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54 **Softergent with sugar ethers as detergency boosters.**

57 A laundry detergent comprises: a deterensively effective amount of a mixture of non-sugar, nonionic surfactant and amphoteric surfactant; a fabric softening effective amount of a water-insoluble quaternary ammonium compound; a detergent building effective amount of at least one builder salt; and a detergency boosting effective amount of a sugar ether containing at least two long chain alkyl groups. The laundry detergent has a high level of detergency on greasy and particulate soils and a high level of redeposition prevention despite the presence of high levels of cationic softener.

EP 0 379 398 A2

Softergent with sugar ethers as detergency boostersBACKGROUND OF THE INVENTION5 Field Of The Invention:

This invention relates to an improved laundry detergent composition. More particularly, this invention is directed to a laundry detergent composition containing a water-insoluble quaternary ammonium compound fabric softener (a softergent) having incorporated therein a sugar ether which provides detergency boosting properties to the laundry detergent composition without loss of softening performance. A preferred embodiment of the invention is directed to a softergent with improved cleaning and whitening performance, especially at 60 ° C or above.

15 Description Of The Prior Art:

Compositions useful for treating fabrics to improve the softness and feel characteristics thereof are known in the art.

When used in domestic laundering, the fabric softeners are typically added to the rinse water during the rinse cycle having a duration of only from about 2 to 5 minutes. Consequently, the consumer is required to monitor the laundering operation or take other precautions so that the fabric softener is added at the proper time. This requires the consumer to return to the washing machine either just prior to or at the beginning of the rinse cycle of the washing operation which is obviously burdensome to the consumer. In addition, special precaution has to be taken to use a proper amount of the fabric softener so as to avoid over-dosage which may render the clothes water-repellant by depositing a greasy film on the fabric surface, as well as imparting a certain degree of yellowness to the fabrics.

As a solution to the above-noted problems, it has been known to use fabric softeners which are compatible with common laundry detergents so that the softeners can be combined with the detergents in a single package for use during the wash cycle of the laundering operation. Examples of such wash cycle added fabric softening composition are shown in U.S. Patents 3,351,438, 3,660,286 and 3,703,480. In general, these wash cycle fabric softening compositions contain a cationic quaternary ammonium fabric softener and additional ingredients which render the softening compounds compatible with the common laundry detergents.

It is also known, however, that the cationic softening compounds added to the wash cycle, either as an ingredient in a detergent-softener (softergent) composition or as a wash cycle softener, interfere with the brightening activity, as well as the cleaning efficiency of the detergent. As a result, it has been sought to offset to some degree this interference in softergent compositions by using nonionic surfactants, higher levels of brightener compounds, carboxymethylcellulose, anti-yellowing compounds, bluing agents, and so forth. However, little improvement has been made in wash cycle softening compositions using a variety of detergents, most of which are anionics.

There have also, however, been many disclosures in the art relating to detergent compositions containing cationic softening agents, including the quaternary ammonium compound softening agents, and nonionic surface-active compounds. As representative of the art, mention can be made of U.S. Patents 4,264,457, 4,239,659, 4,259,217, 4,222,905, 3,951,879, 3,360,470, 3,351,483 and 3,644,203. In addition, U.S. Patents 3,537,993, 3,583,912, 3,983,079, 4,203,872 and 4,264,479 specifically disclose combinations of nonionic surfactant, cationic fabric softener and another ionic surfactant or modifier, such as zwitterionic surfactants, amphoteric surfactants, and the like.

While many of these prior art formulations provide satisfactory cleaning and/or softening under many different conditions they still suffer from the defects of not providing adequate softening - e.g. comparable to rinse cycle-added softeners - especially under hot water washing conditions, i.e. at temperatures of 60 ° C and higher; requiring formation of complexes of the cationic compound; using lower softening performance water-soluble, e.g., monohigher alkyl quaternary ammonium, cationic compounds; being limited to liquid compositions; etc.

Although it is not uncommon for present day laundry detergent compositions and for conventional home automatic washing machines, especially in the United States, to be able to effect washing/cleaning of soiled

fabrics using cold or warm wash water, especially for sensitive fabrics, wash-wear fabrics, permanent-press fabrics, and the like, it is nevertheless appreciated that more effective cleaning (soil removal) requires higher washing temperatures. Furthermore, in Europe and in other countries, the home washing machines operate at hot temperatures of 60° C or more, up to the boiling temperature of the wash water. While these high temperatures are beneficial for soil removal there is not an equal benefit for softening performance.

It is known that softening performance of a detergent system based on a mixture of a nonionic surfactant compound and a cationic quaternary ammonium compound fabric softening agent is significantly enhanced by using a limited class of nonionics characterized by cloud points above the washing temperature. Furthermore, this enhancement of the softening performance is achieved without any, or at least without any significant, deterioration in washing (i.e. cleaning) performance. The utilization of this limited class of nonionics characterized by cloud points above the washing temperature is disclosed in copending, commonly assigned application Serial No. 646,594, filed September 4, 1984, entitled Wash Cycle Detergent-Softener Compositions, the disclosure of which is incorporated herein by reference.

