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[54] **FABRIC-TREATING COMPOSITION AND METHOD**
3 Claims, No Drawings

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ABSTRACT: Fabrics are increased in brightness by deposition thereon of particulate synthetic organic polymer of a size to be suspendible in dilute aqueous solution of sodium hypochlorite, conveniently during an otherwise conventional fabric washing operation.

FABRIC-TREATING COMPOSITION AND METHOD

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention has to do with brightening fabrics. The term "fabric" herein refers to woven and nonwoven goods formed of fibers of natural materials e.g. cotton and silk fibers and synthetic materials e.g. nylon, polyester, polyolefin and polyurethane fibers. More particularly, the invention is concerned with such fabrics which are likely to be subjected to multiple washings e.g. shirts, blouses, sheets and the like.

In the course of multiple washings, fabrics tend to a dullness or greying which is desirably overcome e.g. by bleaching. Bleaching however does not impart brightness.

2. Prior Art

Efforts to improve fabric brightness following washings have included incorporation of fluorescent compounds in detergent materials. These compounds are expensive and being water dispersible are largely rinsed away from the fabric. Moreover, increases in brightness with successive exposure to these compounds in a series of washings are not visibly additive due to competing sorption and desorption of the fluorescent dye with a net low order of dye retention.

SUMMARY OF THE INVENTION

It is a major objective of the present invention to increase the brightness of fabrics, and to so in a manner readily compatible with present washing practices and in addition, provide appreciable cumulative increases in brightness in continued series washings.

It has now been found that bleach compositions containing insoluble particulate synthetic organic polymer suspended therein can be employed in washing cycles to deposit the polymer particles on the fabric whereby the brightness of the fabric is enhanced beyond that produced by the bleach alone. Moreover, successive treatments with such a bleach composition further increase brightness.

A method of treating fabric is provided, therefore, to increase the fabric brightness, which includes wetting the fabric with dilute aqueous solution of household bleach i.e. sodium hypochlorite, containing suspended a particulate synthetic organic polymer and depositing the polymer onto the fabric, thereby to increase the percent light reflection from the fabric when dried. The deposition is conveniently effected during a conventional washing cycle in the presence of a soap or other synthetic detergent, e.g. an anionic synthetic detergent.

The bleach composition used in the foregoing method consists essentially of a dilute aqueous solution of sodium hypochlorite having a pH above 10 and suspended therein a particulate synthetic organic polymer having a specific gravity between 0.95 and 1.2, the polymer being separable from the solution onto the fabric to be treated by contact therewith. The solution pH is generally attributable to the presence of free alkali, NaOH, or to the presence of a strongly basic salt such as sodium carbonate.

The particulate polymer is generally present in a perceptible amount e.g. between 0.1 and 5 percent by weight and has a particle size between 0.05 and 5 microns. In addition the index of refraction of the polymer is typically at least 0.05 unit greater than that of the dilute aqueous hypochlorite solution whereby the presence of the polymer is readily detectable in the solution, which appears opacified.

Miscellaneous additives for specific purposes can be present in the compositions hereof including an anionic surfactant e.g. in an amount lowering the surface tension of the composition to less than 45 dynes/centimeter, or other additives for imparting specific qualities to the bleach composition and/or the fabric.

It will be noted that if an opacifying amount of particulate polymer is employed, the bleach composition takes on a more substantial appearance which is pleasing to the consumer and an important advantage in terms of sales appeal.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The fabric-treating composition of the present invention includes dilute aqueous solution of sodium hypochlorite. In common with conventional bleach solution this solution will contain sufficient free alkali to have a pH of at least about 10 and preferably sufficient alkali to have a pH of 11.5 or more e.g. 0.1 to 1.0 percent by weight free alkali. Percent concentrations of sodium hypochlorite will be above 2.5 percent and generally be less than 10 percent; most solutions being in the range of 3 to 7 percent by weight sodium hypochlorite. Other bleaching agents may be used including other alkali metal salts generating bromine or chlorine in aqueous solution. Nonetheless sodium hypochlorite is the compound of choice.

