

1

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PROCESS FOR WRINKLE- AND CREASE- PROOFING OF TEXTILES

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This invention relates to a process for the treatment of textiles, and more particularly to a process for wrinkle-proofing and crease-proofing of textile materials of all types.

It is well known that the resistance to creasing and wrinkling of a large variety of textile fabrics can be increased by a suitable contact treatment of such fabrics with water-soluble resinous condensation products. The crease-proofing agents usually employed in such processes are water-soluble partial condensation products of a condensation reaction between aldehydes and nitrogen-containing organic compounds. Examples of suitable aldehydes are formaldehyde, acetaldehyde, acrolein, glyoxal and the like, and suitable nitrogen-containing organic compounds are, for example, melamine, urea, thio-urea, dicyandiamide, guanidine and the like.

The procedure followed in these known crease-and wrinkle-proofing processes involves impregnating the textile fabric, usually made of cellulose or regenerated cellulose, with aqueous solutions of the water-soluble partial condensates containing acid or acid-yielding substances which act as condensation catalysts. After the fabric is thus impregnated, the excess liquid is removed from the fabric by running the fabric through a suitable squeeze roll device or by centrifuging, and the wet fabric is then dried at moderate temperatures. As a final step, the dry fabric is heated to temperatures between 100 and 150° C. in order to permit the condensation of the resinous partial condensate to go to completion.

Examples of catalytically active acids which may advantageously be added to the impregnating solution are weak organic acids such as acetic acid, tartaric acid, lactic acid, chlorobutyric acid, as well as weak inorganic acids such as boric acid or mixtures of compounds containing hydroxyl groups with boric acid.

Examples of catalytically active acid-yielding compounds are the chlorides, sulfates, persulfates, nitrates or thiocyanides of ammonia or of other bases which are volatile or which readily react with formaldehyde. Other suitable compounds are salts which easily hydrolyze, such as aluminum chloride or zinc chloride.

The role of these acid or acid-yielding compounds in the crease-proofing process above described is merely to produce the acid pH-range necessary to bring about the final stage of condensation of the synthetic resinous partial condensates into hardened resins.

The impregnating step is usually carried out in a padding machine. Since the fabric comes into contact with the impregnating solution for only a few seconds, it is often necessary to add a wetting agent to the aqueous solution of the partial condensate in order to achieve a rapid and thorough wetting of the fabric. Furthermore, it is customary to add brightening or scrooping agents to the partial condensate solution which not only impart a soft feel to the treated fabric but also further increase the crease- and wrinkle-resistance of the finished fabric in their own right.

2

While the treatment with the above-described impregnating solutions imparts highly desirable crease- and wrinkle-resistant qualities to a variety of fabrics there is still much room for improvement.

5 It is one object of the present invention to provide a method for producing textile fabrics with improved crease- and wrinkle-resistant qualities.

Another object of the present invention is to provide a crease- and wrinkle-proofing solution which will impart improved crease- and wrinkle-resistant qualities to textile fabrics.

Other objects and advantages of this invention will become apparent as the description thereof proceeds.

I have found that the resistance of textile fabrics against creasing and wrinkling can be materially improved by the use of high-molecular sulfonic or phosphonic acid salts of ammonia or organic bases as condensation catalysts in the aqueous solution of the preliminary condensation product.

15 Examples of organic bases which may be employed to form the sulfonic or phosphonic acid salts used as catalysts in accordance with my invention are low-molecular aliphatic amines, diamines, oxyalkylamines or other bases which are volatile or readily react with formaldehyde.

25 The organic sulfonic or phosphonic acids used for the formation of said salts should contain alkyl, cycloalkyl, alkyl-cycloalkyl or alkylaryl radicals with at least eight carbon atoms. These radicals may also carry substituents, or they may be interrupted by hetero-atoms, such as nitrogen, oxygen or sulfur atoms, or by hetero-atom groups derived from such atoms.

30 As a further embodiment of my invention the acid components of said salts may also be acid sulfuric or phosphoric acid esters of corresponding high-molecular organic hydroxy compounds, such as, for example, the sulfuric acid or phosphoric acid esters of high-molecular phenols, alcohols or alkylphenols.

35 More specific examples of suitable acid components employed in the formation of the salts used as catalysts in accordance with the present invention are dodecylsulfonic acid, octadecylsulfonic acid, hexadecylphosphonic acid, alkylbenzene-sulfonic acids wherein the alkyl radical contains from 10 to 18 carbon atoms, dodecylsulfuric acid esters, octadecylsulfuric acid esters, alkylcyclohexyl-sulfuric acid esters wherein the alkyl radical contains from 12 to 16 carbon radicals, alkylphenyl-sulfuric acid esters wherein the alkyl radical contains from 4 to 10 carbon atoms, dodecylphosphoric acid esters and the like.

40 Examples of alkaline components employed in the formation of the salts used as catalysts in accordance with my invention are ammonia, diethylamine, butylamine, hexylamine, ethylenediamine, N,N' - diethyl-ethylenediamine, ethanolamine, propanolamine, diethanolamine, triethanolamine, and the like.

