

Wool Fibers and Specialty Hair Fibers

Wool comes from the “hair” typically called fleece that is sheared from sheep.

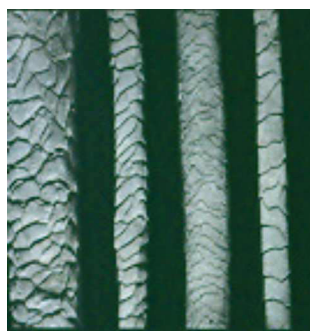
There are several sheep breeds, each giving a slightly different wool fiber quality and performance. Rambouillet and Hampshire are two sheep breeds—there are many more*. You may have heard of “merino wool” as being high quality. The fiber comes from the Merino sheep breed. Because it’s noted for higher quality, you might see it on a fabric’s fiber content label. Woolmark (<https://www.woolmark.com/>) certifies wool that meets its quality requirements. You may have seen Woolmark™ logos for “Pure New Wool,” “Wool Rich Blend,” and “Wool blend.” Go to the Woolmark™ website to learn more about their branding process including the tests that are performed on wool. (<https://www.woolmark.com/> Retrieved 4/29/26)



Sheep half-sheared. Note the dirt on the surface of the fleece. Wool fleece goes through a cleaning process to remove dirt and debris.

Photo source: *National Geographic*, Vol 172, No 5, May 1998.

Each individual wool fiber is complex. The surface has scales that look like shingles or stacked cups. The larger and craggier the scales, the rougher the texture of the fiber. Finer wool fibers, like merino, have smoother scales that wrap around the fiber. The photomicrograph shows that alpaca and cashmere have smoother scales (compared to standard wool) contributing to a smoother, softer fiber (see more on these two fibers in the PDF on specialty hair fibers).



Coarse wool, wool, alpaca, cashmere



Clips of wool fleece with lanolin. Note crimp & yellow tint.

In addition to scales wool fibers have “crimp” that adds texture. Crimp also varies by sheep breed. Scales and crimp make wool easy to spin into a yarn—the fibers naturally cling together. Woolen yarns made of short length and “crimpier” fibers, make a textured yarn; while worsted

yarns are smoother, longer and thinner producing smooth to the touch yarns (more on yarns in the Yarn section).

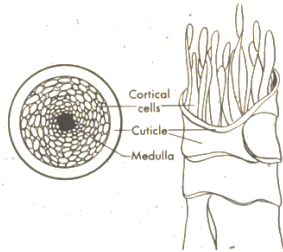


Illustration of wool fiber

The interior of the wool fiber also helps explain some of its properties. The drawing illustrates the exterior scales (made of a material called cuticle). Cortical cells contribute to the lengthwise strength of the fiber. The medulla is in the fiber's center. In some wools the medulla is hollow contributing to the insulating properties of wool. “Dead air space” is insulating.



Irish Fisherman Knit Sweater

Photograph: K. LaBat

When wool is sheared from the sheep—fibers are coated with a natural secretion called “lanolin” which has a yellowish tinge. Think of it like the oil your scalp secretes with your hair. Lanolin is typically removed when the fleece is washed preparing it for further processing. Lanolin is a by-product used in lotions and cosmetics. When it's left on the fiber it lends a natural water-resistant finish. The traditional Irish Fisherman's Knit Sweater was made with “natural wool” and known for its characteristic cream-color and resistance to mist and rain.

Wool Labels

The U.S. Federal Government requires labels on fabric/textile products [see more information about the *Textile Fiber Identification Act* (TFPIA)]. Information in this short course is the “boiled down” version. There are requirements for wool products stated in the *Wool Products Labeling Act* (WPLA). If you are selling wool products, read the complete document to make sure you are complying with regulations (<https://www.ftc.gov/legal-library/browse/rules/wool-products-labeling-act-text>). Wool fabric labeling requires use of one of three terms: *wool*, *recycled wool*

or, *lamb's wool*. Words additional to those terms are unnecessary. *Wool* is the same as *New wool* and *Virgin wool*. *Virgin wool* may convey higher quality, but it just means the wool in the fabric is not recycled. *Recycled wool* means the fiber in the fabric was used in a product before it was shredded to reclaim fibers to spin again into a yarn for the fabric. *Lamb's wool* is the first clip from a lamb. Think of the thin, smooth hair from a baby's first haircut—Lamb's wool has that feel. It's typically included because it conveys a higher price.

Wool Properties

Wool has special properties contributing to characteristics of wool fabrics.

Felting

The scales on the surface of wool contribute to its natural felting ability. When a wool fabric is washed in hot water and detergent, the scales flare open (illustration). If the fabric is agitated, pounded, etc.—the scales tangle making a dense fabric. Woven wool fabrics are typically “finished” with a controlled felting process, making a dense and “full” fabric—the process is called “fulling.” The fabric “felt” is made by felting a batt of fibers.

