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(54) Title: FABRIC-CLEANING FORMULATIONS WITH IMPROVED STAIN-REMOVAL PROPERTIES

(57) Abstract: The invention relates to fabric-treatment or cleaning compositions utilizing a combination of non-ionic and anionic surfactants. These formulations are particularly useful in fabric-treatment systems for treating or freshening of one or more fabric articles in a containment device (such as a bag) in conditions of heat and tumbling in a rotary clothes dryer.

FABRIC-CLEANING FORMULATIONS WITH IMPROVED STAIN-REMOVAL PROPERTIES

FIELD OF THE INVENTION

The present invention relates to formulations for use in cleaning (especially spot removal), freshening or otherwise treating fabric or fabric articles. The formulations are preferably used in fabric-treatment systems, whereby fabric articles are placed in a containment device along with the formulation and are treated in conditions of heat and tumbling in a rotary clothes dryer

BACKGROUND OF THE INVENTION

Methods for dry-cleaning fabrics commonly employ organic solvents which can readily dissolve or disperse soils such as water-insoluble substances, including greases, oily dirts and the like, and which exhibit low solvent boiling points, enabling easy recovery of the solvents.

The use of solvent-based dry-cleaning methods has been primarily limited to commercial cleaning operations that employ expensive specialized equipment. Such equipment includes stills with condensers to contain vapors from the cleaning solvents, which are often toxic. As a result, to utilize such dry-cleaning processes, particularly to remove water-insoluble spots and/or stains from clothes, the user must bring the clothes to a specialized dry-cleaning establishment and pick up the cleaned clothes at a later date. This results in inconvenient expenditures of time in going to the dry-cleaner, waiting for the clothes to be properly cleaned, picking up the clothes, and dealing with damaged and lost articles of clothing. Moreover, articles of clothing and fabric items from many different sources are dry-cleaned with the same batch of solvent, which can result in malodorous residues.

Methods are available for consumers to dry-clean their clothing at home in a rotary hot air dryer. In one such process, soiled fabric articles are placed in a plastic or nylon bag with an added sheet coated with a cleaning/freshening composition including, inter alia, water, fragrance and surfactants. The bag is closed and placed in a dryer where it is tumbled at elevated temperatures for a period of time, so that the cleaning/freshening composition acts to clean or freshen the clothing.

SUMMARY OF THE INVENTION

The present invention encompasses fabric-treatment formulations which provide improved cleaning and stain removal properties, and may reduce residue that may be left on fabrics after treatment.

In one embodiment, the formulation includes an effective amount of:

(a) water;

(b) a non-ionic ethoxylated alcohol surfactant having a straight or branched chain alcohol of between 11-16 carbon atoms and having between 1.6 to 7 moles of ethylene oxide present;

(c) an anionic surfactant selected from the group consisting of alkyl alcohol sulfates, alcohol ethoxysulfates, alkyl alcohol benzene sulfonates, and mixtures thereof;

(d) at least one organic solvent;

(e) optionally, but preferably, a dispersing agent; and

(f) optionally, but preferably, a fragrance.

This formulation is advantageous because it includes a detergent system that effectively removes soil (especially oily soils) from fabric articles while minimizing the amount of visible residue left on the treated fabrics. In addition, these anionic and non-ionic surfactants are generally non-toxic and environmentally safe.

In any of the embodiments of this invention, other ingredients

may be added to the formulations, depending on the desired end-use. For instance, it may be desirable to include organic solvents, fragrances, preservatives, anti-foam components, other surfactants, etc.

The formulations may be in any form, depending on the desired end-use and the convenience of the user. For instance, the formulations may in a gelled or liquid form, and are preferably coated or impregnated onto a substrate, such as a sheet or other carrier device. In the alternative, the formulations may be in the form of a liquid and may be applied to fabrics by spraying, rolling-on, daubing, pouring, and the like.

The invention also contemplates methods for treating fabric, using the formulations of the invention. To that end, the invention is directed to methods for cleaning, freshening and/or treating all types of fabric articles, even including delicate fabric articles (such as, for instance, 100% acetate, 100% silk, 100% rayon and blends of these fabrics). For instance, one or more fabric articles may be placed together with one of the formulations into a container device, such as a bag. The formulation may be applied to the fabric article prior to its placement into the bag, and/or may be coated or impregnated on a substrate that is placed in the bag along with the fabric article. Preferably, the container device is then subjected to conditions of heat and agitation, such as being tumbled in a rotary hot-air dryer, which facilitates the treatment of the fabric articles by the formulation. After a period of time (usually at least 10 minutes), the treated fabric articles may be removed from the container.

