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PROCESS OF IMPROVING OR MODIFYING ACETYL CELLULOSE TEXTILE MATERIAL

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4 Claims. (Cl. 28—1)

This invention relates to processes for the treatment of acetyl cellulose threads and/or of textiles consisting essentially of acetate silk whereby to improve or modify the characteristics of said articles, and to the products thereby obtained.

The comparatively great lack of sensitiveness of acetate silk to the known processes for the treatment of other textile materials acts against the improvement of the same. According to the present invention this difficulty is overcome in that the acetate silk is treated at ordinary or increased temperature, limited by its sensitiveness to boiling, in an aqueous solution of formaldehyde to which methyl alcohol, or other agent that can be mixed with the aqueous solution and which forms acetal with the formaldehyde, can be added, with essential exclusion of agents hydrolyzing, condensing and dissolving the acetyl cellulose.

The process is likewise exceptionally suitable for pre-treatment of acetate silk for dyeing in the skein or piece. By this treatment the acetyl cellulose fiber becomes swollen and by retaining the swollen effect, even with simultaneous change of structure of the fiber, many effects can be obtained.

The result of this action in the thread is that it assumes a larger volume; at the same time it is softer to the touch, it loses the great luster and becomes dull or opaque white in appearance. In the treatment of textiles according to the process, the effect is exceptional in that the material has a denser structure and is very nearly like natural silk in appearance. Moreover, on acetate crepe thread a natural crepe effect is produced, which effect according to the degree of the creping can likewise be manifested by a corresponding shrinking of the material. A further advantage of the process resides in the fact that the material (either skein or piece) thereby is given an increased capacity for dyeing. For instance, the material by the addition of dye to the treating bath itself can be dyed fast even with the ordinary dyes generally used in dyeing especialy those soluble in water.

The behavior of the acetate silk in respect to aqueous formaldehyde solutions of the type mentioned and with the above method of treatment is very different from the behavior of other artificial silks in the treatment according to the processes described in the work of Eschalier, French Patent No. 374,724 and Addition 10,760. German Patent No. 197,965; and of Kaplus, German Patent No. 382,086. These processes were to be employed solely on the artificial silks already known in practice (i. e., viscose, cupro-ammonium, nitro, and albumin artificial silks) in which aldehyde, especially formaldehyde, is use in comparatively slight concentration in a vacuum or in an atmosphere of inert gases with the use of water-extracting agents such as acids, acid salts, or even ammonia and the like, and the material pre-treated in this way is subjected to a subsequent treatment by heating and drying with the use partly of very high temperatures (up to 160° C.): these heretofore-known processes make use of a condensing or polymerizing action of the aldehyde on the fiber, and are intended to increase thereby the resistance to tearing, especially resistance to tearing when wet. The behavior of the acetate silk to the treatment here described and claimed is quite different. The important effect is a swelling of the acetate fiber, which swelling is apparently due to the fact that from the comparatively strong aqueous solution the formaldehyde enters the fiber substance in its hydrate or acetal form. After the subsequent removal of this product from the fiber by washing and vaporizing, the swollen condition remains. Increase in strength, especially strength when wet, is of course not produced by the swelling. Simultaneously with the swelling of the fiber, structural changes in the fiber occur upon moderate increase of the temperature of the bath, generally at about 40° C., these changes apparently being determined by molecular rearrangements, such for instance as described by K. Hess and his co-workers in acetyl cellulose (Zeitschrift für physikalische Chemie, vol. 7, page 1 et seq.).

The effects produced in the acetate silk by these operations are manifold. Leaving out of consideration the fact that there is obtained a sheen and feel approaching that of real silk, a good crepe effect is easily obtained by swelling—for instance, the swelling of acetate crepe thread. The structure of the fabric becomes denser and this can be increased so much that by purely chemical methods textile fabrics can be made of a density that cannot be obtained by the ordinary technical methods used with textiles. The latter leads in part to material with entirely new characteristics.

If, moreover, a dye is dissolved at the same time in the treating bath, then in the swelling operation it penetrates the fiber, is retained by the same, and colors it thoroughly and fast.

The process is carried on as follows:—

(1) For skeins.

(a) *At ordinary temperature*

If necessary, the varnish or oil and the like is removed from the threads by treatment with a suitable solvent. The skein is then placed in an aqueous solution of formaldehyde of not too low formaldehyde content (for instance 15–35%) and allowed to stand a shorter or longer time at ordinary temperature. An addition of methyl alcohol or other substances such as ethyl-, propyl-, isopropyl-, or butyl alcohol which is soluble in water and forms acetal-like compounds with formaldehyde, considerably accellerates the swelling operation. The addition or accelerating agent amounts to about 10–30 parts by volume of the solution according to the type and desired effect. After expiration of the time required for the effect, the skeins are taken from the bath, freed from the adhering bath liquid by wringing, centrifuging or the like, washed with water and dried.

