

Research Article

Mechanical Attribution in Improving Pilling properties

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Abstract

Pilling is undesirable property that affects handle and appearance of fabrics. It happens when washing and wearing of fabrics causes loose fibers to begin to push out from the surface of the cloth, and, over time, abrasion causes the fibers to develop into small spherical bundles, anchored to the surface of the fabric by protruding fibers that haven't broken. This article illustrates how pilling resistance of plain woven polyester/wool blended fabrics is minimized by mechanical support like heat setting, singeing.

Keywords: Mechanical Attribution etc.

Introduction

Polyester blended fabrics with wool are used in many textile applications due to excellent properties. Because of fashion and cost, the present trends in manufacturing light fabrics have led to a certain increase in pilling phenomenon. Many technical developments have been reported over the years in the field of reducing pilling tendency. The present article involves studying the various properties and behavior of polyester /wool blended fabrics subjected to different mechanical treatments to improve pilling and at the same time finishing with amino-silicon softeners in order to pick up the hand feel.

Pilling property

It is observed that pilling tendency of the fabric samples increases with decrease in the wool content of the blend in the all samples. This may be due to the fact that greater number of polyester fibers migrated on the surface of yarn with increase in the polyester content of the blend and hence the pilling increased, and converse is true for wool fibers used in the blend. Wool fibers fuzz more readily than polyester fibers but this fuzz wears off easily.

yarn count has significant effect on pilling tendency of the fabric samples, the yarn count becomes finer with pilling decreasing, which may be due to the fact

that fine yarns are used to weave fabrics, where the number of intersections is greater than when coarse yarn is used. On the other hand coarse yarn is less compact and results in more slippage of fibers as compared to fine yarn.

Formation of pilling in different fabric

Satin woven fabrics have lower pilling resistance as compared to twill and plain-woven fabrics. In other words, the longer the float length the higher is the pilling propensity. In case of plain-woven fabrics, there is higher number of intersections between the warp and weft yarns which offers an increase to slippage of fibers and difficult to easily fuzz formation on fabric samples surface.

Minimization of pilling

Mechanical finishing plays a critical role in pilling. Its main role is to stabilize the fibers inside the yarn and remove the surface nap. This can be achieved via heat setting, singeing etc.

Heat-set and singeing

Heat temperature set has significantly affected pilling tendency of fabric samples, with increasing heat temperature that may be due to the heat temperature set the fiber within the fabric surface and improves proportional pilling resistance. Polyester wool fabrics can be heat-set at temperatures of $180^{\circ}\text{C} \pm 5^{\circ}\text{C}$.

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Table 1: Effect of Heat setting on pilling of polyester/wool blended fabrics

Blended Composition	Weave structure	Heat setting	Singeing	ICI(*) Pill-box
70% PES: 30% Wo	Plain	180 degree Celsius	No	II
55% PES : 45%wo	Plain	180 degree Celsius	No	II
30% PES: 70% Wo	Plain	180 degree Celsius	No	II
70% PES: 30% Wo	Plain	180 degree Celsius	No	II
55% PES: 45% Wo	Plain	180 degree Celsius	No	II

(*) ICI pill-box rating: I = no pilling, II = slight pilling, III = sever pilling

Table 2: Table 1: Effect of Heat setting & singeing on pilling of polyester/wool blended fabrics

Blended Composition	Weave structure	Heat setting	Singeing	ICI(*) Pill-box
70% PES: 30% Wo	Plain	180 degree Celsius	Yes	I
55% PES : 45%Wo	Plain	180 degree Celsius	Yes	I
30% PES: 70% Wo	Plain	180 degree Celsius	Yes	I
70% PES: 30% Wo	Plain	180 degree Celsius	Yes	I
55% PES: 45% Wo	Plain	180 degree Celsius	Yes	I

(*) ICI pill-box rating: I = no pilling, II = slight pilling, III = sever pilling.

This is illustrated that Heat setting helps to minimize pilling which is signified from below table.

Fabric-pilling resistance significantly increases with singeing treatment at 40 m/min speed. This may be due to the fact that singeing removes the nep on fabric samples surface. Although singeing is very effective in removing the surface nep it imparts some harshness to the fabric surface. For that after singeing, softener can be added during washing to improve fabric surface.

Heat setting & singeing influence the extent of pilling formation. These processes are very effective in removing the surface nap on fabric surface.

Some Characteristics of Finished Polyester/wool Blended Fabrics

Preliminary experiments revealed that singeing and heat setting conferred stiff handle to polyester/wool blended fabrics. However, improved pilling performance and soft handle can be enhanced if the fabrics are finished with amino-silicone softeners. This could be attributed to the modification of wood fiber properties. The influence of amino-silicon softeners on performance of polyester/wool blended fabrics exhibit higher dry crease recovery and soil removable. On the other hand, the hydrophilicity of the fabric surface is enhanced with both softeners. This may be due to production of new sites by heat as hydrolytic fission of peptide chains and/or disulphide linkage.

This suggests that presence of amino-silicon softeners seems to induce stabilization of the fabric in the dry state by virtue of its involvement in reactions with amino and or carboxylic group of wool peptide chains. This can be attributed to the presence of amino or sulfonic groups in its molecules.

The extent of changes in chemical properties of finished polyester/wool fabrics to impedes pilling formation was assessed by carrying out various analytical measurements.

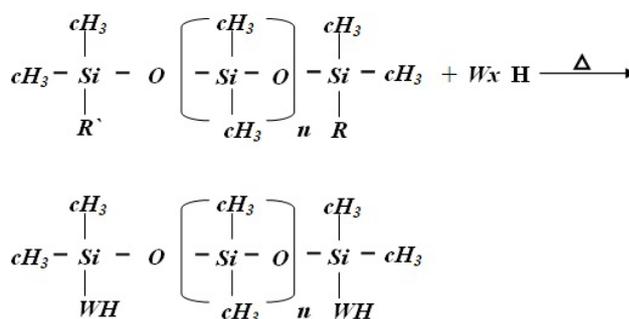


Fig. 1: Amino-silicones

Where:

- C R', R = (cH3)3 - NH - (cH2)2 - NH2
- C (AEAP); Amino - ethyl - amino - propyl silicones
- C w = wool
- C x = OH, SH, COOH or NH2

Conclusion

The pilling is formation of ugly looking small balls of fibers on fabric surface. Pilling does not depend only on single factor but it is the result of several factors. In case of polyester wool blended fabrics, pilling tendency of the fabric increase with increase of the polyester content. Finer yarns have lower pilling than coarser. Pilling resistance significantly increase with increasing heat set temperature with all studied parameters. Singeing plays a critical role than various studied factors for pilling resistance, which significantly increase with decreasing singeing speed.

Reference

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