Additional advantages of the various embodiments of this invention will become readily apparent to persons skilled in the art from the following discussion.

DETAILED DESCRIPTION OF THE INVENTION

The present invention, including the above-described embodiments and various versions thereof, is more fully described in the following detailed discussion.

A. Fabric-treatment formulations

One important feature of the formulation is the inclusion of a combination of an anionic surfactant and a non-ionic surfactant. The non-ionic surfactant is an ethoxylated alcohol having an alcohol chain length between 11-16 carbon atoms, with between 1.6 –7 moles of ethylene oxide present. The anionic surfactant is selected from the group consisting of alkyl alcohol sulfates, alcohol ethoxysulfates, alkyl alcohol benzene sulfonates, and mixtures thereof. When used alone the non-ionic surfactant may tend to leave an oily residue on the treated fabric. However, the particular combination of these non-ionic and anionic surfactants results in a cleaning composition which has excellent soil-removal properties but which leaves little or no visible residue on the treated fabric. For instance, the combination of these non-ionic and anionic surfactants preferably results in detergent systems having desirable critical micelle concentrations (CMC), which imparts soil-releasing properties to the formulation.

In one preferred embodiment, the non-ionic surfactant is an ethoxylated alcohol having a chain length between 12-15 carbon atoms, with between 3-4 moles of ethylene oxide. Examples of preferred non-ionic surfactants include commercially available Neodol 25-3, Neodol 23-3, (both made by Shell Corp.), and Surfonic L24-3, Surfonic L24-4 and Surfonic L1270-2 (all made by Huntsman Corp.). In the compositions of the invention, it is preferred that the non-ionic surfactant be present in an amount between about 0.05

weight percent and about 1.0 weight percent.

In this invention, the non-ionic surfactant must be used in conjunction with at least one of the three categories of anionic surfactants mentioned above. Suitable alkyl alcohol sulfates, alkyl alcohol benzene sulfonates and alcohol ethoxysulfates may be appropriately chosen by someone skilled in this art. Preferred alkyl alcohol sulfates include fatty alcohol sulfates, especially sulfates having 10-18 carbon atoms. In one preferred embodiment, the anionic surfactant is a coco fatty alcohol ethersulfate. This preferred surfactant is commercially available as Bercuterge DG-40 (made by Burlington Chemical Co., Inc.), which has 40% actives. In the compositions of the invention, it is preferred that the anionic surfactant be present in an amount between about 0.10 weight percent and about 0.80 weight percent.

Preferably, the ratio of non-ionic surfactant to anionic surfactant is 49.3 : 50.7 weight percent to 30.9 : 69.4 weight percent.

In addition, both of these surfactants are non-toxic and environmentally friendly, and do not biodegrade into environmentally undesirable products.

The fabric cleaning formulations of the invention may include other optional components, as desired. For instance, the formulations may further include dispersing agents, such as gelling agents or viscosity modifiers. When present, the dispersing agent is preferably in an amount effective to gel the liquid dispersions when they are cooled and applied to a substrate, such as a non-woven or woven sheet, or the like, as described in more detail below. Preferably, the dispersing agent will stabilize the cleaning composition and/or assist in releasably adhering it to a substrate. The dispersing agent may also assist the uniform distribution of the surfactants and solvent (when present) on the substrate while leaving

no significant residue on the fabric. Useful dispersing agents can include modified starches, modified celluloses (CMC, HPMC), and polysaccharide gums, i.e., polysaccharide gums that can be gelled in situ by the addition of an effective amount of one or more metal or ammonium cations.

Preferred polysaccharide gums for use in the present compositions include vegetable gums, such as the alkali metal salts of alginic acid ("alginates"), carrageenan (preferably kappa-carrageenan), pectin, guar gum, and mixtures thereof. These "strong gums" re-gel from solution or dispersion to yield a continuous gel structure. In one preferred embodiment, the dispersing agent, when present, is a carrageenan powder such as Genu LC-4 or Genu CSW-2 (both made by Hercules Corp.). These preferred dispersing agents are lighter in color than other carrageenans, and give the composition an overall asthetically pleasing appearance.

