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TREATMENT OF TEXTILE MATERIALS TO REDUCE THEIR TENDENCY TO FELT AND TO INCREASE THEIR ABRASION RESISTANCE

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This invention relates to a treatment of textile materials composed wholly or partly of wool or other animal fibres, for the purpose of reducing or eliminating the tendency of such textile materials to shrink through felting, and also of increasing their resistance to abrasion.

It has been discovered that the tendency to felt of textile materials composed wholly or partly of wool can be greatly reduced or substantially eliminated by treating these materials with a solution of a high molecular weight synthetic linear polyamide having alkoxymethyl groups or methylol groups attached to the carbonamide nitrogens, and with a solution of a caustic alkali in a suitable organic solvent, followed by treatment with an aqueous solution of a mineral acid or other suitable acid. In addition, the further advantage is obtained that textile materials treated according to the method of this invention possess increased abrasion resistance.

Thus, the present invention provides a process for reducing the tendency to felt and also for increasing the abrasion resistance of textile materials, wherein the textile material is treated with a solution of a caustic alkali in an organic solvent and a solution of a high molecular weight nitrogen substituted linear polyamide, either separately or in admixture, and then with an aqueous solution of a mineral acid or other suitable acid.

The preparation of the nitrogen-substituted polyamides as used according to the present invention may be carried out according to the methods described in British specifications Nos. 573,482 and 576,363, wherein a polyamide is reacted with formaldehyde and methanol or other alcohol.

A suitable organic solvent for the combined treatment with alkali and substituted polyamide is ethyl alcohol containing from 1% to 7% of water.

The textile materials, which may be in the form of loose fibres, yarns, fabrics, made-up goods or the like, may be conveniently treated with a solution of a caustic alkali in an organic solvent and a solution of a nitrogen-substituted polyamide in an organic solvent, either separately or in admixture, under controlled conditions of concentration and temperature of the solution. The concentration should be such that the weight of polymer deposited on the material, combined with the action of the alkali on the wool, is sufficient to impart a satisfactory reduction in felting properties. The temperature of the solution should be such that there is no

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tendency to gel. It may also be advantageous on grounds of economy to add water to the solvent, provided that the solvent power of the mixture for the polymer is not seriously impaired. The material is then removed from the solution, and excess solution removed from it by conventional means, for example by squeezing or centrifuging. The material may or may not be dried. After this treatment the material is immersed in an aqueous solution of an acid, preferably a mineral acid, of suitable concentration, and then washed in water until acid-free. The polyamide is thus deposited and bound on the surface of the fibres, and this, together with the action of the alkali, reduces or eliminates their tendency to felt, and at the same time increases their abrasion resistance. The function of the acid is to neutralize the alkali and also to convert the substituted polyamide to the unsubstituted form. Suitable acids are aqueous solutions of mineral acids such as hydrochloric and sulphuric, but organic acids such as acetic acid may be used, provided that the conditions of temperature and concentration are so chosen that the conversion of substituted polyamide to the unsubstituted form may be achieved.

The invention is illustrated, but not limited, by the following examples:

1. Five parts by weight of air-dry wool fabric were immersed for 30 minutes at 25° C., in a solution containing 1.5 parts by weight of a N-substituted nylon, 0.01 part by weight of potassium hydroxide, 95 parts by weight of ethanol and 5 parts by weight of water. The N-substituted nylon used in this example was obtained by heating a solution of polyhexamethylene adipamide in formic acid with formaldehyde and methanol, and it was determined by analysis that the polymer contained 10% formaldehyde, of which 9.8% was combined as methoxymethyl groups and 0.2% as hydroxymethyl groups.

The fabric was removed from the solution, squeezed between rollers, and partly dried in air. It was then immersed for 30 minutes at 25° C. in a solution containing 7.3 parts by weight of hydrochloric acid and 92.7 parts by weight of water. The fabric was then washed in water until substantially acid-free. The fabric so treated showed an increase in weight of 1.3%.

In a washing test, the fabric gave an area-shrinkage of 12%, while an untreated fabric, washed under identical conditions, shrank 40%. A fabric which was treated and washed in exactly the same way, with the exception that the N-substituted nylon was omitted, shrank 34%, while

a fabric which was also treated identically, with the exception that the potassium hydroxide was omitted, shrank 30%.

