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PROCESS FOR PRODUCING ABSORBENT CELLULOSIC MATERIAL

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4 Claims. (Cl. 8—120)

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The present invention relates to the treatment of cellulosic materials for the purpose of enhancing their rate of absorbency and of drying, and to the product obtained.

It is an object of the invention to increase the rate of absorbency of cellulosic materials. Another object is to improve the rate of drying of such materials. Still another object is to produce a cellulosic fabric in which these desirable properties will be permanent in the sense that they will survive repeated wettings and dryings of the fabric and repeated laundering.

It has been proposed to increase the absorbency of textiles by the application of wetting agents thereto. The effect of such treatment is temporary and the enhanced absorbency imparted to the fabric thereby does not withstand repeated laundering.

In accordance with my invention, cellulosic material is treated with a water-soluble alkyl phosphate or an alkyl alkali metal phosphate, in an alkaline aqueous solution such as a solution containing an alkali metal hydroxide. Preferred phosphates contain more than three and less than seven carbon atoms in the alkyl group. Examples are tributyl phosphate and sodium butyl phosphate.

The reaction is carried only to the point where the rate of absorbency and of drying of the fabric are materially and permanently enhanced but the cellulose remains insoluble in water and in alkalis. Preferably the treating solution contains the alkyl phosphate in amount not more than 5% of the weight of the fabric being treated. The reaction with the fabric, expressed in terms of etherification of the cellulose, preferably is not carried beyond a degree of substitution in the cellulose molecule of 0.1 or less.

For a better understanding of my invention, the following specific examples may be given:

Example 1.—Desized grey terry cloth was kier boiled for eight hours at 15 lbs. steam pressure in an aqueous solution containing by weight 2% sodium hydroxide, 1% sodium carbonate, 0.5% pine oil and tributyl phosphate in amount equal to 5% of the weight of the fabric being treated. The sample was washed, soured, bleached (1° Tw. for one hour at room temperature), washed, soured, and again washed.

Example 2.—The treatment was the same as in Example 1, except that the kier boiling solution contained sodium butyl phosphate instead of the tributyl phosphate of Example 1.

The samples treated in this manner showed the presence of butyl ether of cellulose when analyzed by hydrolysis and subsequent oxidation (modified Zeissel) and the samples showed a greater rate of wick-up and greater rate of drying than similar samples treated by a similar method omitting the tributyl phosphate. The rate of absorption of water by the yarn of these samples was tested by the wick-up method as described in Federal Standard Stock Catalogue No. DDD–T–511, January, 1934, F–3*a*.

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Example 3.—A laboratory autoclave was charged with twelve liters of aqueous solution containing 240 g. sodium hydroxide and 600 g. sodium butyl phosphate (Monsanto 60% solution, pH 7.0) and the following samples were enclosed in separate cloth bags and immersed in the solution:

Viscose fibre, dull, 3 denier, $1\frac{5}{16}$'' Bale BT 45
Viscose fibre, bright, 1½ denier, $1\frac{5}{16}$''

The autoclave was heated at 15 pounds steam pressure for five hours, the samples were then washed, soured and bleached as in Examples 1 and 2.

The rate of absorption of these samples was tested by the Eichler method (Chem. Abstracts, 34, 8290 (1940)).

The product of my invention has substantially enhanced rate of absorbency and of drying and these desirable properties are permanent. The product is cellulose etherified to the point where its rate of absorbency and of drying are materially enhanced but the cellulose is insoluble in water or alkali. For example, in the case of the preferred examples given above, the cellulosic product contains butyl ethers of cellulose.

While the invention is not limited to any particular theory, the following is suggested as an explanation of the markedly improved results obtained by my treatment.

The physical properties of cellulose, especially its behavior towards water, depend, to a great extent, on the exposed hydroxyl groups present in the cellulose molecules. My controlled etherification enhances the ability of the cellulose to take up and give off water in a given time. This structure modification permits the rapid penetration and evaporation of water.

My treatment is an etherification carried out to such a degree of substitution that the hydrophilic properties of cellulose are enhanced without making the cellulose water soluble.

The term "alkyl phosphate" as used in the appended claims includes both alkyl phosphates and alkyl alkali metal phosphates.

I claim:

1. A method for enhancing the rate of absorbency and rate of drying of cellulosic textile material which comprises treating the material under steam pressure at a temperature above the boiling point of water in an alkaline aqueous solution containing an alkali metal hydroxide and an amount not more than about 5% of the weight of the cellulose of an alkyl phosphate in which the alkyl group contains more than 3 and less than 7 carbon atoms, to etherify the cellulose to such an extent that the degree of substitution of the cellulose molecule does not exceed 0.1.

2. A method for enhancing the rate of absorbency and rate of drying of cellulosic textile material which comprises treating the material under steam pressure at a temperature above the boiling point of water in an alkaline aqueous solution containing not more than about 5% of the weight of the cellulose of an alkyl phosphate containing more than 3 and less than 7 carbon atoms, to etherify the cellulose to such an extent that the degree of substitution of the cellulose molecule does not exceed 0.1.

3. A method of enhancing the rate of absorbency and rate of drying of cellulosic textile material which comprises treating the material under stream pressure at a temperature above the boiling point of water in an alkaline aqueous solution containing an alkali metal hydroxide and sodium butyl phosphate in an amount not more than 5% of the weight of the cellulose being treated to etherify the cellulose to such an extent that the degree of substitution of the cellulose molecule does not exceed 0.1.

4. A method of enhancing the rate of absorbency and the rate of drying of cellulosic textile material which comprises heating the material under steam pressure at a temperature above the boiling point of water in an alkaline aqueous solution containing an alkali metal hydroxide and tributyl phosphate in an amount not more than 5% of the weight of the cellulose being treated to etherify the cellulose to such an extent that the degree of substitution of the cellulose molecule does not exceed 0.1.

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