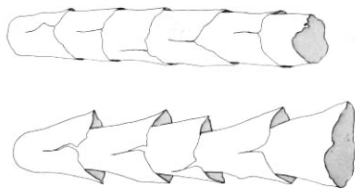


Illustration of wool fiber: before submerging in hot water & detergent and after—scales flare open.

Felting may be good or bad. A sweater mistakenly thrown in the washing machine and dryer—is subjected to a felting process—resulting in “shrinkage” and a smaller size—not good!

Biodegradable

Wool is biodegradable, making it environmentally friendly—one of the reasons for the resurgence in popularity of wool products. One caution is that finishes on wool fabric may delay the decomposition process.

Other Wool Properties:

Naturally flame resistant: The protein in wool makes it resistant to fire, meaning it does not immediately catch fire. It will smolder and has the characteristic odor of burning hair. Some manufacturers of fire fighters gear are returning to using wool instead of high tech fibers.

Resilient: The crimp and internal helix of the fiber (looks like a spring) make the fiber naturally resistant to wrinkling—it's “springy.” It also makes a good carpet fiber—leaving no footprints.

Absorbs odor: If you wear a wool suit in a smoky room, the smoke odor is easily trapped in the fiber—so the smell will linger. Not a good choice for interior fabrics where people will be smoking or eating “fragrant” food.

Absorbs noise (sound insulation): The dead air space in wool makes it a good noise insulator. Wool carpet helps dampen noise in a room.

Weaker wet: Cleaning labels for wool fabric often says—handle gently, do not agitate. One reason is to avoid felting, another is that wool is weaker wet.

Damaged by chlorine bleach and alkali: These two properties mean caution in cleaning wool fabric. If you must, use hydrogen bleach instead of chlorine bleach. Many laundry detergents are alkali base. A mild soap, like *Woolite*, is recommended for wool fabrics.

Wool fabrics shape with heat and moisture: This property makes wool fabric perfect for tailoring as it can be shaped to the body or the curve of a collar.

High heat will scorch wool: Use caution when pressing wool fabrics, because they will scorch giving the characteristic odor of burning hair. Use a press cloth as a barrier between an iron and the fabric.

Moth larvae will damage: You’ve probably seen the tell-tale small holes in wool fabrics. A best practice for wool products, is to clean them before long-term storage removing any tasty food for the larvae—it’s like steak sauce on the protein—yummy!

Weakened by sunlight: Wool is a protein—like your skin. You can sunburn—wool can also be damaged by sun exposure, so it’s not a good choice for draperies or outdoor furniture.

Does not conduct heat: If a fiber is non-conductive, it keeps heat from moving along the fiber. Wool fabrics are known to be warm partially due to this property. Compare wool to something like a metallic fiber which can conduct heat.

Static charge build-up in low humidity: You may have experienced the irritating “snap” of an electric charge or the dreaded “static cling”—especially in a dry cold climate. Other fibers, like nylon, also have this property. Some carpet finishes hold moisture to avoid static build-up.

Wool Blends

Wool fibers are often blended with other fibers which will contribute properties to the fabric. Another fiber, like a synthetic, may be added to cut cost as wool is one of the more expensive fibers. Percentage makes a difference: 50% wool/50% nylon will perform differently from 80% wool/20% nylon.

Typical Wool Fabric Names: wool flannel, herringbone, felt, worsted wool, challis, gabardine, Donegal tweed, Harris tweed, serge, melton, tartan, sharkskin, wool jersey

Specialty Hair Fibers

Specialty hair fibers, like wool, are protein fibers that are sourced from different hair growing mammals. These fibers are often thought of as luxury fibers. Many of these fibers are favorites of textile crafters. Here's a short list: mohair, cashmere, camel hair, angora rabbit, alpaca, llama, horsehair, and many more.*



Knitted mohair yarn

Image credit: "© Alice Wiegand / [CC BY-SA 4.0](https://commons.wikimedia.org/wiki/File:Mohairgarn.jpg) (via Wikimedia Commons)"
<https://commons.wikimedia.org/wiki/File:Mohairgarn.jpg>

Specialty hair fibers have similar performance properties to wool due to their protein composition. Appearance and texture differences are due to physical structure differences like size (length and circumference) and roughness of scales.

* To learn more about wool and specialty hair fibers I recommend: *The Fleece & Fiber Source Book* by Deborah Robson and Carol Ekarius and published by *Storey Publishing*. The book contains terrific descriptions and visuals that will especially be appreciated by hand knitters, crocheters, spinners and weavers.