Further, the treated fabric showed an increase in abrasion resistance when compared with the untreated fabric on a standard abrasion testing machine.

2. Five parts by weight of air-dry wool fabric were immersed for 30 minutes at 25° C. in a solution containing 1.5 parts by weight of a N-substituted nylon, 0.05 part by weight of potassium hydroxide, 95 parts by weight of ethanol and 5 parts by weight of water. The N-substituted nylon used in this example was identical with that used in Example 1.

The fabric was then squeezed, partly dried, treated with hydrochloric acid solution and washed as described in Example 1. The fabric so treated showed an increase in weight of 1.7%.

In a washing test, the fabric gave an area-shrinkage of nil, while an untreated fabric, washed under identical conditions, shrank 40%. A fabric which was treated and washed in exactly the same way, with the exception that the N-substituted nylon was omitted, shrank 26%, while a fabric which was also treated identically, with the exception that the potassium hydroxide was omitted, shrank 27%.

Further, the treated fabric showed an increase in abrasison resistance when compared with the untreated fabric on a standard abrasion testing machine.

We claim:

1. The method of reducing the tendency of wool to shrink which comprises treating textile material containing wool with dilute solutions in organic solvents of caustic alkali and N-substituted polyamide to leave a deposit of N-substituted polyamide on the fibre, and subsequently treating said deposit with an acid while the treated material is still moist from said solutions to neutralize the alkali and convert the N-substituted polyamide into unsubstituted polyamide, said N-substituted polyamide having —CH_2OX groups attached to amido nitrogen atoms, X being hydrogen or a monovalent hydrocarbon radical.

2. The method of reducing the tendency of wool to shrink which comprises treating textile material containing wool with a dilute solution in an organic solvent of caustic alkali and N-substituted polyamide to leave a deposit of N-substituted polyamide and alkali on the fibre, and subsequently treating said deposit with an acid while the treated material is still moist from said solution to neutralize the alkali and convert the N-substituted polyamide into unsubstituted polyamide, said N-substituted polyamide having

—CH_2OX

groups attached to amido nitrogen atoms, X being hydrogen or a monovalent hydrocarbon radical.

3. The method of reducing the tendency of wool to shrink which comprises immersing textile material containing wool in a dilute solution in an organic solvent of caustic alkali and N-substituted polyamide, removing the material from said solution, removing excess solution from said material, immersing said material in an aqueous solution of an acid while the treated material is still moist from the first mentioned solution, removing said material from said acid solution and washing the removed material with water until it is acid-free, said N-substituted polyamide containing —CH_2OX groups attached to amido nitrogen atoms, X being hydrogen or a monovalent hydrocarbon radical.

4. The method of reducing the tendency of wool to shrink which comprises superficially impregnating wool fibres with a linear superpolyamide by immersing textile material containing wool in a dilute solution of an N-substituted nylon in an organic solvent, said solution containing a small proportion of caustic alkali, removing excess solution from said material and then immersing it in an aqueous solution of an acid while the treated material is still moist from the first mentioned solution, said N-substituted nylon having —CH_2OX groups attached to amido nitrogen atoms, X being hydrogen or a methyl group.

5. The method of reducing the tendency of wool to shrink, which comprises immersing textile fabric containing wool for 30 minutes at 25° C. in a solution containing 1.5 parts by weight of N-substituted nylon, 0.01 part by weight of potassium hydroxide, 95 parts by weight of ethanol and 5 parts by weight of water, removing said fabric from said solution, squeezing it between rollers, then immersing said fabric while the latter is still moist from said solution for 30 minutes at 25° C. in a solution containing 7.3 parts by weight of hydrochloric acid and 92.7 parts by weight of water and then washing said fabric in water until it is substantially acid-free, said N-substituted nylon having —CH_2OX groups attached to amido nitrogen atoms, X being hydrogen or a methyl radical.

6. The method of decreasing the tendency of wool to shrink which comprises immersing wool fabric for 30 minutes at 25° C. in a solution of 1.5 parts by weight of an N-substituted nylon containing —CH_2OX groups attached to amido nitrogen atoms, X being H or CH_3, and 0.05 part by weight of KOH in 95 parts of ethanol and 5 parts of water, squeezing excess solution from said fabric, immersing said fabric while the latter is still moist from said solution in a 7.3% solution of hydrochloric acid for 30 minutes at 25° C. and washing it in water until acid free.

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