Other useful organic dispersing agents include polyvinylpyrrolidone, polyvinyl alcohol, polyacrylamides, polysulfonic acid and polymeric organic waxes. The useful polymeric waxes include ethylene acrylate copolymers, ethylene acrylic acid copolymers and polyethylene (e.g., oxidized polyethylenes). These materials are commercially available in the form of aqueous emulsions or dispersions, e.g., from Allied Chemical, Morristown, NJ, as the A-C Copolymer and A-C Polyethylene series, such as A-C Copolymer 540, A-C Copolymer 580 and A-C Polyethylene 617 and 629. Waxy polyethylene glycols (PEG) such as those of a molecular weight of about 800 to 1700-2000 are preferred.

When present, the dispersing agent will make up about 0.01-10% of the cleaning compositions.

Optionally, organic solvent may be included in the composition. When organic solvent is present in the fabric-treatment composition, it may make up between about 2 to about 99 total weight percent based on the total weight percent of the composition, and preferably between about 5 to about 15 weight percent. Although, total amounts may vary as desired and depending on the presence of other components, as would be understood by someone of ordinary skill in this art.

Since water is present in the fabric-treatment composition, the organic solvent is preferably water-miscible, or at least partially water-miscible. One example of a useful organic solvent is a glycol ether. These materials are lower(alkoxy)- or lower(alkoxy)lower(alkoxy)-ethers of ethanol or isopropanol. Some examples of preferred glycol ethers are available under the trade names Arcosolv® (Arco Chemical Co.) or Cellosolve®, Carbitol®, or Propasol® (Union Carbide Corp.), and include, e.g., butylCarbitol®, hexylCarbitol®, methylCarbitol®, Carbitol LG® (diethylene glycol monoethyl ether), and Carbitol® itself, (2-(2-ethoxy)ethoxy)ethanol.

Other organic solvents include dipropylene glycol n-propyl ether, dipropylene glycol n-butyl ether, tripropylene glycol methyl ether, 3-methoxy-3-methyl-1-butanol and γ-butyrolactone.

Other glycol ethers include diethylene glycol monobutyl ether, triethylene glycol monobutyl ether, ethylene glycol monohexyl ether, diethylene glycol monohexyl ether, dipropylene glycol monobutyl ether, butylethoxypropylene glycol, diethylene glycol monomethyl ether, triethylene glycol monomethyl ether, diethylene glycol monoethyl ether, triethylene glycol monoethyl ether, ethylene glycol monopropyl ether, diethylene glycol monopropyl ether, ethylene glycol monobutyl ether, propylene glycol monomethyl ether, dipropylene glycol monomethyl ether, propylene glycol monopropyl

ether, propylene glycol monobutyl ether, propylene glycol methyl ether, propylene glycol ethyl ether, propylene glycol n-propyl ether, propylene glycol t-butyl ether, propylene glycol n-butyl ether, dipropylene glycol methyl ether, dipropylene glycol t-butyl ether, dripropylene glycol n-butyl ether, ethylene glycol methyl ether, ethylene glycol ethyl ether, ethylene glycol propyl ether, ethylene glycol butyl ether, ethylene glycol hexyl ether, ethylene glycol ethyl hexyl ether, diethylene glycol methyl ether, diethylene glycol ethyl ether, diethylene glycol propyl ether, diethylene glycol butyl ether, tripropylene glycol n-butyl ether, propylene glycol phenyl ether, propylene glycol n-phenyl ether, ethylene glycol n-butyl ether, diethylene glycol n-butyl ether, triethylene glycol butyl ether, triethylene glycol methyl ether, ethylene glycol phenyl ether, aromatic-based glycol ethers, butoxy propoxy propanol, methoxy propoxy propanol, ethoxy propoxy propanol, propoxy propoxy propanol, and mixtures thereof. Such glycol ethers are commercially available, for instance, from Dow, Union Carbide and Arco. Of course, the choice of glycol ether can be readily made by one of ordinary skill in the art on the basis of its volatility, weight percent of the total dispersion and the like. Alcohols which can be employed as co-solvents include liquid polyethylene glycols, i.e., polyethylene glycol-200, 300, 400 or 600, wherein the suffixed numbers indicate the approximate molecular weight of the glycol. Other co-solvents include other alcohols, for example, C_2-C_4 polyols, such as a diol or triol, e.g., ethylene glycol, propylene glyol, glycerol, 1,2-octanediol, or mixtures thereof.

