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TREATING TEXTILE FIBERS

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It is already known to treat cotton fabric with solutions of ammoniacal copper oxide; these solutions swell the fibers of the fabric. After the removal of copper an effect can be obtained which is similar to that of mercerisation.

It has already been suggested that this effect can be improved and augmented by treating the fabric with a caustic alkali lye before the treatment with the cuprammonium solution.

I have further found that a pre-treatment of cotton fabric with alkali lye is also of advantage and leads to unexpectedly valuable results if the fabric is treated with solutions of cellulose in cuprammonium. Surprisingly a firmly adhering washable coating of regenerated cellulose is obtained on the fabric.

My present invention relates to a process for improving textile materials which are different from fabrics and are in an earlier working stage, by treating them with a solution of cellulose in cuprammonium. In particular, my invention relates to the treatment of the unspun flock. My invention is equally significant for natural fibers, particularly cotton, as well as for artificial wool produced from regenerated cellulose or cellulose derivatives and for mixed fibers of regenerated cellulose, e. g. cotton and artificial wool, especially in the form of unspun flock.

According to my invention the textile fiber is treated with a solution of cellulose in cuprammonium solution in a working stage preceding the fabric, e. g. as flock. Whereas hitherto such solutions have always been employed in a very thick consistency resembling syrup or paste, I employ a solution of about the consistency of a lubricating oil. I obtain this consistency by a protracted stirring of the solution, preferably in the presence of oxygen, or by means of an increased content of ammonia or by a reduced content of cellulose or by a number or all of these steps.

It has now been found that by employing these steps alone or in combination with further steps, it is possible to obtain a series of advantages which signify a very definite improvement of the properties of fibrous materials in flock or yarn form.

In the first place it has been found that the solution of cellulose in cuprammonium of the above described consistency produces a coherent coating on the individual fibers, the material penetrating the fibrous material effectively. Nevertheless this solution does not give any adhesion between the individual fibers if the excess cuprammonium cellulose solution is removed before the precipitation and removal of copper. Centrifuging is very suitable for removing the excess cuprammonium cellulose solution. In the treatment of fibers in flock form the removal of the excess cellulose solution by suction has been found to be satisfactory. After the precipitation and removal of copper, the fibers exhibit a good lustre and are pleasant to handle. The fibers can be carded and drawn in the same way as ordinary raw fibers.

If fibers of regenerated cellulose or cellulose derivatives or mixtures of natural fibers with fibers of regenerated cellulose or cellulose derivative are treated, the artificial fibers receive an increased resistance with respect to certain solutions employed in subsequent treatment. Thus for example raw artificial fibers alone or in admixture with other fibers may first be coated with the cuprammonium cellulose solution and then bucked or bleached, the fibers being damaged less than if the raw fibers were subjected to bucking or bleaching.

Artificial fibers in flock form are in addition rendered easier to spin by the treatment. If the fibrous material consists of cellulose derivative, e. g. cellulose ester or ether, then irrespective of whether it is in the form of an untreated flock or in the form of yarn, it is altered by the treatment in such a manner that it can be dyed with the ordinary dyes which go on cellulose.

After the treatment with the cellulose solution the fibrous material is preferably treated with an alkali lye of varying strength, e. g. from 4–20° Baumé. The fibers are etched by the lye whereby the cellulose film which is subsequently regenerated adheres firmly.

Then follows the removal of copper and the regeneration of the cellulose by the use of dilute acid, e. g. sulphuric acid. In some cases it is advisable after the treatment with the cellulose solution, to dry the textile material wholly or in part by exposure to the outer atmosphere or by means of hot air.

In every case the textile material is finally neutralised, washed and dried in known manner.

