

Yarn and Fabric Production from Angora Rabbit Fiber and Its End-Uses

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Abstract The Angora rabbit fiber has a smooth texture which makes it difficult to spin. Because of this reason it is usually blended with other fibers such as wool to improve its performance both in processing and fabric wearability. In this study, general knowledge on the yarn and fabric production from Angora rabbit fiber and its end-uses is given.

Keywords: Angora rabbit fiber, yarn, fabric, end-uses

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1. Introduction

It's no secret that the world's softest garment fiber comes from animal called the Angora rabbit. Quiet and calm by nature, these animals have been used in fiber harvest for hundreds of years, and are thought to have originated in Turkey [1].

Angora fiber has a low density of about 1.15 to 1.18 gm/cm³ compared to 1.33 gm/cm³ for wool and 1.50 gm/cm³ for cotton. This gives the Angora garments a feeling of being very light and also Angora is extremely warm, soft and silky to touch [2].

Wool made of Angora rabbit tends to be very warm and is frequently used to trim sweaters or to knit hats and scarves. Angora is generally accepted as a luxury fiber, and most products made from it are very expensive, reflecting the laborious harvesting process and the small number of producers [3].

2. Yarn and Fabric Production From Angora Rabbit Fiber

Angora rabbit fiber has excellent luster, warmth retaining properties and flexibility, which makes it an ideal fiber for textile end uses. However, since it has little scales and crimps in comparison to other animal fibers, spinnability is very poor and it is difficult to produce a fine spun yarn [5]. For the reason of being a slippery fiber to spin, it requires a lot of twist to hold the fibers firmly in the yarn. Owing to its fine quality and smoothness, one way to spun yarn from Angora wool is to use the hand held spindle used for hand spinning. Difficulties arise during processing of fibers because of intensive generation of electrostatic charges and because of the smooth surface of

the fibers [4]. There is a constant risk of fiber shedding as there is lack of fiber to fiber friction. Because of this reason Angora rabbit fiber is usually blended with another fiber such as wool to improve its performance both in processing and fabric wearability [2]. Due to its fibrosity, it is also extremely difficult to weave a 100% Angora yarn. Hence, the normal practice is to weave fabrics using Merino wool yarns for the warp and Angora yarns for the weft [4].

Mishra and Goel (2004) studied the production of Angora rabbit fiber and merino wool blends. The evenness of yarn decreased with increasing proportion of Angora rabbit fiber. Pure Angora rabbit yarn showed more neps and other irregularities compared to that of pure merino wool yarn. They concluded that a blend of 35:65 of rabbit fiber and merino wool was found to be best for preparing woven or knitted fabric because of better performance, aesthetic appearance and low cost [5].

Chattopadhyay and Ahmed (2006) studied the blending of Angora rabbit fiber with cotton fibers. The soft feel and low shrink properties of Cotton and Angora rabbit fiber blended knitted fabrics were found suitable for women's innerwear and children's wear [5].

Some of the commercial blends of Angora knitting yarns can be listed as:

- 70% Angora, 30% Nylon
- 50% Angora, 25% Merino wool, 25% Polyester
- 40% Angora, 50% Wool, 10% Nylon
- 70% Angora, 30% Silk
- 50% Viscose, 25% Nylon, 15% Angora, 10% Wool [5].

Another way to produce a 100% Angora rabbit yarn is to modify the fiber surface to introduce crimps or roughness to the surface [5]. For this aim, National Institute of Design (NID) in collaboration with Institute for Plasma Research (IPR) developed a Prototype Plant for Atmospheric Pressure Plasma Processing for Angora

Wool (APPAW). This plasma plant for surface modification of fibers is shown in Fig.1. APPAW is a novel Plasma Technology which generates plasma at atmospheric pressure using air as plasma forming gas. A patent has already been filed for this technology. This is a cost-effective green process [4].

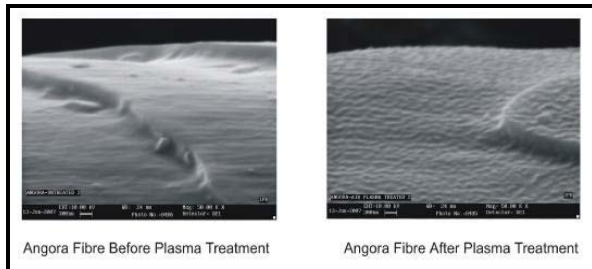


Figure 1. Modification of Angora rabbit fiber surface [4]

The plasma etching of Angora fiber surface at atmospheric pressure glow discharge is shown in Figure 1. Plasma treatment assists in increasing the friction and cohesion between the fibers. It forms a part of the movement on promotion of non-polluting techniques for mechanical processing of textile materials without any difficulties such as static, shedding, fibrosity [6].