Other organic solvents can also be used including conventional chlorinated dry-cleaning solvents. Examples of these solvents are the di- to tetrachlorinated derivatives of methane, the di- to pentachlorinated derivatives of ethane and of ethylene, the mono-

to trichlorinated derivatives of cyclohexane, and monochlorobenzene. Specific examples of this type include carbon tetrachloride, methylenechloride, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-trichloroethane, 1,1,2-trichloroethane, 1,1,1 -trichloroethane, 1,1,2-trichloroethane, trichloroethylene, 1,1,2,2-tetrachloroethane, tetrachloroethylene, pentachloroethane, monochlorocyclohexane, 1,4-dichlorocyclohexane, monochlorobenzene and mixtures of the foregoing. Further, hydrocarbon solvents such as isoparaffinic solvents (available commercially as Isopar K made by Exxon, and DP-2000) can be useful.

The fabric-treatment composition can include minor but effective amounts of one or more surfactants besides the above-mentioned non-ionic and anionic surfactants. These other surfactants may act as cleaning intensifiers to facilitate removal of the soil upon release of the fabric-treatment composition from the substrate in the dryer. For instance, lauryl pyrrolidone (Surfadone LP-300) may be useful not only for stain-removal but for dewrinkling and minimizing visible residue. Amphoteric and other non-ionic and anionic surfactants may be used in the compositions. For instance, other non-ionic surfactants and amphoteric surfactants may act as adjunct fabric softeners. Minor but effective amounts of certain anionic surfactants may also be useful to provide faster dissipation of the composition in the dryer (such as, for instance, Schercamox DML).

Useful amphoteric surfactants include the (C_8-C_{22}) alkyl(dimethyl)amine oxides, such as those of the Schercamox series (Scher Chem. Co., Clifton, NJ), e.g., Schercamox DML is lauryl(dimethyl)amine oxide. Other useful amphoteric surfactants are known to the art, e.g., as disclosed in Marshall et al. U.S. Patent No. 3,936,538), the disclosure of which is incorporated by reference herein.

In addition, the composition may include additional fabric-treatment agents. Common agents include, for instance, dry-cleaning and fabric-softening agents. Examples of other fabric-treatment agents are anti-creasing agents, fatty acid condensates, anti-foamers, preservatives, anti-soil agents, bacteriostatic agents, brightening agents, bodying agents, dyes, coloring agents, fiber emollients, finishing agents, fragrances, germicides, lubricants, mildew-proofing agents, moth-proofing agents, shrinkage controllers, preservatives, fiber emollients, stain-removing agents, deodorants, insect repellents, sizing agents, starch, and the like, and mixtures thereof. Persons having ordinary skill in this art would easily be able to determine the effective amount of any fabric-treatment agent to be added to the formulation.

B. Methods of Use of the Fabric-Treatment Formulations

One utilization of the formulations is via fabric-treatment systems for dry-cleaning, freshening or otherwise treating fabric articles. The term "fabrics" or "fabric articles" encompasses not only clothing, but any other textile items which are commonly dry-cleaned or treated, including sheets, draperies, rugs, upholstery coverings, towels and the like. For this invention, the term "fabrics" also can include wool, wool blends, linen, cotton, knits, double-knits, polyester, twill, synthetics, etc., as well as delicate fabrics, such as 100% acetate, silk, rayon and blends of these fabrics. The fabric-treatment systems can accommodate fabrics that are in a wet, moist, or dry state.

As used herein with respect to the fabrics to be dry-cleaned, freshened or otherwise treated, the term "soil" includes odoriferous compounds such as tobacco smoke, residue, perfume, mustiness,

perspiration and the like, as well as visible spots and stains.

Therefore, as used herein, the term "treating" or "treatment" encompasses any chemical treatment of fabric, including but not limited to dry-cleaning and freshening. The term "freshen" includes the removal, deodorizing, chemical neutralizing and/or masking of odoriferous compounds on or within a fabric with a desirable scent. As used herein, the term "dry cleaning" or "cleaning" includes the removal of both kinds of "soil".

As used herein, the term "dryer" refers to a rotary hot air dryer, which tumbles the clothes in a drum with warm or heated air at an elevated temperature. The temperature within is usually between about 40°C and about 95°C, although the temperature may reach as high as about 200°C at points within the dryer, especially at the walls of the dryer unit and near the hot air inlet (often referred to as "hot spots" within the dryer). These higher temperatures are also characteristic of industrial dryers or Laundromat dryers. Preferably, however, the temperature within the dryer will be between about 50°C and about 90°C, for preselected periods of time (preferably, between about 15 and about 45 minutes).