The second nonaqueous component of the present composition is the water insoluble synthetic organic polymer which is of a particle size and constitution permitting suspension in the aqueous hypochlorite solution. Particle size will generally range between 0.05 and 5 microns, with smaller sizes being less visible and larger sizes less stable in suspension in typical compositions within the invention. Concentrations of the polymer will range from an effective amount for imparting added brightness through deposition on fabric to that amount forming a deposit visible as such on fabric. Convenient concentrations are between 0.1 and 5 percent by weight, with 0.3 to 3 percent by weight being particularly preferred, both on a solids basis.

It is further characteristic of preferred polymers that they exhibit an index of refraction more than 0.05 unit greater than the index of the aqueous hypochlorite solution. As such the polymer particles are perceptible as a component of the composition although not individually visible i.e. an opacity is imparted to the bleach composition.

The synthetic organic polymer is any chemical species substantially insoluble and nonreactive in the bleach solution. Numerous polymers will have the requisite chemical stability i.e. resistance to oxidation. In addition the polymer should be easily suspendible in the bleach composition i.e. be physically stable in the bleach. This property is realized in polymers having polar groups along the polymer chain e.g. hydroxyl, carboxyl, carbonyl, peroxy, ester, amide, nitrile and similar hydrophilic groups. With such groups, the polymer chain per se can be hydrophilic or hydrophobic e.g. a polymer of an ethylenically unsaturated monomer including olefins e.g. ethylene, propylene, butene-1; vinyl aromatic hydrocarbons and derivatives e.g. styrene, p-methyl styrene, p-ethyl styrene, α-methyl styrene, monochlorostyrene, polychlorostyrenes, nitrostyrenes, vinyl naphthalenes, vinyl diphenyl, divinyl benzene; vinyl esters, ethers and amides, e.g. vinyl acetate, methyl vinyl ether, ethyl vinyl ether, etc., acrylic and α-substituted acrylic acid derivatives including esters, amides and nitriles such as the alkyl esters of acrylic acid, methacrylic acid, chloracrylic acid, phenyl acrylic acid, methacrylamide, acrylonitrile, methacrylonitrile; derivatives of α, β-unsaturated dibasic acids such as the esters, amides and nitriles of maleic, fumaric, itaconic, citraconic, mesaconic acids and the like; vinylidene compounds, dienes, isoolefins and the like. Copolymers of two or more of the foregoing may be employed. Particularly effective are copolymers of the styrenes with between 5 and 25 percent and preferably up to 15 percent by weight of an acid group containing comonomer such as, among the organic acid groups, a carboxyl, ester, and nitrile group and among the inorganic acid groups a phosphonic, sulfonic or sulfonate group some of which comonomers are listed above. These polymers are preferred to have specific gravities above about 1.0 at 25° C. and will generally be between 0.95 and 1.2 in specific gravity. Where the acid group is an ester group it may have the structure A—R in which A is an acid radical particularly selected from oxycarbonyl, sulfo or phosphinyl groups and R is an alkyl group containing 1 to 4 carbon atoms. The term "acid group" has reference to the capacity of the group to act as a proton donor in aqueous media.

The foregoing polymers may be prepared by any of the polymerization techniques known in the art such as mass, suspension, emulsion or solution techniques. Conveniently, preferred copolymers of styrene and acid group containing monomer are prepared by emulsion polymerization and with or without the added presence of an emulsion stabilizer such as a vinyl ester-maleic anhydride salt which finished emulsion may be incorporated directly, emulsifiers and all, into the aqueous hypochlorite solutions.

Surfactants in small but effective amounts may be employed in the bleach composition added either along with emulsion polymerized polymer or separately.

EXAMPLE

All parts are by weight.

Washing solutions containing 16 gallons of 150 p.p.m. hardness water, a cup of 6 percent bleach solution (243 p.p.m. available chlorine) and 0.2 percent Tide detergent were prepared. In the example the bleach solution contained 0.3 percent (solids basis) of styrene-methacrylic acid emulsion copolymer (10 percent acid) having a particle size of about 0.3 microns as an opacifier brightener. In the Control the opacifier was omitted from the bleach solution.

