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FINISH PERFORMANCE OF FABRICS COMPRISED OF SYNTHETIC FIBERS AND CELLULOSIC FIBERS

Earl H. Hartgrove, Jr., Julian J. Hirshfeld, and Bertie J. Reuben, Decatur, Ala., assignors to Monsanto Company, St. Louis, Mo., a corporation of Delaware

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ABSTRACT OF THE DISCLOSURE

Pre-cure and post-cure processes for imparting wash-and-wear and permanent press or durable crease characteristics to garments are improved by impregnating a fabric comprised of synthetic and cellulosic fibers with an aqueous solution of a resin and a swelling agent specific to the synthetic fiber.

This invention relates to a process of treating fabrics. More particularly, the invention concerns a process of treating fabrics to impart thereto excellent wash and wear and crease retention characteristics.

Wash and wear fabrics and permanent crease fabrics have become very popular in the garment industry. Garments made of these fabrics are known as "Permanent Press" or "Durable Crease" garments. Such garments are rapidly becoming an established fashion trend and, to the customer, represent the ultimate in minimum-care garments, i.e. they require little or no pressing and will retain a wrinkle-free, sharp-crease appearance after numerous home launderings or cleanings.

Wash and wear and permanent press or durable crease characteristics can be imparted to garments by two basic procedures. These procedures are the post-cure procedure which consists of impregnating a fabric with an appropriate resin, fabricating the garment and then curing the resin impregnated garment after the appropriate creases are incorporated therein; and the pre-cure procedure which consists of impregnating a fabric with a resin, curing the resin impregnated fabric, fabricating a garment from the fabric and then permanently creasing the garment at a high temperature, or high temperature and high pressure. The amount of resin impregnated in the garment is usually within the range of from about 20% to about 35%. Examples of useful resins include thermosetting resins of the hydroxyethylene urea type and the dimethylolethyl carbamate type. Auxiliary chemicals such as hand modifiers, softening agents, etc. can also be added with the resin to give desired properties to the fabric.

Though the above procedures impart good permanent crease and wash and wear characteristics to the garment, the resins used in these procedures react with the hydroxy groups in the cellulosic molecules and, as a result, adversely affect the physical characteristics of the garment. For example, the resins adversely affect the hand of the garment; they impart poor edge abrasion resistance to the garment, especially at the crease and at the points of the cuff; and on curing, the garments shrink to some extent. However the most significant adversity imparted to the fabric by the resin is the fact that the resin weakens the tensile characteristic of the fabric, i.e. the tear strength of the fabric is reduced. This is especially true with fabrics composed of 100% cellulosic fibers where the tear strength is reduced about 50%. These adversities can be overcome to a degree, i.e. the shrinking can be overcome by initially over sizing the garment to compensate for the shrinkage and the poor handle of the garment can be restored by chemically treating the fabric

to modify the hand. However, the poor edge abrasion resistance and the loss in tear strength are difficult to overcome and are directly dependent on the amount of resin impregnated into the fabric, i.e. the more resin present within the fabric, the weaker the fabric.

To overcome the loss in the tear strength of a fabric composed of cellulosic fibers, synthetic fibers such as polyester fibers are blended with the cellulosic fibers. These synthetic fibers are non-reactive with the resins and impart good tear strength characteristic to the fabric. However, when a crease is imparted to such a fabric blend, stresses and strains are built-up within the synthetic fibers and these fibers tend to resist any deformation. In such a condition, the synthetic fibers have a natural tendency to assume their original shape and, as a result, the efficiency and permanency of creasing such a fabric is somewhat diminished.

It was thought that if the synthetic fibers could be chemically modified so that upon creasing the molecules within the synthetic fibers could assume a new configuration, the stresses and strains imparted to the synthetic fibers would be alleviated. Also, it was thought that if the resin could be more evenly and uniformly distributed throughout the synthetic and cellulosic fibers within the fabric, less resin would have to be used to impart good wash and wear and permanent crease retention characteristics to the fabric. And, since less resin would be available to react with the cellulosic fibers, a fabric having a better tensile strength would result. Improved economics, as a result of using less resin, is also an obvious improvement.