It is also known that the cloud point of nonionic surfactants having cloud point temperatures of less than 60° C can be raised to above 60° C by incorporating in the detergent composition an amphoteric surfactant. It is further known that the mixed nonionic/amphoteric surfactant mixtures are compatible with water-insoluble cationic quaternary ammonium compound fabric softeners, such as dimethyl distearyl ammonium chloride (DMDSAC) and enhance the softening performance of the cationic fabric softeners to the same extent as do the high cloud point nonionics which by themselves have cloud points above the washing temperature. It is also known that the mixed nonionic/amphoteric surfactant system, even in the presence of the cationic fabric softener, acts synergistically to provide better cleaning performance than the same or greater amounts of each of the two surfactants used in the absence of the other. This utilization of the mixed nonionic/amphoteric surfactant system in combination with cationic fabric softener is disclosed in copending, commonly assigned application Serial No. 646,604 filed August 31, 1984, entitled Hot Water Wash Cycle Detergent-Softener Compositions, the disclosure of which is incorporated herein by reference.

However, the fact remains that the high level of cationics, necessary for softening performance, does not permit as high a level of detergency on greasy and particulate soils as would be desirable, nor does it permit as high a level of redeposition prevention as would be desirable.

The use of various sugar derivatives in laundry detergent compositions is known.

It is well known in the art that certain alkyl glycosides, particularly long chain alkyl glycosides, are surface active and are useful as nonionic surfactants in detergent compositions. Lower alkyl glycosides are not as surface active as their long chain counterparts. Alkyl glycosides exhibiting the greatest surface activity have relatively long-chain alkyl groups. These alkyl groups generally contain about 8 to 25 carbon atoms and preferably about 10 to 14 carbon atoms.

Long chain alkyl glycosides are commonly prepared from saccharides and long chain alcohols. However, unsubstituted saccharides such as glucose are insoluble in higher alcohols and thus do not react together easily. Therefore, it is common to first convert the saccharide to an intermediate, lower alkyl glycoside which is then reacted with the long chain alcohol. Lower alkyl glycosides are commercially available and are commonly prepared by reacting a saccharide with a lower alcohol in the presence of an acid catalyst. Butyl glycoside is often employed as the intermediary.

The use of long chain alkyl glycosides as a surfactant in detergent compositions and various methods of preparing alkyl glycosides is disclosed, for example, in U.S. Patents 2,974,134; 3,547,828; 3,598,865 and 3,721,633. The use of lower alkyl glycosides as a viscosity reducing agent in aqueous liquid and powdered detergents is disclosed in U.S. Patent 4,488,981.

Acetylated sugar esters, such as, for example, glucose penta acetate, glucose tetra acetate and sucrose octa acetate, have been known for years as oxygen bleach activators. The use of acetylated sugar derivatives as bleach activators is disclosed in U.S. Patents 2,955,905; 3,901,819 and 4,016,090.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to improve the detergency of detergent compositions containing cationic fabric softening agents.

It is a further object of the present invention to improve the whitening of detergent compositions containing cationic fabric softening agents.

It is a still further object of the invention to provide a heavy duty detergent composition including cationic fabric softening agent with improved cleaning and whitening performance, especially at 60° C or

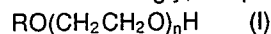
higher.

These and other objects of the invention which will become apparent hereinafter may be achieved by the provision of a laundry detergent comprising a detergently effective amount of a mixture of non-sugar, nonionic surfactant and amphoteric surfactant; a fabric softening effective amount of a water-insoluble quaternary ammonium compound; a detergent building effective amount of at least one builder salt; and a detergency boosting effective amount of a sugar ether containing at least two long chain alkyl groups.

DETAILED DESCRIPTION OF THE INVENTION

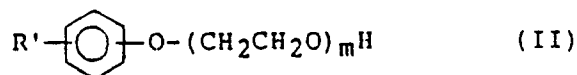
Suitable non-sugar, nonionic surface active agents are commercially available and are derived from the condensation of an alkylene oxide or equivalent reactant and a reactive-hydrogen hydrophobe. The hydrophobic organic compounds may be aliphatic, aromatic or heterocyclic, although the first two classes are preferred. The preferred types of hydrophobes are higher aliphatic alcohols and alkyl phenols, although others may be used such as carboxylic acids, carboxamides, mercaptans, sulphonamides, etc. The ethylene oxide condensates with higher-alkyl phenols or higher fatty alcohols represent preferred classes of nonionic compounds. Usually, the hydrophobic moiety should contain at least about 6 carbon atoms, and preferably at least about 8 carbon atoms, and may contain as many as about 50 carbon atoms or more, a preferred range being from about 8 to 22 carbon atoms, especially from 10 to 18 carbons for the aliphatic alcohols, and 12 to 20 carbons for the higher alkyl phenols. The amount of alkylene oxide will vary considerably depending upon the hydrophobe, but as a general guide and rule, at least about 3 moles of alkylene oxide per mole of hydrophobe up to about 14 moles of alkylene oxide per mole of hydrophobe will provide the required water solubility, cleaning performance and cloud point temperatures of less than about 60 °C.

Accordingly, the preferred nonionic surfactants can be represented by the formula



wherein R is a primary or secondary alkyl chain of from about 8 to 22 carbon atoms and n is an average of from 3 to 14, preferably 4 to 12 especially 6 to 11;

or



wherein R' is a primary or secondary alkyl chain of from 4 to 12 carbon atoms, and m is an average of 3 to 14, preferably 4 to 12, especially 6 to 11.