In one preferred embodiment, the fabric-treatment systems comprise at least two components: (a) at least one formulation such as one described above, and (b) a containment device, such as a flexible bag. In general, the containment device defines an opening and includes sides or walls each having an interior surface and an exterior surface. The containment device may be formed of any material that is capable of enclosing fabric articles while substantially maintaining its shape and integrity, which material can readily be selected by someone having ordinary skill in the art. It is preferred that the containment devices exhibit sufficient thermal stability for use in a rotary hot air dryer. In addition, it is preferred that the

containment device will not be substantially damaged upon exposure to conditions including a temperature effective to cause release of the fabric-treatment composition from the substrate, fabric, etc. (which is described in more detail below). Preferably, the bag can resist "hot spots" within the dryer, where the temperature may reach as high as about 200°C.

The containment device preferably includes a fastening system or closure mechanism to open and close the opening. For instance, the closure mechanism may operate by manual folding of the top edges and fastening the closure mechanism. However, the containment device may also be closed by a closure mechanism absent the folding. Of course, the device may include any type of known fastening system, or may have none at all, depending on the desired end-use. For example, a bag's closure mechanism may include press-studs, a zipper, Velcro®, hook and loop, magnetic strips, folds, snaps, buttons, a latch and/or a Ziplock® fastener. Further, the opening need not necessarily be at the top of the bag, but may be anywhere in the sides of the bag, and of any design. The bottom edges and the side edges of the bag may be connected by folding, heat sealing, gluing or a combination thereof. The bag may or may not be hermetically sealed, depending on the desired end-use.

In one fabric-treatment system embodiment, an effective amount of at least one of the fabric-treatment compositions contacts the soiled fabric (or fabrics) and treats it chemically. The composition contacts soiled, spotted and/or stained portions of fabric therein and removes or decreases the soil, spots and/or stains. In addition to, or in the alternative, the composition contacts the fabric and freshens it.

Preferably, the fabric-treatment compositions are effective when subjected to heat. Therefore, in one preferred practice of this

embodiment, the soiled fabric (or fabrics) is added to the containment device along with an effective amount of at least one of the fabric-treatment compositions, and the device is subjected to agitation and heat effective to release the composition in liquid and/or in vaporous form from the substrate, vehicle, fabric, interior absorptive surface of the bag, etc., on which the composition is present in the bag. The composition in liquid and/or vaporous form contacts the fabric article and treats it. Moreover, the composition contacts spotted and/or stained portions of fabric therein and cleans, removes or decreases the spots and/or stains. In addition to, or in the alternative, the composition contacts the fabric and freshens it.

The containment device of the present invention can be placed in a rotary hot air clothes dryer to provide the effective amount of heat and agitation, or tumbling. Thus, in another embodiment, the present invention provides a method for cleaning and/or freshening soiled fabric articles comprising (a) placing a soiled fabric article (i.e., spotted, stained and/or in need of freshening) in a container along with a fabric-treatment composition; (b) closing the opening in the container; and (c) tumbling the container and its contents in a dryer at a temperature effective to release the fabric-treatment composition in liquid and/or vapor form and for a time effective to contact an effective amount of the released composition with the soiled fabric, so as to treat, clean and/or freshen the fabric.

The fabric-treatment formulations may be present on a substrate (for instance, a sheet, a sponge, a ball, a dauber, a stick, granules or a cube). The substrate should be of sufficient size to contain an effective amount of the fabric-treatment composition. A sheet is the preferred substrate, such as, for instance, a plastic sheet or a porous sheet, and the composition may be stably impregnated, coated or otherwise applied onto the sheet.

Usually the fabric-treatment formulations remain in a moist or wet state when present on a substrate. In the alternative, the compositions may be present in a spray or roll on solution, or even be in a dry state, such as powder or granules.

The fabric-treatment formulations of the invention may be applied to soiled fabric articles in any manner. Preferably, the fabric-treatment formulation is present in the fabric-treatment system on a substrate such as described above.

A sheet is the preferred substrate. Fabric materials useful to form the sheet (which should be flexible) include woven or, preferably, non-woven fibers that are generally adhesively or thermally bonded. Fibrous sheets having a web or corded fiber structure, or those which comprise fibrous mats in which the fibers are distributed haphazardly or in a random array can also be used. The fibers can be natural, such as wool, silk, jute, hemp, cotton, linen, sisal, or ramie; or synthetic such as rayon, cellulose ester, polyvinyl derivatives, polyolefins, polyamides or polyesters. Generally, any diameter or dernier of fiber is useful in the present invention. Preferably, the non-woven cloth materials are not prone to tear or separate when used, for example, in an automatic dryer, which may be due to the haphazard or random array of fibers in the non-woven material imparting strength in all directions.