It is therefore an object of this invention to provide a process of imparting excellent wash and wear and permanent crease retention characteristics to fabrics comprised of synthetic fibers and cellulosic fibers.

Another object of the invention is to provide a process of imparting excellent wash and wear and permanent crease retention characteristics to fabrics comprised of synthetic fibers and cellulosic fibers wherein the synthetic fibers are substantially free of stresses and strains.

It is also an object of the invention to provide a process of imparting excellent wash and wear and permanent crease retention characteristics to fabrics comprised of synthetic fibers and cellulosic fibers whereby about 25% to about 30% less resin is required to impart these characteristics than present-day permanent press processes.

Other objects of the invention will become apparent as the invention is fully developed within the specification.

These and other objects of this invention are accomplished by providing a process of imparting a wash and wear and crease retention characteristics to a fabric comprised of synthetic fibers and cellulosic fibers comprising impregnating the fabric with an aqueous liquid comprised of a resin and a synthetic-fiber swelling agent.

Fabrics useful with the invention include fabrics comprised of cellulosic fibers and synthetic fibers. Examples of cellulosic fibers include rayon (a manufactured fiber composed of regenerated cellulose, as well as manufactured fibers composed of regenerated cellulose in which substituents have replaced not more than 15% of the hydrogens of the hydroxyl groups), acetate (a manufactured fiber in which the fiber-forming substance is cellulose acetate; where not less than 92% of the hydroxyl groups are acetylated, the term tri-acetate may be used as a generic description of the fiber) and cotton. Examples of useful synthetic fibers include spandex (a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of at least 85% by weight of a segmented polyurethane), polyester (a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of at least

85% by weight of an ester of a dihydric alcohol and a dibasic acid or derivative thereof, such as terephthalic acid and dimethyl terephthalate), olefin (a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of at least 85% by weight of ethylene, propylene, or other olefin units), modacrylic (a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of less than 85% but at least 35% by weight of acrylonitrile units), nylon (a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polyamide having recurring amide groups as an integral part of the polymer chain), and acrylic (a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of at least 85% by weight of acrylonitrile units). Examples of particularly useful fabrics include a blend of polyester fiber and cotton fiber, preferably containing up to about 65% polyester fiber, and a blend of an acrylic fiber and a cellulosic fiber, for example a blend of acrylic, acetate and rayon fibers or a blend of acrylic and rayon fibers, containing up to about 45% of the cellulosic fiber. Preferable fabrics useful with the invention are fabrics composed of synthetic fibers and cellulosic fibers containing at least 25%, and preferably at least 50%, of the synthetic fiber. Examples of such fabric blends include a blend of polyamide fiber and cotton fiber containing less than about 50% of the polyamide fiber, a blend of polyester fiber and cotton fiber containing at least 50% of the polyester fiber, a blend of polyester fiber and rayon fiber containing at least 50% of the polyester fiber, a blend of polyester fiber and any cellulosic fiber, for example acetate, rayon, or cotton, containing at least about 50% of the polyester fiber, a blend of acrylic fiber and rayon fiber containing at least 40% of the acrylic fiber, a blend of acrylic fiber and a cellulosic fiber or fibers such as rayon, rayon and acetate, wherein the acrylic fiber content is at least about 40%.