3. End-Uses of Angora Rabbit Fiber

Angora rabbit hair is used both knitted and woven outdoor, ladies underwear, hosiery, gloves and knitted millinery and felt hats, although fiber shedding can sometimes present problems [7]. Angora rabbit hair knitted products can present serious fiber shedding problems, due to low fiber friction, length and strength, together with the fact that low yarn twists are generally employed to maximize softness of the garments [8]. Angora rabbit fiber is used for items such as sweaters, mittens, baby clothes, and millinery etc. [7].

End-uses of Angora rabbit fiber can be divided into two main categories:

1) Knitted clothes usually with a moderate fluffing effect, such as sweaters, scarves, woollen hats, socks, gloves, etc (Figure 2).



Figure 2. Sweater from Angora rabbit fiber [9]

2) Woven material for suiting fabric and next to skin thermal underwear.

Knitted product is the common fabric type produced, as the bristle content of most Angora fleeces makes it unsuitable for the production of next to skin wear or high quality suiting material [2].

The warm nature of Angora fabrics resulted in Angora fabrics being used in health products for the benefit of arthritis patients and for thermal underwear in cold

climates. This is a non-fluffy material currently being sold as blends of wool, Angora and synthetic to produce a durable fabric. Angora fiber blends with synthetics or cotton have also been developed to produce high quality, light weight, wash and wear suiting material [2,10].

Angora products usually contain 20% wool, however; to gain the properties of Angora in the finished product no more than 30% Angora fiber is required in the fabric. Angora can be successfully blended with a range of natural and synthetic fiber to maintain the desired fabric characteristics of pure Angora fabrics. Fabrics containing a high Angora fiber content are only suitable for hand washing. Machine washable fabrics can be produced if the Angora fabric contains 50% of a synthetic fiber such as polyester [2].

Oglakcioglu *et al.* (2008) studied the thermal comfort properties of cotton/angora rabbit fiber blended knitted fabrics. The percentage content of Angora fiber varied from 5-25%. Results showed that at least 25% of Angora fibers need to be added in the blend to achieve better thermal comfort properties [5,6].

Angora rabbit fiber is very popular in medical and thermal underwear, under-blankets in hospitals, nightwear and blank etc., particularly the hair from the German Angora rabbit. The hair from the French type is very popular in fashion wear (e.g. shawls) [8].

The German Textile Industry was the greatest user of Angora rabbit hair during the latter part of the twentieth century, with popular end-uses there being medical and other types of underwear. In medical underwear, it is considered to reduce muscular and other pains attributed to its electrostatic, thermal moisture absorption properties, the medullated and fine structures of the fiber resulting in it having excellent thermal insulation properties [8].

Angora rabbit fiber can be conveniently used in high-altitude clothing, especially those used by defence personnel deployed in sub-zero temperature regions [11]. Soldiers on duty at high altitudes require light, warm, breathable and waterproof clothing to get excellent protection from cold, wind and rain. Angora fiber is well-known for its high thermal insulation and its extreme lightness in weight. The plasma etching of Angora fiber has enabled in increasing the friction and cohesion between the fibers and facilitating spinning and weaving of 100% Angora fabrics. Therefore, the fabric from plasma treated Angora wool was used as a middle layer, which insulates body from cold, for making multilayer clothing to provide protection against cold, wind and rain. This is illustrated in Figure 3.



Figure 3. Prototype multilayer jacket with Angora rabbit fiber [4]

4. Conclusions

Angora rabbit fiber is a specialty fiber known for its excellent thermal insulation characteristics and fibers are blended with wool in production of cold weather clothing and fashion garments. Innovative blends of these fibers with wool; cotton and other fibers need to be explored to produce value added products with improved functional characteristics. Modification of fiber surface by chemical treatments or plasma treatment or by any other means is essential for improving the spinnability of this fiber. It is also used in blends with other natural fibers for the production of yarns for both knitwear and woven cloth for apparel.

This fiber is very fine, soft hair used principally in the production of high quality knitwear, although currently there is a trend towards incorporating small quantities of angora in woven cloth.

Angora wool is normally mixed when knitted into clothing, with other soft fibers such as silk, cashmere, mohair, or sheep's wool, at a usually no more than 30% ratio. Garments made of 100% Angora wool are undesirable as they would be too warm and the texture too fine to provide density in knit stitches.

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