The preferred alcohols from which the compounds of formula I are prepared include lauryl, myristyl, cetyl, stearyl and oleyl and mixtures thereof. Especially preferred values of R are C₁₀ to C₁₈ with the C₁₂ to C₁₅ alkyls and mixtures thereof being especially preferred.

The preferred values of R' are from C₆ to C₁₂, with C₈ to C₉, including octyl, isooctyl and nonyl being especially preferred.

Typical examples of a nonionic compound of formula (I) are lauryl alcohol condensed with 5 or 7 or 11 moles ethylene oxide. Typical example of a nonionic compound of formula (II) is isooctyl phenol or nonyl phenol condensed with 3 to 8 moles ethylene oxide.

Other non-sugar, nonionic compounds which may be used include the polyoxyalkylene esters of the organic acids such as the higher fatty acids, the rosin acids, tall oil acids, acids from petroleum oxidation products, etc. These esters will usually contain from about 10 to about 22 carbon atoms in the acid moiety and from about 3 to about 12 moles of ethylene oxide or its equivalent.

Still other non-sugar, nonionic surfactants are the alkylene oxide condensates with the higher fatty acid amides. The fatty acid group will generally contain from about 8 to about 22 carbon atoms and this will be condensed with about 3 to about 12 moles of ethylene oxide as the preferred illustration. The corresponding carboxamides and sulphonamides may also be used as substantial equivalents.

The amount of the non-sugar, nonionic will generally be the minimum amount which when added to the wash water with the amphoteric surfactant will provide adequate cleaning performance. Generally, amounts ranging from about 0.5 to about 20%, preferably from about 1 to about 15%, and especially preferably from about 1 to 10% by weight of the composition, can be used.

The compositions of the present invention are utilizable in connection with those home and commercial laundry washing machines which operate at elevated washing temperatures, especially at water temperatures in excess of about 60° C (140° F) , preferably in excess of 80° C (176° F) , and especially preferably at-the-boil, i.e. at 100° C (212° F) or more.

5 When the compositions are formulated for use at wash temperatures over a broad range of say, for example, 20° C to 60° C, as well as higher temperatures in order to be most useful for a broad range of fabrics including delicate natural and synthetic fibers, as well as more temperature insensitive fabrics such as cottons, etc., the nonionic-amphoteric combination and ratio can be selected to provide a cloud point temperature which exceeds the wash water temperature by at least about 20° C, for example, a cloud point
10 temperature of the composition in the range of 80° to 90° C. Where, however, the formulation is designed for use at elevated washing temperatures of 60° C or more, such as is generally the case in Europe, as well as when using industrial washing machines, then the composition will have a substantially higher cloud point, for example, up to about 50° C above the washing temperature. Thus, for a washing temperature of 60° C, the nonionic/amphoteric should have a cloud point of at least about 65° C, preferably at least about
15 70° C and up to about 90° C, preferably in the range of from about 70° C to 85° C. For wash water temperatures of 100° C, the composition cloud point is chosen in the range of from about 105° C to about 150° C, preferably 105° C to 120° C.

As used herein, the term "cloud point" means the temperature at which a graph which plots the light scattering intensity of the composition versus wash solution temperature begins to sharply increase to its
20 maximum value, under the following experimental conditions:

The light scattering intensity is measured using a Model VM 12397 Photogoniometer, manufactured by Societe Francaise d'Instruments de Controle et d'Analyses, France (the instrument being hereinafter referred to as SOFICA). The SOFICA sample cell and its lid are washed with hot acetone and allowed to dry. The surfactant mixture is made and put into solution with distilled water at a concentration of
25 1000 ppm. Approximately a 15 ml. sample of the solution is placed into the sample cell using a syringe with a 0.2 μ nucleopore filter. The syringe needle passes through the sample cell lid so that the cell interior is not exposed to atmospheric dust. The sample is left in a variable temperature bath, and both the bath and the sample are subject to constant stirring. The bath temperature is heated using the SOFICA's heater and cooled by the addition of ice (heating rate = 1° C/minute); the temperature of the sample is determined by
30 the temperature of the bath. The light scattering (90° angle) intensity of the sample is then determined at various temperatures, using a green filter and no polarizer in the SOFICA.

In the present invention, cloud point measurements are made for both solutions of the nonionic/amphoteric (at 1% by weight) in distilled water and in water containing 10% NaCl, although the latter generally far exceeds the amount of salts and electrolytes actually experienced in normal usage.
35 Therefore, if the nonionic/amphoteric cloud point measured in 10% NaCl solution satisfies the cloud point requirement of this invention, then there will be no problem in formulating compositions containing very high concentrations of builder salts and other electrolytes, for example, up to about 85% of the composition.

In this regard, it is known that the cloud point temperature for a given composition in the wash solution depends upon the physical and chemical properties (such as critical micelle concentration (CMC) and solubility) of the cationic, nonionic/amphoteric and additional components included in that composition, and
40 will be lowered by increasing the alkyl chain lengths of the nonionic surface-active compound, by decreasing the degree of ethoxylation of the nonionic component, or by adding electrolytes, such as phosphates, polyphosphates, perborates, carbonates, sulfates, etc., particularly in relatively low amounts (such as from about 1 to about 15% of the given composition).