Resins useful with the invention include any resin which is capable of imparting wrinkle-resistant properties to fabrics comprised of synthetic fibers and cellulosic fibers. Such resins include a wide range of thermosetting synthetic resins and especially those resins which are reactive with the hydroxy grouping in the cellulosic fibers. Examples of such resins include formaldehyde glyoxal, acrolein, various urea-formaldehydes including cylic ethylene urea resins, melamine and modified melamine formaldehydes, epoxy resins and others of the general class of thermosetting resins which can be condensed with aldehydes or which can be polymerized on cellulosic fibers and which react with the hydroxy groups in the cellulose molecules, or which can react without polymerization to cross-link with cellulose molecules. Examples of useful resins available on the market incude Permafresh Reactant 183 (an imidazolidone resin); Eponite 100 (an epoxy resin); Ganalok A–14 (a divinyl sulfone resin); Protoset B (a carbamate resin); Aerotex 23 (a triazine resin); Dextraset UN (a uron resin); and Reactant RL–2035 (a modified ethylene urea resin). There must be present with the resin a suitable catalyst to facilitate the polymerization and/or crosslinkng of the resin. The catalyst should be present in amounts ranging from about 1 part of catalyst to about 3 to 10 parts of polymerizable resin. Useful catalyst are of common knowledge in the art and it is of common knowledge that a particular catalyst is preferred with a particular resin. Examples of useful catalyst include ammonium dihydrogen phosphate with a formaldehyde and urea resin, magnesium chloride hexahydrate with a triazine or a carbamate type resin, zinc nitrate with a uron type resin, sodium carbonate with a divinyl sulfone type resin, and zinc fluoroborate with an epoxy resin. The term "resin," where used herein, is intended to include sufficient catalyst to facilitate polymerization and/or crosslinking of the resin.

The synthetic-fiber swelling agents useful with the invention include any chemical agent which tends to swell the synthetic fiber, i.e. the diameter and surface area of the fiber is increased upon contact with the swelling agent. Examples of useful swelling agents include benzoic acid, salicyclic acid, phenol, meta-cresol, monochlorobenzene, p-dichlorbenzene, tetrahydro-naphthalene, methyl benzoate, methyl salicylate, ortho-phenylphenol, and furfural. Examples of useful swelling agents identified by their tradenames include Carolid ELF-C (a non-ionic, modified biphenyl derivative emulsifiable); Carolid (an anionic, self-emulsifiable modified phenyl derivative); Tanavol (anionic, modified self-emulsifiable solvent carrier); Tanalon Special (a self-emulsifiable solvent); and Latyl Carrier A (an organic-ester amide mixture).

The aqueous solution, in addition to the crosslinking and/or polymerizable resin, the catalyst to facilitate the reaction of the resin, and the synthetic-fiber swelling agents, can contain auxiliary chemicals such as hand builders, textile softeners, deodorants, antiseptics, antifoaming agents, antistatic agents, wetting agents, water and oil stain repellents, brighteners, tints, and dyes. When furfural is used as the swelling agent, it is preferred that it be added last to the aqueous solution and that it be present in a water mixture containing one part of furfural per 25 parts of water.

As mentioned previously, the fabric is impregnated with an aqueous liquid comprised of a polymerizable and/or a crosslinking resin and a synthetic-fiber swelling agent. Impregnation can be accomplished at room temperature or a higher temperature by padding, coating, spraying, kiss-roll application, or any like means known in the art whereby the fabric can be wetted or impregnated with the aqueous liquid effecting a fabric pick-up of from about 50% to about 80% of the liquid, the percent based on the weight of the fabric. The term "resin" is intended to include sufficient catalyst to facilitate polymerization and/or crosslinking of the resin. The aqueous liquid should contain from about 10% to about 35% of the resin. From about 5% to about 25% of the resin should be impregnated in the fabric; a preferred amount is about 13% of the resin impregnated in the fabric. The amount of the synthetic-fiber swelling agent in the aqueous liquid is dependent upon the amount of synthetic fiber within the fabric, amounts within the range of from about 0.1% to about 5%, and preferably from about 1.0% to 2.0%, are usually sufficient to swell the synthetic fiber, the percents based on weight of the aqueous liquid. Other auxiliary chemicals, such as hand softeners, etc., of common knowledge to the art can be added to the aqueous liquid to modify the physical characteristics of the fabric.

