folded and the folded area is viewed over a contrasting surface, the fiber ends can be seen, making the edge of the fabric look slightly fuzzy or hazy. When a yarn is unraveled from these fabrics, short fiber ends can be seen protruding from the yarn. When the yarn is untwisted, short fibers can be pulled from the yarn and the fibers may vary slightly in their length. No fiber is as long as the yarn or the piece of fabric from which the yarn was raveled.

Smooth filament yarns will produce a fabric that is shiny, lustrous, smooth, and slick. No fiber ends can be seen on the surface. When a yarn is removed, it usually takes fewer turns to unravel it. The only fiber ends that exist are where the fabric has been cut and the fibers are as long as that piece of fabric. If the fabric is folded and viewed over a contrasting surface, the edge of the fabric will look sharper or crisper than that of a spun yarn fabric. If the filament yarn has been textured or bulked, it will resemble spun yarns in some aspects and filament yarns in other aspects. The fiber ends only occur where the fabric is cut and the yarns are as long as that piece of fabric. But the hand is not as smooth and slick and the surface will not look as flat and even as a smooth filament yarn fabric. Consumers will not see filament tow. Filament tow is used to produce spun yarns—either of a single fiber type or blends such as cotton and polyester chambray for shirts or wool and acrylic herringbone for skirts and trousers.

Diameter Fiber diameter greatly influences a fabric's performance and hand (how it feels). Large fibers are crisp, rough, and stiff. Large fibers also resist crushing—a property that is important in products such as carpets. Fine fibers are soft and pliable. Fabrics made with fine fibers drape more easily and are more comfortable next to the skin. Large fibers are used to produce durable products such as book bags and luggage. Fine fibers are used to produce softer and more comfortable products such as apparel and bed linens.

Natural fibers like cotton, ramie, wool, and silk are subject to growth irregularities and are not uniform. In natural fibers, fineness is one factor in determining quality—fine fibers are of better quality. Fineness is measured in micrometers (a micrometer is 1/1000 millimeter or 1/25,400 inch). The diameter range for some natural fibers is 16 to 20 micrometers for cotton, 12 to 16 for flax, 10 to 50 for wool, and 11 to 12 for silk.

For manufactured fibers like rayon, nylon, and polyester, diameter is controlled at several points during production. Manufactured fibers can be made uniform in diameter or can be thick and thin at regular intervals throughout their length. The fineness of manufactured fibers is described as denier or tex. **Denier** is the weight in grams of 9,000 meters of fiber or yarn. When used to describe a fiber, denier refers to the fineness or coarseness of the fiber—small

Learning Activity 2

Use Fabrics #3, 5, and 6 from your swatch kit. Identify the fiber lengths in each fabric as filament or staple. Suggest one or two textile products that might be made using each fabric. Describe the serviceability for each product that would be related to fiber length. Explain your reasoning. From the clothes you are wearing and the other textile products you have with you today, identify the items that are made from staple fibers and those made from filament fibers. How does the serviceability of those items relate to fiber length?

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