Some examples of preferred non-woven cloth material useful as substrates in the present invention include 100% rayon sheets, 100% polypropylene sheets, or blended sheets (such as, for example, blends of cellulosic rayon and synthetic fibers).

Preferably the sheets have dimensions ranging from about 3" X 4" up to about 14" X 16". However, the sheet must also be of a sufficient size to carry a desirable load of fabric-treatment composition. Thus, the most preferred size of sheets range from about

4" X 14", particularly from about 5" X 12" to about 9" X 10". In conjunction therewith, the preferred sheets have surface areas ranging from about 12 inches squared to about 224 inches squared, and most preferably from about 48 inches squared to about 120 inches squared. When the bag is sufficiently small for containment of a single soiled fabric article or several small fabric articles (e.g., having dimensions ranging from about 18" x 22" up to about 20" x 26", and preferably 20" x 24") the sheet should also be suitably small (e.g., having dimension ranging between about 3" X 4" up to about 6" x 9", and preferably 5 5/8" x 8 1/2").

The fabric-treatment composition of the present invention is released from the sheet, sponge, ball, dauber, stick, cube, granules, etc. upon physical contact with the fabric articles in any manner desired, such as, for example, when the fabric articles and the sheet, sponge, ball, dauber, stick, cube, granules, etc. are tumbled together in the bag, preferably under heated conditions.

For instance, in one embodiment of the invention, one or more fabric articles and a suitably sized, flexible sheet containing a fabric-treatment composition are placed into a bag, the opening of the bag is closed, and then the bag is subjected to an amount of agitation and/or heat effective to release the composition from the flexible sheet upon contacting the fabric articles. The sheet "tumbles" among the fabric articles, thus dispersing the composition evenly onto them. Thus contacted, the fabric articles are cleaned, freshened or otherwise treated by the composition.

In one aspect of the invention, a bag containing the flexible coated/impregnated sheet and the fabric article(s), can be placed in a rotary hot air clothes dryer to provide the effective amount of heat and/or agitation, or tumbling, usually at a temperature of about 40°C-95°C., preferably at about 50°-90°C, for preselected periods of

time. For example, about 15-45 minutes of tumbling are sufficient to release the fabric-treatment composition from the sheet interior surface of the bag at these temperatures and to clean or freshen the fabric articles.

In an alternative embodiment, the fabric-treatment formulation may further be applied directly to the soiled fabric to be cleaned, e.g., by spraying, sponging, applying via squeeze bottle, rolling on wet or sprinkling via dry or moist powder or granule, the dry-cleaning composition onto the fabric. The fabric is subsequently placed into the container, the container's opening is fastened shut and the system is rotated in a hot air clothes dryer.

One option with the invention, instead of or in addition to placing into the bag an effective amount of the fabric-treatment composition, is that at least a portion of the interior surface of the containment device has an effective amount of the fabric-treatment composition releasably absorbed thereinto. For example, the interior absorptive surface may be a non-woven fabric attached to the inside surface of the device after formation of the device itself, as a second step. The fabric-treatment composition may be applied to the interior absorptive surface of the container wall, i.e., by spraying, after the manufacture of the container. Once the composition has been applied, the soiled fabric can be introduced into the container, the container fastened and then tumbled in a clothes dryer. The composition cleans the soil from the fabric, and optionally, excess moisture and the removed soil are absorbed by the interior absorptive surface of the container. In addition, the spotted and/or stained sections of the fabric may be manually rubbed on the inside of the impregnated container to pre-treat the soiled areas with the composition in order to loosen the soil. After use, the containment device may be discarded, or if desired, it may be constructed of a suitable material to allow

repeated usage in a plurality of cleaning cycles.

Alternatively, the composition is applied to the fabric in another suitable manner, and the absorptive surface need not contain the composition at all. In that case, the absorptive surface may be useful for absorbing soil and excess moisture during the cleaning process.

The invention also relates to kits for treating a fabric article. These kits comprise, packaged in association,

(i) at least one containment device, and

(ii) an effective amount of at least one fabric-treatment composition.

The invention is further illustrated in the following non-limited examples.