After impregnation, the fabric is partially dried to a moisture content of from about 2% up to about 30% and preferably to a moisture content of from about 4% to about 8%. Thereafter the fabric can be fabricated into an apparel, a crease imparted thereto, for example by a steam press, and then the creased fabric can be subjected to a heat treatment for a sufficient period of time and at a sufficient temperature to cure the resin, for example at a temperature of from about 250° F. to about 450° F. for a period of time of from about 5 seconds up to about 30 minutes, and preferably at a temperature of from about 275° F. to about 350° F. and for a period of time ranging from about 5 to about 20 minutes. The fabric can be processed also by impregnating the fabric with the aqueous liquid, drying the impregnated fabric, curing the resin in the fabric, fabricating an apparel, imparting a crease to the apparel and then permanently creasing the apparel by reforming the cured resin in the fabric by subjecting it to high temperatures, for example about 450° F., and/or high pressures for short periods of time, e.g. 5 to about 20 seconds.

The following examples are presented to specifically illustrate working embodiments of the invention. These examples are not presented to limit in any way the subject matter of the invention but are presented to show how the use of synthetic-fiber swelling agents with resins are useful to impart excellent wash and wear characteris-

tics and excellent crease retention characteristics to the fabric and, at the same time, require less resin than is normally required in conventional processes to accomplish these characteristics. After the samples are treated as described in the following examples, they are subjected to the below indicated tests to show their utility. The tests are described in the following paragraphs.

The Wash and Wear Rating Test is tentative test method number AATCC 88A–1964T, procedure number IIc, described in the "Technical Manual of the American Association of Textile Chemists and Colorists," volume 41, pages B–99 through B–103, Howes Publishing Company, New York (1965). The results of this test are evaluated on a numerical basis from 1 to 5, 1 indicating a poor wash and wear rating and 5 indicating the best rating.

The Crease Retention Rating Test is tentative test method number AATCC 88C–1964T, described in the "Technical Manual of the American Association of Textile Chemists and Colorists," volume 41, pages B–104 through B–105, Howes Publishing Company, New York (1965). The results of this test are indicated on a numerical basis from 1 to 5, a 1 rating indicating a poor crease retention rating whereas a 5 rating indicates the best crease retention rating.

The "Wrinkle Recovery Test" is ASTM test, designation D–1295–60T. The results of this test are given for the warp and the filling direction of the fabric and are rated on a numerical basis of from 0 to 100. A rating of 0 indicates a poor wrinkle recovery characteristic whereas a rating of 100 indicates an excellent rating.

The "Abrasive Resistance Test" is ASTM test, designation D–1175–64T. The results of this test are rated on a numerical basis in minutes. A rating of 3 minutes indicates a poor abrasive resistance rating whereas a rating of 8 minutes indicates a good rating.

The following examples are presented to specifically illustrate working embodiments of the invention. Unless otherwise specified, the percents used in the examples are based on weight. Chemicals used in the examples which have not previously been identified include the following tradenames: Aqualine N (a nonionic emulsion of a high melting point polyolefin); Mycon SF (a nonionic paraffin-free polyethylene emulsion); Mycon WA (an ethylene oxide condensate); Catalyst X–4 (a 40% aqueous solution of zinc nitrate); Rhoplex HA–8 (an aqueous acrylic dispersion of thermoplastic resin); Silkand 40 (a nonionic polymer emulsion); Morapol 700 (a nitrogen-free nonionic polyethylene emulsion); Triton X–100 (an alkylaryl-polyether alcohol); and Neutronxy 600 (an alkylphenol polyglycolether).

EXAMPLE I

Fabric samples being of a broadcloth weave and weighing about 3.0 oz. per yard and composed of 65% polyester fiber and 35% cotton fiber are padded at ambient temperature with aqueous liquids containing the compositions indicated in Table 1. The samples are dried at about 200° F. for 5 minutes (dried to a moisture content of about 5%) and are then creased in a steam press at 250° F. for 15 seconds. Thereafter the crease is permanently imparted to the fabric samples at conditions outlined in Table 1. Each sample is then evaluated for wash and wear rating, crease retention rating and wrinkle recovery rating and the results are indicated in Table 1.