45 The condensation catalysts used in accordance with the present invention are added to the aqueous solution of the preliminary condensate in amounts ranging from 5 to 30 gm./liter, and when used in this manner cause the preliminary resinous condensate to be completely condensed at temperatures usually employed for this purpose. These catalysts have the further advantage that they act, to a certain degree, as wetting agents and therefore bring about a rapid and thorough penetration of the impregnating solution into the fabric without the use of a separate wetting agent.

50 Moreover, these catalysts impart a soft feel to the finished crease-proofed fabric and also materially contribute to the increase of the resistance against creasing and wrinkling, friction, chafing, rubbing and scraping of such a fabric.

When salts of phosphoric acid esters are used as cat-

3

alysts in the impregnating solution the finished fabric, in addition to the above desirable qualities, also possesses good water-repellent characteristics and a certain amount of anti-static characteristics.

The process in accordance with the present invention may be advantageously applied to all types of textile fabrics which are usually subjected to a crease- and wrinkle-proofing treatment, but the process is particularly well adapted for the treatment of cotton and regenerated cellulose or mixtures of such fibers with wool and other textile materials.

While it is customary to subject a woven fabric to a crease- and wrinkle-proofing treatment, the process in accordance with my invention may be applied to textile materials in any stage of manufacture, for example to fibers and yarns.

The following examples will further illustrate my invention and enable others skilled in the art of textile finishing to understand the invention more completely. However, it is understood that my invention is not limited to the scope of these examples.

Example I

A garment fabric made of regenerated cellulose was passed through a padding machine containing an impregnating solution. The solution was composed of water having dissolved therein 250 gm./liter of a 60% aqueous preliminary condensate of urea and formaldehyde, and 10 gm./liter of the ammonium salt of an acid sulfuric acid ester, the acid having been esterified with a technical mixture of alcohols containing from 12 to 18 carbon atoms. The impregnated fabric was then freed from excess liquid until the weight of the wet fabric showed a 100% increase over the dry unimpregnated fabric. Thereafter, the wet fabric was dried at a temperature of 70° C. and then heated for five minutes at 130° C. to permit the condensation of the preliminary condensate to go to completion. The critical crease-angle of the fabric treated in this manner was increased from 54° to 132°, and the finished fabric had a soft and warm feel.

Example II

A cotton poplin fabric was passed through a padding machine containing a crease-proofing solution. The solution was composed of water having dissolved therein 250 gm./liter of a 60% aqueous melamine-urea-formaldehyde preliminary condensation product, and 15 gm./liter of the ammonium salt of an acid octadecyl-alcohol ester of phosphoric acid. The fabric was then freed from excess liquid, dried and heated as described in Example I. The critical crease angle of the fabric was increased from 61° to 117°, and the crease-proofed fabric had a pleasant, soft feel as well as good water-repellent qualities.

The use of 4 gm./liter of ammonium chloride as a catalyst increased the critical crease angle to only 92°.

Example III

A poplinette fabric made entirely of viscose staple fibre was passed through a padding machine containing an impregnating solution. The solution was composed of water having dissolved therein 180 gm./liter of a 60% aqueous melamine-formaldehyde preliminary condensation product and 25 gm./liter of the hydroxyethyl amine salt of an alkylphosphonic acid mixture having alkyl radicals from 16 to 20 carbon atoms. After the impregnation the fabric was squeezed, dried, and heated as described in Example I. The critical crease angle of the fabric was increased from 66° to 144°. The finished fabric had an outstanding soft feeling and was highly flexible.

Example IV

Cell wool cloth is impregnated by an aqueous solution containing 200 gm./liter of a 60% aqueous urea-formaldehyde preliminary condensation product and 20 gm./liter of the hydroxy ethyl amine salt of an alkyl phosphonic acid mixture having alkyl radicals from 16 to 20 carbon

4

atoms. The cloth was freed from excess liquid to a content of 100%, dried at 76° and treated for 5 minutes at 130°. The critical crease angle of the cloth treated in this manner was increased from 48° to 120°. The cloth shows water-repellent properties and possesses an outstanding soft and full feeling.

Example V

Cotton fabric is impregnated by an aqueous solution containing 150 gm./liter of a 60% aqueous urea-melamine-formaldehyde preliminary condensation product and 24 gm./liter of the ammonium salt of an acid ester of a fatty alcohol mixture obtained from tallow fatty acids. The fabric is subsequently treated as described in the above-mentioned examples and shows a pleasant smooth feeling. The critical crease angle increases from 61° to 119°. Using instead of the above-mentioned ammonium salt as catalyst 4 gm./liter ammonium chloride, the crease angle of the fabric amounts only to 90°.

As results from the above-mentioned examples the outstanding good smooth feeling of the impregnated textiles is preferably obtained by using catalyst solutions having from 20 to 30 gm./liter of salts of ammonia or salts of low molecular organic bases of the described high molecular sulfonic acids, phosphonic acids, organic sulphuric acid esters and organic phosphoric acid esters. The condensation catalysts are in such case added to the aqueous solution of the preliminary condensate in amounts ranging from 5 to 10% of the preliminary undiluted condensate corresponding from 20 to 30 gm. liter.

