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TREATMENT OF WOOL

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This invention relates to treatment of wool in the form of loose fibers, yarn or fabric consisting wholly or partly of wool, in order substantially to eliminate or reduce tendencies of such materials to felt or shrink when subjected to washing with aqueous solutions.

Wool and woolen fabrics have long been known to undergo undesirable changes in physical characteristics during washing operations because of the pronounced tendency of the wool to shrink and "felt," the latter term denoting the curling and tenacious intertwining of adjacent fibrillae, which causes the wool material to become denser, more compact and less elastic.

It has been proposed to render wool substantially unshrinkable by chlorinating the wool, either with chlorine gas or with hypochlorite or hypochlorous acid solution. It has been found, however, chlorination of wool to an extent sufficient substantially to eliminate or reduce its shrinking tendencies causes deterioration and impoverishment of the wool fibers. The chlorination apparently completely destroys the epithelial scales constituting the outer surface of the wool fiber and also attacks the inner corium portion of the fiber, resulting in a thin and glass-like fiber. Wool treated with chlorine in accordance with heretofore known procedures has at times been found to be slimy to the touch when wet, weak, frayed, considerably thinner than untreated wool and harsh to the touch when dry. Moreover, the deterioration of the wool is even greater unless conditions of chlorination are carefully controlled, for example the moisture content of wool to be chlorinated with elemental chlorine must be below 8%. This necessitates a drying step, except possibly in the limited geographical regions where the relative humidity is generally below 30%.

It is an object of this invention to provide a process for treating wool, which process substantially eliminates or reduces the felting and shrinking tendencies of the wool when subjected to washing with aqueous solutions and does not result in deterioration and impoverishment of the wool substance.

I have discovered the tendency of wool to felt and shrink upon washing may be substantially eliminated or greatly reduced by treating the wool with nitrosyl chloride, either in gaseous form or in solution in an inert organic solvent. By this process there is obtained an improved wool product, the nitrosyl chloride having modified the properties of the wool fibers to reduce greatly or substantially eliminate their felting and shrinking characteristics.

The wool to be treated by the process of this invention is usually air-dried, i. e., moisture-conditioned by exposure to air, preferably, for the sake of uniformity of product, by exposure to air of relative humidity 40% to 100% at about 20° C. for a time sufficient to attain the equilibrium moisture content corresponding thereto (about 10% to 30% H_2O in the wool). However, the use of air of 40% to 100% relative humidity for conditioning the wool is not essential, particularly in regions where the relative humidity of the atmosphere is near the range stated, and the process of this invention may be practiced without drying or moisture-conditioning the wool.

In the process of my invention the wool is treated with nitrosyl chloride, preferably by immersion in a solution of NOCl in an inert organic liquid, i. e., a liquid unreactive towards either nitrosyl chloride or wool fiber; for example, benzene, carbon tetrachloride, petroleum solvents or other organic liquid, the solution containing about 0.5% to 5% NOCl by volume (based on liquid volumes), preferably about 2%. About 4 to 12 parts by weight of solution to 1 of wool may be used in the treatment. After treating the wool at room temperature for a time sufficient to bring about the desired reduction in felting and shrinking characteristics of the wool, usually about an hour when using the above-described solution of NOCl, the wool is removed from contact with the NOCl. When a solution has been used for the treatment the wool is washed with an organic solvent, e. g., in a centrifuge, to remove residual solution and reaction products, and thereafter dried, the solvent and residual nitrosyl chloride being recovered for further use.

The treated wool is washed with water containing a detergent or wetting agent, neutralized with an aqueous solution of a mild alkali such as ammonium hydroxide or sodium bicarbonate to remove residual acid bodies, rinsed and dried.

When gaseous NOCl is used as the treating agent the wool is exposed to nitrosyl chloride gas in a chamber from which the air has been substantially removed, until samples of the wool show the desired reduction in felting and shrinking tendencies. The treated wool is washed in a detergent solution, neutralized, rinsed and dried as described above.

The following is a preferred example of the process embodying my invention:

A number of pieces of air-dried "natural" color knitting yarn one meter in length were provided;

some of the pieces of yarn were then treated with benzene containing 1.6 volume % NOCl (about 2.55 wt. % NOCl) at a temperature of 20° C. for one hour. The treated yarn was rinsed several times in pure benzene, air-dried to remove the organic solvent, soaked in a detergent solution (0.2% Orvus WA) for five minutes at room temperature to wet out the wool, rinsed and soaked for five minutes in 0.03% NH_4OH, rinsed with water, and air-dried without applying tension to the yarn. Upon comparison the treated yarns were found to be substantially the same length as the untreated yarns at this point.

The treated and untreated yarns were then washed in the standard Lauder-ometer for one hour at 60° C. and one hour at 80° C. The yarns were thereupon air-dried without tension and measured for shrinkage. The following data are representative of the results obtained.

Length of treated yarns	cm.	90
Length of untreated yarns	cm.	68

That is, nitrosyl chloride treatment was found to have reduced the shrinkage of the wool yarn about 70%.

In further tests made on flannel cloth it was found the felting or intertwining of adjacent fibrils was much more conspicuous on untreated cloths than on samples treated with nitrosyl chloride.

In contrast to wool treated with chlorine, cloth and yarn treated with nitrosyl chloride lost none of their softness, elasticity, and other desirable characteristics.

It is understood the above description is merely illustrative of my process, and my invention is not restricted thereto as it is apparent that many changes may be made therein, without departing from the scope of the invention as defined by the appended claims.

I claim:

1. A process for reducing the felting and shrinking tendencies of wool, comprising treating the wool with nitrosyl chloride.

2. A process for reducing the felting and shrinking tendencies of wool, comprising treating the wool with a solution of nitrosyl chloride in an inert organic liquid, containing about 0.5% to 5% NOCl by volume.

3. A process for reducing the felting and shrinking tendencies of wool, comprising treating the wool with a gas containing nitrosyl chloride.

4. A process for treating wool, comprising contacting air-dried wool with nitrosyl chloride for a time sufficient substantially to reduce the felting and shrinking tendencies of the wool.

5. A process for reducing the felting and shrinking tendencies of wool, comprising treating wool with a solution of nitrosyl chloride in an inert organic liquid of the group consisting of benzene, carbon tetrachloride and petroleum solvents, containing about 0.5% to 5% NOCl by volume.

6. A process for treating wool comprising immersing air-dried wool in a solution of nitrosyl chloride in an inert organic liquid containing about 0.5% to 5% NOCl by volume for a period of time sufficient to bring about substantial reduction in the felting and shrinking characteristics of the wool, removing the treating liquid from the wool and neutralizing residual acid bodies in the wool.

7. A process for treating wool to reduce its felting and shrinking tendencies, comprising immersing air-dried wool in a solution of about 2% by volume of NOCl in a liquid from the group benzene, carbon tetrachloride and petroleum solvents for about one hour at about 20° C., removing the wool from contact with said solution and treating the wool with a dilute solution of an alkali to neutralize residual acid bodies in the wool.

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