TABLE 1

Sample No.	Composition of aqueous mixture	Conditions of imparting permanent crease	Wrinkle recovery rating		Wash and wear rating after 5 washings	Crease retention rating after 5 washings
			Warp	Filling		
1	8% Eponite 100, 2% Neutronyx 600, 2% Aqualene N, 1.5% zinc fluoroborate.	10 min. at 300° F	84	81	2	2
2	30% Ganalok A–14, 2.3% sodium carbonate, 0.3% borax, 3.0% Mykon SF.	1.5 min. at 300° F	70	68	3	3
3	15% Protorez WW, 4% magnesium chloride, 0.1% Triton X–100, 3.0% Mykon SF.	1.5 min. at 325° F	77	74	2	2
4	20% Aerotex Resin 23, 4% magnesium chloride, 3% Mykon SF, 0.1% Triton X–100.	10 min at 300° F	81	78	2	3
5	20% Dextraset UN, 1.5% zinc nitrate, 3% Mykon SF, 0.1% Triton X–100.	2 min. at 340° F	84	82	2	3
6	15% Permafresh reactant 183, 2% Mykon SF, 2.7% Catalyst X–4, 0.1% Mykon WA.	10 min. at 300° F	77	74	3	4
7	15% Reactant RL–2035, 2% Mykon SF, 2.5% magnesium chloride, 0.1% Mykon WA.	10 min. at 300° F	81	78	3	4
8	Control		66	67	2	2

EXAMPLE II

To show the effect of fiber swelling agents in combination with finish compositions, fabric samples being of a broadcloth weave and weighing about 3.5 oz. per square yard and composed of 65% polyester fiber and 35% cotton fiber are padded at ambient temperature with aqueous mixtures containing the composition indicated in Table 2. The samples are dried to approximately 5% moisture in an oven at 200° F. for 5 minutes and are then creased on a steam press at 250° F. for 15 seconds. Thereafter the samples are placed in an oven for 10 minutes at 300° F. The samples are removed and each sample is evaluated for wash and wear rating and for crease retention rating. Table 2 contains the test results of the ratings:

TABLE 2

Sample No.	Composition of aqueous mixture	Wash and wear rating after 5 washings	Crease retention rating after 5 washings
1	15% Permafresh Reactant 183, 2.7% Catalyst X–4, 2.0% Mykon SF, 0.1% Mykon WA.	3.0	3.0
2	Formulation Sample 1, 1% Carolid ELF–C.	3.0	3.3
3	Formulation Sample 1, 1% Carolid.	3.3	4.0
4	Formulation Sample 1, 1% furfural.	3.0	3.6
5	Formulation Sample 1, 1% Tanavol.	3.0	4.0
6	Formulation Sample 1, 1% methyl salicylate.	3.3	4.0
7	Formulation Sample 1, 1% Latyl Carrier A.	3.0	3.3
8	Formulation Sample 1, 1% Tanalon Special.	3.0	3.0

As can be readily ascertained from the above data, the incorporation of a swelling agent betters the crease retention rating and in most cases betters the wash and wear ratings.

EXAMPLE III

Fabric samples being of a broadcloth weave, weighing about 3.5 oz. per yard and composed of 65% polyester fiber and 35% cotton fiber are padded at ambient temperature with aqueous mixtures containing the composi-

tions indicated in Table 3. The samples are dried to approximately 4% moisture in an oven at 200° F. for 5 minutes and are then creased on a steam press at 250° F. for 15 seconds. Thereafter the samples are placed in an oven at 300° F. for 10 minutes. The samples are removed and are then tested for wash and wear rating crease retention rating, wrinkle recovery rating and abrasion resistant rating. The results of the tests are indicated in Table 3.