Examples

Example 1

The following formulation was worked up:

(a) non-ionic surfactant, C_{12}-C_{15} alcohol ethyxylate (such as Neodol 25-3, by Shell Corp. or Surfonic by Huntsman Corp.), preferably about 0.25% by weight;

(b) anionic surfactant, coco fatty alcohol ethersulfate (such as Burcoterge DG-40), preferably about 1.0% by weight (0.40% solids);

(c) carrageenan powder (such as Genu LC-4, by Hercules), preferably about 1.0% be weight;

(d) carragenan powder (such as Genu CSW-2, by Hercules), preferably
about 0.25% be weight;

(e) diethylene glycol monoethyl ether (such as Carbitol LG,

by Union Carbide), preferably about 9.75% by weight;

(f) lauryl dimethyl amine oxide (such as Schercamox DML, by Scher Chemical Corp.), preferably about 2.0% by weight;

(g) heterocyclic preservative/fungicide (such as Nuosept 95, by Huls Corp.), preferably about 0.53% by weight;

(h) silicone defoamer (such as Foamex AD-100), preferably about 0.3% by weight;

(i) fragrance, preferably about 0.6% by weight; and

(j) distilled water, up to 100%.

Wool and polyester-type fabrics were stained with lipstick, gravy or ketchup. The formulation was applied to each stain. In every case the stain was decreased or removed, and there was little or no residue from the formulation left on the fabric.

Example 2

The formulation described in Example 1 was worked up 16 times, except that the non-ionic surfactant was modified in alcohol chain length and moles of ethoxylation. Fabrics made of wool or rayon/polyester were stained with lipstick, gravy and ketchup. Each formulation was applied to each stain and the results are recorded in Table 1.

Scale for gauging degree of residue:

0 = none 1 = slight 2 = moderate 3 = heavy 4 = extreme

Scale for gauging stain removal:

0 = no removal 1 = slight removal 2 = moderate removal 3 = heavy removal

4 = no visible stain remaining.

Table 1

Surfactant	Alcohol chain length	Moles of ethoxylation	Stain removal quality : wool	Stain removal quality: rayon/poly-ester	Residue Left on Fabric: wool	Residue Left on Fabric: rayon/poly-ester
Neodol 25-3	12 to 15	3	Lipstick: 3 Gravy: 4 Ketchup: 4	Lipstick: 4 Gravy: 4 Ketchup: 4	Lipstick: 0 Gravy: 0 Ketchup: 0	Lipstick: 1 Gravy: 1 Ketchup: 1
Neodol 25-7	12 to 15	7	Lipstick: 2 Gravy: 4 Ketchup: 4	Lipstick: 4 Gravy: 4 Ketchup: 3	Lipstick: 1 Gravy: 1 Ketchup: 1	Lipstick: 2 Gravy: 2 Ketchup: 3
Neodol 25-9	12 to 15	9	Lipstick: 3 Gravy: 3 Ketchup: 2	Lipstick: 3 Gravy: 3 Ketchup: 2	Lipstick: 2 Gravy: 2 Ketchup: 2	Lipstick: 2 Gravy: 2 Ketchup: 2
Neodol 25-12	12 to 15	12	Lipstick: 3 Gravy: 2 Ketchup: 2	Lipstick: 4 Gravy: 3 Ketchup: 2	Lipstick: 3 Gravy: 2 Ketchup: 2	Lipstick: 2 Gravy: 2 Ketchup: 2
Neodol 1-3	12 to 15	3	Lipstick: 3 Gravy: 1 Ketchup: 1	Lipstick: 1 Gravy: 2 Ketchup: 4	Lipstick: 2 Gravy: 2 Ketchup: 2	Lipstick: 2 Gravy: 3 Ketchup: 2
Neodol 1-5	12 to 15	5	Lipstick: 2 Gravy: 1 Ketchup: 1	Lipstick: 2 Gravy: 1 Ketchup: 3	Lipstick: 3 Gravy: 3 Ketchup: 2	Lipstick: 2 Gravy: 3 Ketchup: 2
Neodol 1-7	12 to 15	7	Lipstick: 2 Gravy: 1 Ketchup: 1	Lipstick: 2 Gravy: 1 Ketchup: 1	Lipstick: 2 Gravy: 3 Ketchup: 2	Lipstick: 2 Gravy: 3 Ketchup: 2
Surfonic L12-3	11-12	3	Lipstick: 3 Gravy: 4 Ketchup: 4	Lipstick: 1 Gravy: 3 Ketchup: 3	Lipstick: 1 Gravy: 0 Ketchup: 0	Lipstick: 1 Gravy: 1 Ketchup: 1
Surfonic L12-6	11-12	6	Lipstick: 2 Gravy: 2 Ketchup: 2	Lipstick: 1 Gravy: 3 Ketchup: 3	Lipstick: 2 Gravy: 1 Ketchup: 1	Lipstick: 2 Gravy: 2 Ketchup: 2
Surfonic L12-8	11-12	8	Lipstick: 1 Gravy: 2 Ketchup: 2	Lipstick: 2 Gravy: 2 Ketchup: 3	Lipstick: 3 Gravy: 2 Ketchup: 1	Lipstick: 3 Gravy: 4 Ketchup: 4