(b) *With raised temperature*

The swelling mixture is heated at about 40° to 50° C. for about one to two hours according to the nature of the acetate fiber.

In case *a* there is obtained a more or less voluminous and soft, dull thread which may exhibit a certain wavy character at the same time, according to the duration of the treatment and the nature of the acetate silk so treated.

In case *b* the thread is opaque white, dull and soft and has a firm fiber.

(2) For textiles of acetate silk the process is essentially the same as above. Material direct from the spinner should first be freed from size. With finished dyed material, a modification of the dyeing occurs at the same time, the dye passing over into the inner layers of the thread.

The used solutions can under certain circumstances be used again for further treatment after suitable regeneration.

Examples of methods

(1) Skeins:—

(*a*) The skein (120 *d* 32/150 oiled) is placed at ordinary temperature in 30% aqueous formaldehyde solution to which 30% by volume methyl alcohol is added. The increase in volume of the thread is at once ascertainable in that the air enclosed between the separate partial threads leaves in the form of bubbles. The skein is left in the bath at least until this latter phenomenon occurs.

Product: Voluminous; dull thread with soft feel.

(*b*) The skein (60 *d*, slightly oiled) is heated in a bath of a composition equivalent to that described in (*a*) above for an hour at 45° C., and then is washed out and dried.

Product: Very voluminous, soft and opaque white; soft feel with firm fiber.

(2) Fabric.

(*a*) Taffeta, treatment as above under (1 *b*).

Product: Fine dull sheen; shrinking in width of unstretched material, 15%; fine silk-like appearance; feel not strawy in spite of lack of finishing.

(*b*) Crêpe de Chine with acetate crepe, treated as above.

Product: Dulled well; shrinking in width (unstretched) about 15%; natural crepe effect; appearance, fine silk-like; very soft to the touch.

(*c*) Heavy crêpe de Chine (even crepe marocain) with acetate crepe allowed to stand for several hours at ordinary temperature in the mixture according to (2 *a*) or (2 *b*).

Product: Dulled; shrinking (unstretched) 14%; distinct natural crepe effect; appearance, fine silk-like as crêpe de Chine; soft to the touch.

(*d*) Voile with printed color pattern: Treated in a mixture of 30% aqueous formaldehyde with 30% by volume methyl alcohol or of 30% aqueous formaldehyde with 10 percent by volume butyl alcohol, for ten minutes or a half hour, respectively, at ordinary temperature.

Product: Great increase of density, printed pattern correspondingly clearer, the appearance is similar to that of georgette crepe.

(*e*) Charmeuse (two machine type), in 30% formaldehyde with 20% by volume propyl alcohol after standing for three hours at ordinary temperature.

Product: Dulled, very much denser; very soft to the touch.

After heating for two hours in the above bath at 45° C:

Product: Dulled, absolutely dense.

(*f*) Satin, printed like leather, is allowed to stand in 30% formaldehyde with 20% by volume methyl alcohol for several hours at ordinary temperature, or for one hour at 40° C.

Product: Beautifully dull, very soft; the effect of the printed pattern is exactly the reverse and is similar to woven material (damask).

(*g*) Fabrics simultaneously improved and dyed. Crepe-like fabric with acetate crepe: The desized fabric has no crepe effect. It is allowed to stand in the bath (30% formaldehyde with 30% by volume methyl alcohol) several hours while cold, after the addition of dye of the most varied type, such as tartrazine, light green, sudan, or methyl violet, to the bath liquid.

Product: Great crepe effect: uniform beautiful coloring, with dull, silk-like sheen and softness to the touch.

I claim:

1. Process of improving or modifying acetate silk textile material, which comprises uniformly treating the same with a strong aqueous solution of formaldehyde containing dissolved therein a monatomic aliphatic alcohol amounting to from 10% to 30% by volume of said solution and thereafter freeing the textile material from said solution.

2. Process of improving or modifying acetate silk textile material, as defined in claim 1, characterized in that the treatment is effected with heating up to a temperature short of that at which the said acetate silk is adversely effected.

3. Process of improving or modifying acetate silk textile material which comprises immersing the same in an aqueous solution containing formaldehyde in an amount from 15% to 35% and a monatomic aliphatic alcohol in material amount, and thereafter removing the silk and freeing it from said solution.

4. Process of improving or modifying acetate silk textile material, as defined in claim 3, characterized in that the immersion treatment is effected at a temperature up to 50° C.

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