TABLE 3

Sample No.	Composition of aqueous mixture	Wash and wear rating: 10 washings	Wash and wear rating: 2 washings	Crease retention rating: 10 washings	Crease retention rating: 20 washings	Wrinkle recovery rating (filling)
1	25% Permafresh Reactant 183, 4.5% Catalyst X–4, 0.1% Mykon WA	3.6	4.0	3.0	2.3	78
2	20% Permafresh Reactant 183, 3.6% Catalyst X–4, 0.1% Mykon WA.	3.3	3.0	2.3	2.0	73
3	10% Permafresh Reactant 183, 1.8% Catalyst X–4, 0.1% Mykon WA.	3.0	3.3	2.0	1.6	77
4	Formulation of Sample 1, 2% Carolid	3.6	4.0	3.6	3.3	75
5	Formulation of Sample 2, 2% Carolid	2.6	2.6	3.0	2.6	69
6	Formulation of Sample 3, 2% Carolid	3.0	3.3	2.3	2.0	72
7	Formulation of Sample 1, 2% furfural	2.6	4.0	4.0	2.6	79
8	Formulation of Sample 2, 2% furfural	3.3	3.0	2.3	2.0	77
9	Formulation of Sample 3, 2% furfural	3.0	3.0	2.6	2.3	72
10	Formulation of Sample 1, 2% Tanavol	2.6	2.6	2.0	2.6	71
11	Formulation of Sample 2, 2% Tanavol	2.6	3.0	2.0	2.0	72
12	Formulation of Sample 3, 2% Tanavol	3.0	3.0	1.6	1.6	75
13	Formulation of Sample 1, 1% Carolid	3.6	3.6	3.6	2.6	80
14	Formulation of Sample 2, 1% Carolid	3.3	3.6	3.0	2.6	77
15	Formulation of Sample 3, 1% Carolid	4.0	3.3	3.6	2.3	73
16	Formulation of Sample 1, 1% furfural	3.6	3.0	3.3	2.3	80
17	Formulation of Sample 2, 1% furfural	4.0	3.3	3.0	3.0	79
18	Formulation of Sample 3, 1% furfural	3.0	3.0	2.3	2.0	74
19	Formulation of Sample 1, 1% Tanavol	3.6	3.6	2.0	2.0	78
20	Formulation of Sample 2, 1% Tanavol	3.6	3.6	2.3	2.3	78
21	Formulation of Sample 3, 1% Tanavol	3.3	3.0	2.0	1.6	77
22	Formulation of Sample 1, 0.5% Carolid	4.0	4.0	3.6	2.6	78
23	Formulation of Sample 2, 0.5% Carolid	3.6	4.0	2.6	2.7	77
24	Formulation of Sample 3, 0.5% Carolid	3.0	3.0	2.6	2.0	76
25	Formulation of Sample 1, 0.5% furfural	4.0	4.0	3.0	2.6	80
26	Formulation of Sample 2, 0.5% furfural	4.0	4.0	3.0	2.3	79
27	Formulation of Sample 3, 0.5% furfural	3.0	3.3	2.0	2.0	75
28	Formulation of Sample 1, 0.5% Tanavol	3.3	4.0	3.3	3.0	75
29	Formulation of Sample 2, 0.5% Tanavol	3.6	3.0	3.6	3.0	78
30	Formulation of Sample 3, 0.5% Tanavol	4.0	3.3	3.0	2.3	75
31	Control	2.0	2.0	2.0	1.0	65

EXAMPLE IV

Fabrics samples being of a twill weave, trouser weight 6 oz. per yard and composed of 65% polyester and 35% cotton fiber are padded at ambient temperature with aqueous liquids containing the compositions indicated in Table 4. The samples are dried to approximately 6% moisture in an oven at 200° F. and 5 minutes and are then creased on a steam press at 250° F. for 15 seconds. Thereafter, the samples are placed in an oven at 300° F. for 10 minutes. Each sample is then evaluated for wash and wear rating, crease retention rating, wrinkle recovery rating and abrasive resistance rating. Table 4 contains the results of the tests:

EXAMPLE V

To show the significance of the invention in regards to increased wrinkle resistance and more efficient use of the resin, fabric samples being of a twill weave, trouser weight of about 6 oz. per yard and composed of 65% polyester fiber and 35% cotton fiber are padded with two different aqueous mixtures. Aqueous mixture number 1 consists of the following [this is a conventional mixture for this particular type of fabric used in the Koratron process for imparting wash and wear and crease characteristics to cellulosic fabrics (Koratron, a registered trademark of Koratron Co., Inc., San Francisco, Calif.)]:

	Percent
Permafresh Reactant 183	25
Catalyst X–4	4.5
Rhoplex HA–8	2.0
Triton X–100	0.25
Silkand 40	4.0
Moropol 700	3.0

TABLE 4

Sample No.	Composition of aqueous mixture	Wash and wear rating: 5 washings	Wash and wear rating: 10 washings	Crease retention rating: 5 washings	Crease retention rating: 10 washings	Wrinkle recovery rating (filling)	Abrasive resistance rating (edgewear method)
1	25% Permafresh Reactant 183, 4.5% Catalyst X–4, 0.1% Mykon WA.	3.6	3.6	3.2	3.2	79	5
2	20% Permafresh Reactant 183, 3.6% Catalyst X–4, 0.1% Mykon WA.	3.6	3.2	2.2	1.8	73	8
3	17.5% Permafresh Reactant 183, 3.2% Catalyst X–4, 0.1% Mykon WA.	3.6	3.8	2.6	3.0	73	8
4	Formulation of Sample 2, 0.8% Carolid	3.8	3.8	2.8	2.8	68	8
5	Formulation of Sample 3, 0.2% Carolid	3.6	3.4	3.0	3.0	71	8
6	Formulation of Sample 3, 0.2% furfural	3.8	3.4	2.8	2.8	68	8
7	Formulation of Sample 3, 0.5% Carolid	3.4	3.4	3.2	3.2	70	8
8	Formulation of Sample 3, 0.5% furfural	4.0	3.6	3.2	3.2	74	8
9	Formulation of Sample 3, 0.8% Carolid	3.8	3.8	3.4	3.6	67	8
10	Formulation of Sample 3, 0.8% furfural	3.6	3.6	3.0	3.2	75	10
11	Control	2.6	3.0	2.0	2.0		

Aqueous Mixture number 2 contains the following:

	Percent
Permafresh Reactant 183	17
Catalyst X–4	3.3
Rhoplex HA–8	2.0
Triton X–100	0.25
Silkand 40	4.0
Moropol 700	3.0
Furfural	0.8

The samples are dried to approximately 8% moisture in an oven at 200° F. for 5 minutes. The samples are then tested for wrinkle recovery and the results are indicated in Table 5:

TABLE 5

Sample No.	Aqueous mixture composition	Wrinkle recovery rating	
		Warp	Filling
1	Aqueous Mixture No. 1	72	75
2	Aqueous Mixture No. 2	76	80

As can be readily ascertained, the incorporation of the furfural in aqueous mixture number 2 increases the wrinkle recovery ratings while requiring the use of less resin, i.e. from 25% down to 17% (a reduction in resin usage of 32%) to give good wrinkle resistance to the fabric.

EXAMPLE VI

The procedure of Example V is repeated on fabric samples being of a twill weave, trouser weight of about 6 oz. per yard and composed of 50% polyester fiber and 50% cotton fiber. Table 6 indicates the results of the test:

TABLE 6

Sample No.	Aqueous mixture composition	Wrinkle recovery rating	
		Warp	Filling
1	Aqueous Mixture No. 1 as outlined in Example 5.	72	72
2	Aqueous Mixture No. 2 as outlined in Example 5.	76	80

Incorporation of furfural into the aqueous mixture again shows increased wrinkle resistance while the resin content of the fiber is reduced by 32%, i.e. from 25% down to 17%.

What is claimed is:

1. In a process of imparting wash-and-wear and crease retention characteristics to a fabric comprised of at least about 25% of a synthetic fiber selected from the group consisting of spandex fibers, polyester fibers, olefin fibers, modacrylic fibers, nylon fibers, acrylic fibers, and mixtures thereof; and not more than about 75% cellulosic fibers, wherein said fibers are impregnated with a resin which is subsequently cured, the improvement comprising modifying the resin impregnation step by impregnating the fabric with an aqueous solution consisting essentially of from about 10% to 35% of a thermosetting resin selected from the group consisting of urea-formaldehyde resins, melamine-formaldehyde resins, carbamate resins, uron resins, imidazolidone resins, epoxy resins, sulfone resins, and triazine resins, and from about 0.1% to about 5% of a chemical swelling agent specific to said synthetic fiber.