45 Because water-insoluble cationic softening compounds are used in this invention the cationics will have substantially no effect whatsoever on the cloud point of the total composition. Actually, because the softening cationic compounds used in this invention are water-insoluble the cloud point temperature of the total formulation is very difficult to measure since the mixtures are naturally somewhat cloudy. Therefore, the cloud point of the nonionic, and nonionic/amphoteric mixture, with or without addition of electrolytes, is
50 determined in the absence of the cationic compound, and this provides a sufficiently accurate measure of the cloud point of the total composition including the cationic.

For washing temperatures of from about 60 to 70° C, all of the nonionic surfactants described above, but which are ethoxylated with at least 15 moles ethylene oxide, generally 15 to 30 moles ethylene oxide, will provide cloud points in excess of the washing temperature.

55 However, for higher washing temperatures of 71° C to 100° C, especially 80° C to 100° C, only the more highly ethoxylated surfactants, for example 25 to 30 moles ethylene oxide per mole of hydrophobe, for example, the C₈-C₉ alkyl phenols ethoxylated with from 25 to 30 moles, especially from 28 to 30 moles, and especially preferably about 30 moles, ethylene oxide, have sufficiently high cloud points.

While detergent compositions based on the high cloud point nonionic surfactants can be utilized, as disclosed in the aforementioned copending Serial No. 646,594, filed September 4, 1984, the disclosure of which is incorporated herein by reference, these compositions often suffer from a mild deterioration of cleaning performance. In addition, the highly ethoxylated nonionics are more expensive and less readily commercially available than the low cloud point temperature nonionics used in the present invention.

These drawbacks are avoided, as taught in copending application Serial No. 646,604, filed August 31, 1984, the disclosure of which is incorporated herein by reference, in the present invention since the addition of the amphoteric surfactant permits the use of the less expensive and readily commercially available nonionics characterized by cloud points of below 60° C, and by hydrophilic-lipophilic balances (HLB) of from about 5 to about 17; requires substantially lower amounts of total surfactants to achieve equivalent or superior cleaning performance; and raises the cloud point of the composition to above the selected washing temperature.

For any of the nonionics the cloud point can be raised by as much as about 40° C, generally about 5 to 20° C by adding to the composition an amphoteric surface-active compound, for example, a carboxyethylated higher fatty alkyl (e.g. coco) imidazoline amphoteric compound, generally in an amount of from about 1 to 20%, preferably 1 to 15%, especially preferably from about 1 to 10%, by weight of the composition.

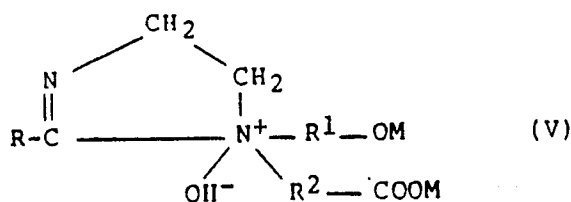
Therefore, in a preferred embodiment of the invention which is especially useful for washing soiled fabrics in an aqueous wash water at an elevated temperature in the range of from about 80° C to 100° C, the detergent composition includes, in addition to the nonionic surfactant of formula (I) or formula (II) and a water-insoluble cationic quaternary ammonium compound fabric softener, an amphoteric surfactant in an amount sufficient to raise the cloud point of the composition to above the elevated temperature of 80° C to 100° C, especially preferably above about 105° C.

While not wishing to be bound by any particular theory of operation, it is hypothesized that the amphoteric and nonionic surfactants form mixed micelles which are more soluble than micelles formed from the nonionics alone. These mixed micelles provide greater resistance to forming sufficiently large aggregates to come out of solution, thereby increasing the cloud point temperature.

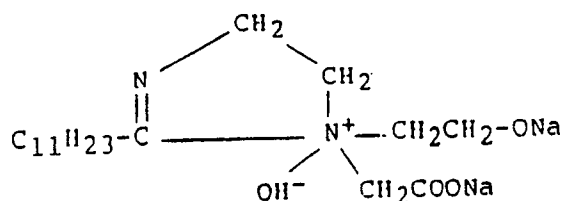
Substantially any of the known amphoteric surfactants can be used to raise the cloud point of the nonionic surfactant-cationic fabric softener composition.