Examples of my invention follow:

1. The untreated flock of natural cellulose, regenerated cellulose or cellulose derivatives, is introduced in the dry state into a suitably apertured vessel of corrosion resistant metal, e. g. of V4a steel, in such a manner that it is not subjected to any appreciable pressure. In the first stage of the treatment a centrifugal pump supplies a cuprammonium cellulose solution of suitable viscosity (e. g. with 2–3% cellulose content)

from a reservoir through the loose material in the apertured vessel and this operation can be repeated continuously in accordance with the size of the vessel. A vacuum pump which is also connected to the vessel by way of an interposed tap then frees the loose material in the vessel from excess cellulose solution so that at the most there is only a superficial adhesion. In the same way, in the second stage of the treatment a NaOH solution of 4–18 Bé. according to the nature of the loose material is passed through the vessel to precipitate the cellulose on the threads. Vacuum suction is then applied. In the same way, in the third stage of the treatment an acid, (e. g. H_2SO_4) having a strength of 2–4° Bé. is passed through to release the copper from the material and to fix the cellulose.

Then follows a thorough washing and, after the washing water has been drawn off, the fibrous material is neutralised. The material is then dried and is transferred to the card in the spinning shop. The thread is then spun from the card after any other customary treatment and exhibits a bulky wool-like appearance.

2. The flock of natural cellulose, regenerated cellulose or cellulose derivatives is treated in a centrifuge with a cuprammonium cellulose solution of the consistency of lubricating oil and, after the excess cellulose solution has been removed by centrifuging, the material is treated directly with the precipitating and de-coppering solution, e. g. 15% sulphuric acid. The material is then washed, neutralised and dried.

3. A mixed fiber in flock form consisting half of cotton and half of fibers of cellulose acetate (or cellulose nitrate or ethyl cellulose or benzyl cellulose), is impregnated with a cuprammonium solution having a content of 2½% cellulose (the cellulose is weighed without drying out atmospheric moisture, i. e. with about 10% moisture) and of the consistency of lubricating oil and the flock is freed from excess cellulose solution by means of a vacuum pump.

The material can then be treated with a dilute alkali lye, e. g. NaOH of 5° Bé. or more, whereupon in each case there is a treatment with sulphuric acid of 3° Bé. After neutralisation and washing, the material is dried.

The fibrous material can be dyed with dye stuffs which go on cotton with difficulty and do not go on cellulose derivatives. When fiber in flock form is treated, then the treated flocks can readily be carded and drawn out on a drawing frame. After the spinning operation, a thread is obtained of wool-like appearance.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. The process for the treatment of cellulose textile fibers in loose, uncarded and unspun, flock form for the purpose of impregnating and building up said fibers with added cellulose, which comprises the steps of introducing a quantity of loose raw untreated flock into a vessel, running a freely fluent solution of cuprammonium cellulose of the consistency of lubricating oil into the vessel and throughout the mass of flock, then after thorough penetration of the flock by the solution removing the excess solution, then decoppering and precipitating the cellulose of the solution within and upon the fibers of the flock, and then neutralizing, washing and drying the resulting reinforced fibers preparatory to carding, drawing, and spinning.

2. The process for the treatment of cellulose textile fibers in loose, uncarded and unspun, flock form for the purpose of impregnating and building up said fibers with added cellulose, which comprises the steps of introducing a quantity of loose raw untreated flock into a vessel, maintaining the pressure in the vessel at atmospheric pressure throughout the treatment, running a freely fluent solution of cuprammonium cellulose of the consistency of lubricating oil into the vessel and throughout the mass of flock, then after thorough penetration of the flock by the solution removing the excess solution, at least partially drying the treated flock, then subjecting the flock to acid to decopper the mass, and then neutralizing, washing and drying the resulting reinforced fibers preparatory to carding, drawing, and spinning.

3. The process as claimed in claim 1, in which the flock treated is composed of natural cellulose fibers.

4. The process as claimed in claim 1, in which the flock treated is composed of artificial cellulose fibers.

5. The process as claimed in claim 1, in which the flock treated is composed of a mixture of natural and artificial fibers.

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