Surfonic L24-3	12-14	3	Lipstick: 3 Gravy: 3 Ketchup: 4	Lipstick: 2 Gravy: 2 Ketchup: 2	Lipstick: 1 Gravy: 2 Ketchup: 2	Lipstick: 1 Gravy: 2 Ketchup: 2
Surfonic L24-4	12-14	4	Lipstick: 2 Gravy: 3 Ketchup: 3	Lipstick: 2 Gravy: 2 Ketchup: 2	Lipstick: 2 Gravy: 2 Ketchup: 2	Lipstick: 1 Gravy: 2 Ketchup: 2
Surfonic L24-7	12-14	7	Lipstick: 2 Gravy: 3 Ketchup: 2	Lipstick: 1 Gravy: 2 Ketchup: 2	Lipstick: 2 Gravy: 3 Ketchup: 2	Lipstick: 3 Gravy: 3 Ketchup: 3
Surfonic L24-9	12-14	9	Lipstick: 2 Gravy: 2 Ketchup: 2	Lipstick: 1 Gravy: 2 Ketchup: 2	Lipstick: 3 Gravy: 3 Ketchup: 3	Lipstick: 4 Gravy: 3 Ketchup: 3
Surfonic L24-12	12-14	12	Lipstick: 1 Gravy: 2 Ketchup: 2	Lipstick: 1 Gravy: 2 Ketchup: 2	Lipstick: 3 Gravy: 3 Ketchup: 2	Lipstick: 4 Gravy: 4 Ketchup: 4
Surfonic L1270-2			Lipstick: 0 Gravy: 2 Ketchup: 1	Lipstick: 0 Gravy: 3 Ketchup: 1	Lipstick: 0 Gravy: 3 Ketchup: 2	Lipstick: 1 Gravy: 1 Ketchup: 1

The invention has been described with reference to various specific and preferred embodiments and techniques. However, it should be understood that many variations and modifications may be made while remaining within the spirit and scope of the invention. All references cited herein are incorporated by reference in their entirety.

WHAT IS CLAIMED IS:

1. A fabric-treatment composition comprising:

(a) water;

(b) an ethoxylated alcohol non-ionic surfactant having an alcohol chain length between 11-16 carbon atoms and having between 1.6 – 7 moles of ethylene oxide present;

(c) an anionic surfactant selected from the group consisting of alkyl alcohol sulfates, alcohol ethoxysulfates, alkyl alcohol benzene sulfonates, and mixtures thereof;

(d) optionally, but preferably, a dispersing agent;

(e) optionally, but preferably, at least one organic solvent; and

(f) optionally, but preferably, a fragrance..

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/29859

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :C11D 3/00; D06L 3/00
US CL :510/519, 520

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 510/519, 520

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Please See Extra Sheet.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	US 6,133,226 A [KNOWLTON et al] 17 October 2000, col.2, line 47 et seq, col.4, line 29 et seq, col.6, lines 60-62, col. 11, line s 34-35	1
Y	US A 5,789,368 A [YOU et al] 04 August 1998, col.17, line 33 et seq, col.18, lines 31-45, col.35, line 49, col.36, line 4	1
A	US A 5,480,567 A [LAM et al] 02 January 1996	

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document published on or after the international filing date

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

17 DECEMBER 2000

Date of mailing of the international search report

15 FEB 2001

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Form PCT/ISA/210 (second sheet) (July 1998)★

B. FIELDS SEARCHED
Electronic data bases consulted (Name of data base and where practicable terms used):

WEST 2.0 all databases
nonionic and anionic surfactants, ethoxylated alcohol, Neodol 25-3, Neodol 23-3, Surfonic L24-4, Surfonic L1270-2, alkyl alcohol sulfate, alcohol ethoxy sulfate, alkyl alcohol benzene sulfonate, coco fatty alcohol ethersulfate, Bercuterge DG-40, fabric, dryer