Examples of suitable amphoteric detergents are those containing both the anionic and cationic group having a hydrophobic organic group, which is advantageously a higher aliphatic radical, e.g. about 10-20 carbon atoms. Among these are the N-long chain alkyl amino carboxylic acids [e.g. of the formula $RR_2NR'COOM$]; N-long chain alkyl imino di-carboxylic acids (e.g. of the formula $RN(R'COOM)_2$) and the N-long chain alkyl betaines (e.g. of the formula $RR_3R_4N^+-R'COO^-$) where R is a long chain alkyl group, e.g. of about 10-20 carbons, R' is a divalent radical joining the amino and carboxylic portions of an amino acid (e.g. an alkylene radical of 1-4 carbon atoms), M is hydrogen or a salt forming metal, R₂ is a hydrogen or another monovalent substituent (e.g. methyl or other lower alkyl), and R₃ and R₄ are monovalent substituents joined to the nitrogen by carbon-to-nitrogen bonds (e.g. methyl or other lower alkyl substituents). Examples of specific amphoteric detergents are N-alkyl-beta amino propionic acids; N-alkyl-beta-imino dipropionic acids and N-alkyl, N,N-dimethyl glycine; and alkyl group may be for example that derived from coco fatty alcohol, lauryl alcohol, myristyl alcohol (or a lauryl-myristyl mixture), hydrogenated tallow alcohol, cetyl, stearyl or blends of such alcohols. The substituted amino propionic and imino dipropionic acids are often supplied in the sodium or other salt forms which may likewise be used in the practice of this invention. Examples of other amphoteric detergents are the fatty imidazolines such as those made by reacting a long chain fatty acid (e.g. of 10-20 carbon atoms) with di-ethylene triamine and monohalo carboxylic acids having 2-6 carbon atoms, e.g. 1-coco-5-hydroxyethyl-5-carboxyethyl imidazoline; betaines containing a sulfonic group instead of a carboxylic group; betaines in which the long chain substituent is joined to the carboxylic group without an intervening nitrogen atom, e.g. inner salts of 2-trimethylamino fatty acids such as 2-trimethylaminolauric acid, and compounds of any of the previously mentioned types in which the nitrogen atom is replaced by phosphorous.

One specific class of amphoteric surfactants are the complex fatty amido surfactants of the general formula (V)



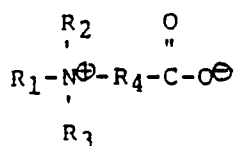
wherein R is a straight or branched, saturated or unsaturated aliphatic group having 10-18 carbon atoms (such as lauryl, tridecyl, tetradecyl, pentadecyl, palmityl, heptadecyl, stearyl, tallow, coco, soya, oleyl, linoleyl), R¹ and R² are each, independently, a divalent aliphatic hydrocarbon group having 1-5 carbon atoms, (e.g. methylene, ethylene, propylene, butylene, 2-methylbutylene, pentylene, etc.), and M is hydrogen or an alkali metal (e.g. sodium, potassium, cesium and lithium). Examples of compounds of formula V which are commercially available include



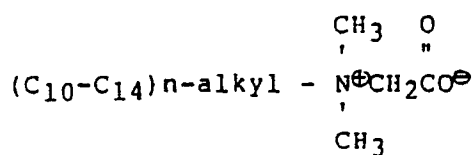
available as Miranol CM (liquid) and Miranol DM (paste) from Miranol Chemical Co.; Soromine AL and Soromine AT from GAF Corporation and the Deriphat compounds from General Mills.

The amphoteric compounds disclosed in columns 3 and 4 of U.S. Patent 4,203,872, to Flanagan, can also be used. These include the following seven groups of compounds:

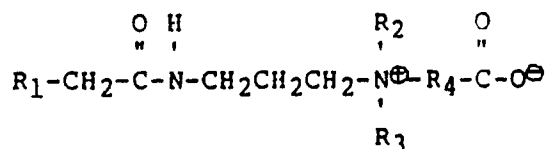
(1) Betaine detergents having the formula



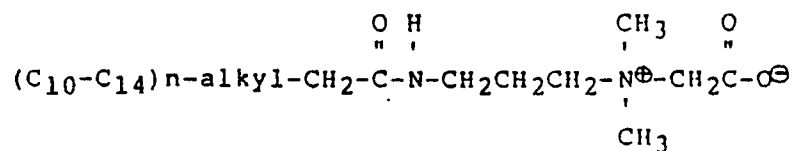
A suitable example is



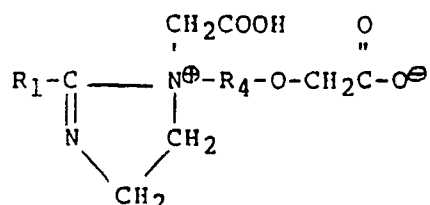
(2) Alkyl bridged betaine detergents having the formula



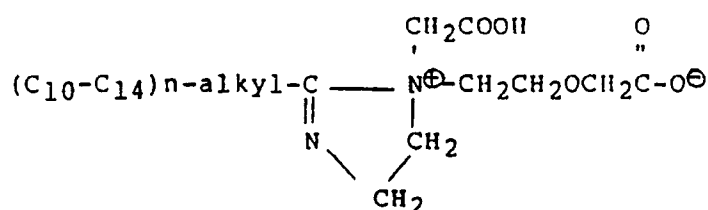
A suitable example is



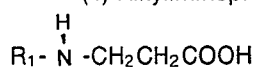
(3) Imidazoline detergents having the formula



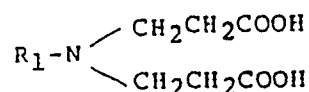
A suitable example is



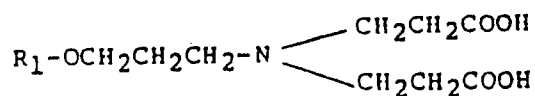
(4) Alkyliminopropionate detergents having the formula



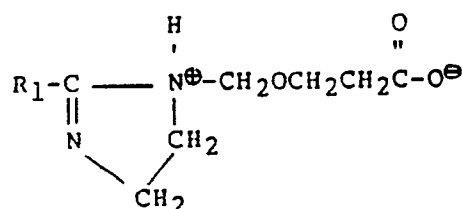
(5) Alkyliminodipropionate detergents having the formula



(6) Ether bridged alkyliminodipropionate detergents having the formula



(7) Cocoimidazoline-based detergents having the formula



Mixtures of any of the amphoteric detergents with one another may also be used.