While I have given certain specific embodiments of my invention, it is understood that the present invention is not limited to such embodiments and that various modifications and changes may be made therein without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. A process for the production of a crease-resistant and wrinkle-resistant textile material which comprises the steps of impregnating said textile material with an aqueous solution having dissolved therein a water-soluble preliminary condensation product produced by an incomplete condensation reaction between a condensable organic compound containing at least one atom group selected from the group consisting of amino and imino groups, and an organic compound containing at least one aldehyde group, said solution also containing a salt, of a compound selected from the group consisting of high-molecular sulfonic acids, high-molecular phosphonic acids, high-molecular organic sulfuric acid esters, and high-molecular organic phosphoric acid esters, said salt selected from the group consisting of ammonia salts and salts of low-molecular organic bases, drying the impregnated textile material, and heating said dried textile material to a temperature between about 100° C. and 150° C.

2. A process for the production of a crease-resistant and wrinkle-resistant textile material which comprises the steps of impregnating said textile material with an aqueous solution having dissolved therein a water soluble preliminary condensation product produced by an incomplete condensation reaction between a condensable organic compound containing at least one atom group selected from the group consisting of amino and imino groups, and an organic compound containing at least one aldehyde group, said solution also containing a salt of a compound selected from the group consisting of high-molecular sulfonic acids, high-molecular phosphonic acids, high-molecular organic sulfuric acid esters, and high-molecular organic phosphoric acid esters, said salt selected from the group consisting of ammonia salts and salts of low-molecular organic bases, said last-named compound containing a radical having at least eight carbon atoms, selected from the group consisting of alkyl, cycloalkyl, alkylcycloalkyl and alkylaryl radicals, drying the impregnated textile material, and heating said dried textile

5

material to a temperature between about 100° and 150° C.

3. A process for the production of a crease-resistant and wrinkle-resistant textile material, which comprises impregnating said textile material with an aqueous solution, having dissolved therein a water soluble preliminary condensation product produced by an incomplete condensation reaction between urea and formaldehyde, and the ammonium salt of an acid sulfuric acid ester produced by the esterification of sulfuric acid with a mixture of alcohols containing from 12 to 18 carbon atoms in their molecules, drying the impregnated textile material, and heating said dried textile material to a temperature between about 100° and 150° C.

4. A process for the production of a crease-resistant and wrinkle-resistant textile material, which comprises impregnating said textile material with an aqueous solution, having dissolved therein a water soluble preliminary condensation product produced by an incomplete condensation reaction between urea, melamine and formaldehyde, and the ammonium salt of the octadecylalcohol ester of phosphoric acid, drying the impregnated textile material, and heating said dried textile material to a temperature between about 100° C. and 150° C.

5. An aqueous solution for crease-proofing and wrinkle-proofing a textile material, comprising a water-soluble preliminary condensation product produced by an incomplete condensation reaction between a condensable organic compound containing at least one atom group selected from the group consisting of amino and imino groups, and an organic compound containing at least one aldehyde group, and also comprising a salt of a compound selected from the group consisting of high-molecular sulfonic acids, high-molecular phosphonic acids, high-molecular organic sulfuric acid esters and high-molecular organic phosphoric acid esters, said salt selected from the group consisting of ammonia salts and salts of low-molecular organic bases.

6. An aqueous solution for crease-proofing and smoothing a textile material, containing a water-soluble preliminary condensation product according to claim 5 and 20-30 gm./liter of a salt according to claim 5.

6

7. An aqueous solution for crease-proofing and wrinkle-proofing a textile material, comprising a water-soluble preliminary condensation product produced by an incomplete condensation reaction between a condensable organic compound containing at least one atom group selected from the group consisting of amino and imino groups, and an organic compound containing at least one aldehyde group, and also comprising a salt of a compound selected from the group consisting of high-molecular sulfonic acids, high-molecular phosphonic acids, high-molecular organic sulfuric acid esters and high-molecular organic phosphoric acid esters, said last-named compound containing a radical having at least eight carbon atoms, selected from the group consisting of alkyl, cycloalkyl, alkylcycloalkyl, and alkylaryl radicals, said salt selected from the group consisting of ammonia salts and salts of low-molecular organic bases.

8. An aqueous solution for crease-proofing and wrinkle-proofing a textile material, comprising a water-soluble preliminary condensation product, produced by an incomplete condensation reaction between urea and formaldehyde, and the ammonium salt of an acid sulfuric acid ester produced by the esterification of sulfuric acid with a mixture of alcohols containing from 12 to 18 carbon atoms in their molecules.

9. An aqueous solution for crease-proofing and wrinkle-proofing a textile material, comprising a water-soluble preliminary condensation product, produced by an incomplete condensation reaction between melamine, urea and formaldehyde, and the ammonium salt of the octadecylalcohol ester of phosphoric acid.

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