Swatches of cotton, nylon and polyester cloth were washed successively five times at 120° F. for 15 minutes. Percent reflectance for six swatches of each cloth was measured after odd-numbered washings using a Gardner Color Difference Meter and Hunter D–40 Reflectometer. In all instances the reflectance values for the opacified bleach exceeded those of the nonopacified conventional (Control) bleach. Measurements for blue-red and yellow-green values showed consistently superiority or equivalence for the opacified bleach washed cloths.

A panel of 100 persons was requested to compare nylon and cotton swatches produced in the above washings. 80 percent of those inspecting the cloths selected the opacified bleach (example) whitened cloth, nylon or cotton, as whiter than the corresponding nonopacified bleach (Control) cloths.

Duplication of the above experiment with particulate depositable polymer contents of 0.1, 0.5, 0.75, 1.0, 1.5, 3 and 5 percent (solids basis) provides equivalent results.

Softness or "hand" of the fabric was not deleteriously affected by the deposit of polymer.

Among suitable surfactants are anionic aromatic detergents, e.g. water-soluble higher alkyl aryl sulfonate detergents particularly those having from 8 to about 15 carbon atoms in the alkyl group. It is preferred to use the higher alkyl benzene sulfonate detergent for optimum effects, though other similar detergents having a mononuclear aryl nucleus, such as toluene, xylene, or phenol, may be used also. The higher alkyl substituent on the aromatic nucleus may be branched or straight-chained in structure, examples of such group being nonyl, dodecyl and pentadecyl groups derived from polymers of lower monoolefins, decyl, keryl, and the like.

Illustrative of suitable aliphatic anionic detergents are the normal and secondary higher alkyl sulfate detergents, particularly those having about 8 to 15 carbons in the fatty alcohol residue, such as lauryl (or coconut fatty alcohol) sulfate. Other suitable detergents are the sulfuric acid esters of polyhydric alcohols incompletely esterified with higher fatty acids, e.g. oleic acid ester of isothionic acid; the higher fatty acid (e.g. coconut) ethanolamide sulfate; the higher fatty acid amide of amino alkyl sulfonic acids, e.g. lauric acid amide of taurine; and the like.

These sulfate and sulfonate detergents are used in the form of their water-soluble salts, such as the alkali metal and nitrogen-containing, e.g. lower alkylolamine, salts. Examples are the sodium, potassium, ammonium, isopropanolamine, mono- and tri-ethanolamine salts of said higher alkyl benzene sulfonate, higher alkyl sulfate and the like. In commercial practice, it is preferred to use the alkali metal salts.

Typical specific examples are:

the sodium salt of a sulfate ester of an alkylphenoxypoly (ethyleneoxy) ethanol, the ammonium salt of this sulfate ester, sodium methyl oleyl taurate, sodium alkyl naphthalene sulfonate, alkyl acyl sodium sulfonate, sodium tetrahydronaphthalene sulfonate, sodium alkyl aryl sulfomate, alkyl amido sulfate, cocomonoglyceride sulfate, dodecylbenzene sodium sulfonate, dodecylbenzene sulfonic acid, tridecylbenzene sodium sulfonate, fatty alcohol sodium sulfate, sodium dodecyl diphenyl oxide disulfonate, sulfonated castor oil, polyethoxyalkyl phenol sulfonate triethanolamine salts, sodium triethanolamine alkyl aryl sulfonate, magnesium lauryl sulfate, potassium lauryl sulfate, sodium lauryl ether sulfate, ammonium lauryl ether sulfate, sodium tallow sulfate, dodecylbenzene sodium sulfonate, oleyl methyl tauride, ammonium lauryl sulfate, amide sulfonate, and the like.