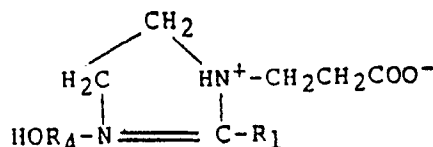
In the above formulae (1) -(7),

R_1 is a straight or branched, saturated or unsaturated aliphatic radical containing from about 7 to about 20, preferably from about 8 to 18, especially preferably from about 10 to 14 carbon atoms,

R_2 and R_3 are each lower alkyl of C_1 to C_4 , preferably methyl or ethyl, especially preferably ethyl,

R₄ is a divalent C₁-C₄ alkyl, preferably methylene, ethylene or propylene, especially preferably ethylene.

A further suitable group of amphoteric compounds are the carboxyethoxylated higher fatty alkylimidazoline compounds of the formula (8)



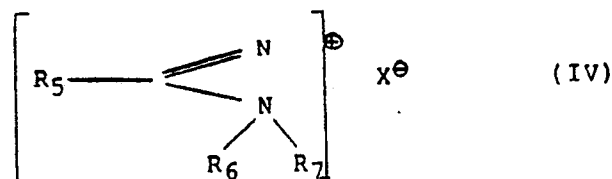
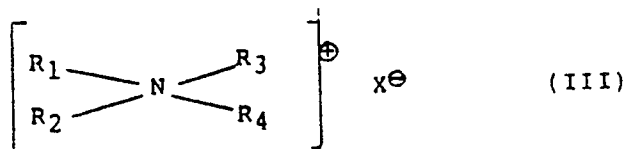
wherein R₁ is straight or branched, saturated or unsaturated aliphatic group of from 7 to 20 carbon atoms, preferably 8 to 18 carbon atoms, especially preferably 10 to 14 carbon atoms, and R₄ is a divalent lower alkyl group of 1 to 4 carbon atoms, preferably 1 or 2 carbon atoms. Preferred groups R₁ include coco, tallow, heptadecyl, oleyl, decyl and dodecyl, especially coco (i.e. derived from coco fatty acid). The preferred group R₄ is ethylene (-CH₂CH₂-). The compound carboxyethylated cocoimidazoline is available as Rexoteric CSF, a trademarked product of Rexolin, on a 100% active ingredient basis, or on a 45% active ingredient solution.

The open chain carboxyethylated higher fatty alkyl amine derivatives are another preferred class of amphoteric compound. These include the above groups (4), (5), and (6), i.e. the alkyliminopropionate and ether bridged alkyliminopropionate detergents. Carboxyethylated octyl amine which is available as Rexoteric OASF from Rexolin is a preferred member of this group.

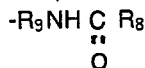
Other classes of amphoteric surfactants such as the sarcosines, taurines, isothionates and the like can also be used.

Although there are no firm guidelines for selecting combinations of nonionic surfactants and amphoteric surfactants or the appropriate amounts of each to give the necessary cloud point temperature in excess of the washing temperature, it is usually sufficient to use the amphoteric - with the amount of non-sugar, nonionic surfactant specified above - in an amount of from about 1 to 20%, preferably from about 1 to about 15%, especially from about 1 to about 10%, based on the total weight of the composition. Suitable ratios of nonionic:amphoteric within the above-mentioned amounts are in the range of from about 1:5 to 10:1, preferably 1:3 to 6:1, especially 1:2 to 4:1.

Suitable water-insoluble quaternary ammonium compound fabric softeners which are commercially known may be represented by the following formulae:



wherein R₁ and R₂ and R₅ and R₆ are each, independently, a straight or branched, saturated or unsaturated, long-chain aliphatic radical having from 16 to 22 carbon atoms; R₃, R₄ and R₇ are, independently, C₁-C₄ alkyl radicals and hydroxy substituted C₁-C₄ alkyl; or R₆ may be the group



wherein R₈ is a straight or branched, saturated or unsaturated long-chain aliphatic radical having from 16 to 22 carbon atoms, and R₉ is a divalent alkyl (alkylene) group of 1 to 3 carbon atoms, and X⁻ is a water-soluble salt forming anion such as a halide, i.e. chloride, bromide, iodide; a sulfate, acetate, hydroxide, methosulfate, ethosulfate; or similar inorganic or organic solubilizing mono- or di-basic radical. Preferably, the carbon chains are obtained from long-chain fatty acids such as those derived from tallow and soybean oil. The terms "disoya," and "di-tallow", etc., as used herein refer to the source from which the long-chain fatty alkyl chains are derived. Mixtures of the above, as well as other water-insoluble quaternary ammonium

surface active agents may also be used if desired. The preferred ammonium salt is a dialkyl dimethyl ammonium chloride wherein the alkyl group is derived from hydrogenated tallow or stearic acid, or a dihigheralkyl imidazolinium chloride. Specific examples of quaternary ammonium softening agents of the formula (III) suitable for use in the composition of the present invention include the following: hydrogenated ditallow dimethyl ammonium chloride, dimethyl distearyl ammonium chloride, dimethyl stearyl cetyl ammonium bromide, dimethyl dicetyl ammonium chloride, disoya dimethyl ammonium chloride, the corresponding sulfate, methosulfate, ethosulfate, bromide and hydroxide salts thereof, etc.