2. The improvement of claim 1 wherein the fabric is composed of polyester fibers and cotton fibers.

3. The improvement of claim 1 wherein the resin is an imidazolidone.

4. The improvement of claim 1 wherein the resin is a modified ethylene urea.

5. The improvement of claim 1 wherein the resin is a carbamate.

6. The improvement of claim 1 wherein the synthetic-fiber swelling agent is furfural.

7. The improvement of claim 1 wherein the synthetic-fiber swelling agent is o-phenylphenol.

8. The improvement of claim 1 wherein the fabric is composed of acrylic fibers and cellulosic fibers.

9. A garment comprised of synthetic fibers and cellulosic fibers treated by the process of claim 1.

10. A process of imparting wash-and-wear and crease retention characteristics to a fabric comprised of at least about 25% of a synthetic fiber selected from the group consisting of spandex fibers, polyester fibers, olefin fibers, modacrylic fibers, nylon fibers, acrylic fibers, and mixtures thereof; and not more than about 75% cellulosic fibers comprising impregnating the fabric with an aqueous solution consisting essentially of from about 10% to about 35% of a thermosetting resin selected from the group consisting of urea-formaldehyde resins, melamine-formaldehyde resins, carbamate resins, uron resins, imidazolidone resins, epoxy resins, sulfone resins, and triazine resins, and from about 0.1% to about 5% of a chemical swelling agent specific to said synthetic fiber; drying the fabric at a temperature within the range of from about 175° to about 275° F. for a period of from about 2 to about 8 minutes, imparting a crease to the fabric and heating the fabric at a temperature sufficient to effect curing of the resin.

11. The process of claim 10 wherein the fabric is composed of polyester fibers and cotton fibers.

12. The process of claim 10 wherein the fabric is composed of acrylic fibers and cellulosic fibers.

13. The process of claim 10 wherein the resin is selected from the group consisting of resins of imidazolidone, modified ethylene urea, and carbamate.

14. The process of claim 10 wherein the synthetic-fiber swelling agent is furfural.

15. The process of claim 10 wherein the synthetic-fiber swelling agent is o-phenylphenol.

16. A garment comprised of synthetic fibers and cellulosic fibers treated by the process of claim 10.

17. A garment comprised of polyester fibers and cotton fibers treated by the process of claim 10.

18. A garment comprised of acrylic fibers and cellulosic fibers treated by the process of claim 10.

19. A process of imparting wash-and-wear and crease retention characteristics to a fabric comprised of at least about 25% of a synthetic fiber selected from the group consisting of spandex fibers, polyester fibers, olefin fibers, modacrylic fibers, nylon fibers, acrylic fibers, and mixtures thereof; and not more than about 75% cellulosic fibers comprising impregnating the fabric with an aqueous solution consisting essentially of from about 10% to about 35% of a thermosetting resin selected from the group consisting of urea-formaldehyde resins, melamine-formaldehyde resins, carbamate resins, uron resins, imidazolidone resins, epoxy resins, sulfone resins, and triazine resins, and from about 0.1% to about 5% of a chemical synthetic-fiber swelling agent specific to said synthetic fiber, drying the fabric at a temperature within the range of from about 175° to about 275° F. and for a period of time of from about 2 to about 8 minutes, heating the fabric to a temperature sufficient to effect curing of the resin, imparting a crease to the fabric and then pressing the crease while the fabric is heated to a temperature of from about 300° F. to about 450° F.

20. The process of claim 19 wherein the fabric is composed of polyester fibers and cotton fibers.

21. The process of claim 19 wherein the resin is selected from the group consisting of resins of imidazolidone, modified ethylene urea, and carbamate.

22. The process of claim 19 wherein the synthetic-fiber swelling agent is selected from the group consisting of furfural and o-phenylphenol.

23. The process of claim 19 wherein the fabric is composed of acrylic fibers and cellulosic fibers.

24. A garment comprised of synthetic fibers and cellulosic fibers treated by the process of claim 19.

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