In general, suitable nonionic surfactants include those such as produced by the introduction of alkylene oxide group into an organic hydrophobic compound or group having an aliphatic or aromatic structure. The hydrophobic organic group generally contains at least eight carbon atoms and up to about 30 carbon atoms. Condensed with the hydrophobic group are at least 5 and preferably up to about 50 alkylene oxide groups. It is preferred to use the polyoxyethylene condensates derived from ethylene oxide. It is preferred to use the polyalkylene oxide condensates of alkyl phenol, such as the polyoxyethylene ethers or alkyl phenols having an alkyl group of at least about six, and usually about eight to 12 carbons, and an ethylene oxide ratio (number of moles per phenol) of about 7.5, 8.5, 11.5, or 20, though the number of ethylene oxide groups will be usually from about eight to 18. The alkyl substituent on the aromatic nucleus may be di-isobutylene, diamyl, polymerized propylene, dimerized C_6–C_7 olefin, and the like.

Further suitable nonionics are the polyoxyalkylene esters of organic acids, such as the higher fatty acids, rosin acids, tall oil acids, or acids from the oxidation of petroleum, et cetera. These polyglycol esters will contain usually from about 12 to about 30 moles of ethylene oxide or its equivalent and about eight to 22 carbons in the acyl group. Suitable products are refined tall oil condensed with 16 or 20 ethylene oxide groups, or similar polyglycol esters of lauric, stearic, oleic acids, etc.

Additional nonionic agents are the polyalkylene oxide condensates with higher fatty acid amides, such as the higher fatty acid primary amides, mono- and di-ethanolamides. Suitable agents are coconut fatty acid amide condensed with about 10 to 50 moles of ethylene oxide. The fatty acyl group will have similarly about eight to 22 carbons, and usually about 10 to 18 carbon atoms, in such products. The corresponding sulfonamides may be used also if desired.

Other suitable polyether nonionic detergents are the polyalkylene oxide ethers of high aliphatic alcohols. Suitable fatty alcohols having a hydrophobic character, preferably eight to 22 carbons, are lauryl, myristyl, cetyl, stearyl and oleyl alcohols which may be condensed with an appropriate amount of ethylene oxide, such as at least about six, and preferably about 10 to 30 moles. A typical product is oleyl alcohol condensed with about 12, 15 or 20 moles of ethylene oxide. The corresponding higher alkyl mercaptans or thio-alcohols condensed with ethylene oxide are suitable in the present invention also. The water-soluble polyoxyethylene condensates with hydrophobic polyoxypropylene glycols may be employed also.

Further suitable nonionic materials are the higher fatty acid alkanolamides, such as the monoethanolamides, diethanolamides and isopropanolamides wherein the acyl radical has about 10 to 14 carbon atoms and amine oxides. Examples are coconut (or equivalent lauric), capric and myristic diethanolamide, monoethanolamide and isopropanolamide, dodecyl dimethyl amine oxide and dimentyl acetoxyalkylamine oxide where alkyl is C_{11}–C_{14}.

I claim:

1. Composition for treating a fabric to increase the brightness thereof consisting of an aqueous solution of sodium

hypochlorite having a pH above 10 suitable for bleaching said fabric, a nonionic or anionic surfactant selected from organic sulfates, organic sulfonates, polyoxyalkylene ethers, esters and amides, and fatty acid alkanolamides wherein the acyl group has about 10 to 14 carbon atoms in an amount sufficient to lower the surface tension of the composition at 25° C. to less than 45 dynes per centimeter and suspended therein, from 0.1 to 5 percent, based on the weight of the composition of a particulate styrene polymer insoluble and nonreactive in said solution having a particle size between 0.05 and 5 microns, an index of refraction more than 0.05 unit greater than the solution and a specific gravity between 0.95 and 1.2 at 25° C., said polymer deposited onto the fabric by fabric treatment with said composition increasing the fabric brightness by increasing the light reflection from the fabric.

2. Composition according to claim 1 in which said styrene polymer consists essentially of copolymerized styrene monomer and from 5 to 25 percent by weight of an ethylenically unsaturated monomer containing a polar group selected from the group consisting of sulfonic, sulfonate, phosphoric and carboxylic-acid groups.

3. Method of treating fabric to increase the brightness thereof without the use of fluorescing brighteners which includes intimately wetting the fabric with the composition claimed in claim 1 and depositing said polymer onto said fabric thereby to increase light-reflectance from said fabric when dried.