Examples of quaternary ammonium softening agents of formula (IV) include 1-methyl-1,2-diheptadecyl imidazolinium chloride (bromide, methosulfate), 1, 2-dieicosylalkylamidoethyl-1-methyl imidazolinium chloride (bromide, methosulfate, etc.), 2-hexadecyl-1-methyl-1[(2-dodecoyl amido)ethyl] imidazolinium methylsulfate, 2-heptadecyl-1-methyl-1(2-stearoyl amido)ethyl] imidazolinium methylsulfate, 2-nonadecyl/heneicosyl-1-[(2-eicosoyl/docosoyl imido)ethyl] imidazolinium methyl chloride.

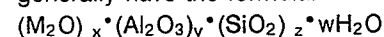
Dimethyldistearyl ammonium chloride is especially preferred in view of its superior softening performance, biodegradability, low water solubility, availability and cost.

The amount of the cationic fabric softener can generally range from about 1 to about 20%, preferably from about 4 to about 16%, and especially preferably from about 6 to 9%, by weight of the composition.

The weight ratio of the non-sugar, nonionic surfactant to the cationic fabric softener can be within the range of from about 1:10 to 5:1, preferably from about 1:8 to 4.5:1.

The present detergent composition may include water-soluble builder salts. Water-soluble inorganic alkaline builder salts which can be used alone or in admixture with other builders are alkali metal carbonates, borates, phosphates, polyphosphates, bicarbonates, silicates. (Ammonium or substituted ammonium salts can also be used.) Specific examples of such salts are sodium tripolyphosphate, sodium carbonate, sodium tetraborate, sodium pyrophosphate, potassium pyrophosphate, sodium bicarbonate, potassium tripolyphosphate, sodium hexamethaphosphate, sodium sesquicarbonate, sodium mono and diorthophosphate, and potassium bicarbonate. The alkali metal silicates are useful builder salts which also function to make the composition anti-corrosive to washing machine parts. Sodium silicates of $\text{Na}_2\text{O}/\text{SiO}_2$ ratios of from 1.6/1 to 1/3.2 especially about 1/2 to 1/2.8 are preferred. Potassium silicates of the same ratios can also be used.

Another class of builders useful herein are the water-insoluble aluminosilicates, both of the crystalline and amorphous type. Various crystalline zeolites (i.e. aluminosilicates) are described in British Patent 1,504,168, U.S. Patent 4,409,136 and Canadian Patents 1,072,835 and 1,087,477, all of which are hereby incorporated by reference for such descriptions. An example of amorphous zeolites useful herein can be found in Belgium Patent 835,351 and this patent too is incorporated herein by reference. The zeolites generally have the formula:



wherein x is 1, y is from 0.8 to 1.2 and preferably 1, z is from 1.5 to 3.5 or higher and preferably 2 to 3 and w is from 0 to 9, preferably 2.5 to 6 and M is preferably sodium. A typical zeolite is type A or similar structure, with type 4A particularly preferred. The preferred aluminosilicates have calcium ion exchange capacities of about 200 milliequivalents per gram or greater, e.g. 400.

Other materials such as clays, particularly of the water-insoluble types, may be useful adjuncts in compositions of this invention. Particularly useful is bentonite. This material is primarily montmorillonite which is a hydrated aluminum silicate in which about 1/6th of the aluminum atoms may be replaced by magnesium atoms and with which varying amounts of hydrogen sodium, potassium, calcium, etc., may be loosely combined. The bentonite in its more purified form (i.e. free from any grit, sand, etc.) suitable for detergents invariably contains at least 50% montmorillonite and thus its cation exchange capacity is at least about 50 to 75 meq. per 100 g. of bentonite. Particularly preferred bentonite are the Wyoming or Western U.S. bentonites which have been sold as Thixo-jels 1, 2, 3 and 4 by Georgia Kaolin Co. These bentonites are known to soften textiles as described in British Patent 401,413 to Marriott and British Patent 461,221 to Marriott and Dugan.

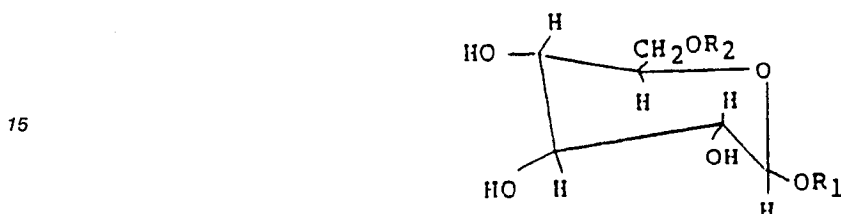
Examples of organic alkaline sequestrant builder salts which can be used alone or in admixture with other organic and inorganic builders are alkali metal, ammonium or substituted ammonium, aminopolycarboxylates, e.g. sodium and potassium ethylene diaminetetraacetate, sodium and potassium nitrilotriacetates and triethanolammonium N-(2-hydroxyethyl)-nitrilotriacetates. Mixed salts of these polycarboxylates are also suitable.

Other suitable builders of the organic type include carboxymethylsuccinates, tartronates and glycollates. Of special value are the polyacetal carboxylates. The polyacetal carboxylates and their use in detergent compositions are described in 4,144,226; 4,315,092 and 4,146,495. Other patents on similar builders include 4,141,676; 4,169,934; 4,201,858; 4,204,852; 4,224,420; 4,225,685; 4,226,960; 4,233,422; 4,233,423;

4,302,564 and 4,303,777. Also relevant are European Patent Application Nos. 0015024; 0021491 and 0063399.

The amount of the builder salt can generally range from about 5 to about 60%, preferably from about 10 to about 55%, and especially preferably from about 20 to about 50% by weight of the composition.

- 5 Any sugar, etherified with at least two long chain alkyl groups, may be used as a detergency booster in the present composition. Alkyl groups having 8 to 22 carbon atoms are preferred; most preferable are alkyl groups having 10 to 18 carbon atoms. It is to be understood that the hydrophilic head group can be any sugar derivative, e.g., polysaccharides, disaccharides, monosaccharides, etc., with monosaccharides such as glucose and fructose being especially preferred. In an especially preferred embodiment, the sugar ether
- 10 comprises a compound of the formula

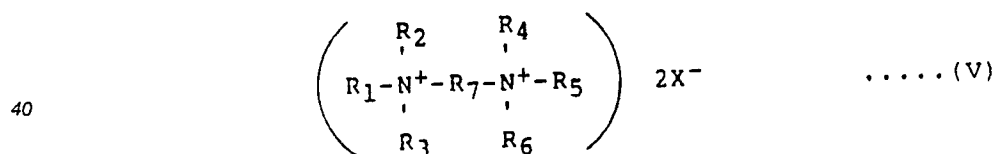


- 20 wherein R_1 and R_2 are each, independently an alkyl group of from about 8 to 22 carbon atoms, preferably 10 to 18 carbon atoms, the alkyl group being branched or unbranched. In a preferred embodiment of the invention, the dialkylglucoside may be used in admixture with a minor amount of a monoalkylglucoside.

- The amount of the sugar ether can generally range from about 1 to about 15%, preferably from about 1 to about 10%, and especially preferably from about 1 to about 5% by weight of the composition. In a
- 25 preferred embodiment, the sugar ether is used as a "replacement" for a portion of the non-sugar, nonionic surfactant, so as to maintain the total nonionic surfactant content (sugar plus non-sugar) at the same level as would be appropriate for a conventional (sugar-ether-free) softergent composition. Typically, the sugar ether will "replace" about 10 to about 75% by weight of the non-sugar, nonionic surfactant, preferably 20 to 65%, and most preferably 25 to 55%.

- 30 The compositions of the present invention, in a preferred embodiment, may further include antistatic agent compounds, such as diammonium compounds which are characterized by their water-solubility, i.e. ability to form stable, clear solutions, or dispersions in water at 25° C containing at least 5%, preferably at least 10% by weight of the diammonium compound.

- The diammonium compounds useful herein for reducing static charge buildup are the water-soluble
- 35 compounds of the following general formula (I)



wherein R_1 is an aliphatic hydrocarbon having from about 12 to about 30 carbon atoms;

- 45 each of R_2 , R_3 , R_4 , R_5 and R_6 are independently selected from the group consisting of (1) aliphatic hydrocarbon groups having from 1 to 22 carbon atoms with the proviso that the total number of carbon atoms in all the aliphatic hydrocarbon groups, including R_1 , is no more than about 75 and with the further proviso that no more than three of the R_2 - R_6 groups having more than 12 carbon atoms; and (2) alkanol groups of the formula



- 55 wherein m and n are independently 0 or positive numbers with the sum of m and n from all of the groups R_2 - R_6 being at least 2 but no more than 30; with the still further proviso that at least one of R_2 - R_6 is said alkanol group;

R_7 is an alkylene of 2 to 4 carbon atoms, such as ethylene ($-CH_2CH_2-$), propylene ($-CH_2CH_2CH_2-$),

isopropylene ($-\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_2-$), butylene ($-\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2-$), etc., or such alkylene having one or more, such as one or two substituents, such as hydroxyl, C_1 - C_4 lower alkyl, hydroxylower (C_1 - C_4) alkyl, etc., preferably $-\text{CH}_2\text{CH}_2-$ or $-\text{CH}_2\text{CH}_2\text{CH}_2-$, and X is a water-soluble salt forming anion.

The preferred compounds of formula (V) are those containing only 1 or 2, preferably only a single long carbon chain group, i.e. 12 or more carbon atoms. Accordingly, in formula I() the preferred definitions for R_1 - R_6 are:

R_1 is an aliphatic hydrocarbon group, which may be straight chain or branched chain, and saturated or unsaturated (i.e. linear or branched alkyl, alkenyl or alkynyl), having from 16 to 22 carbon atoms;

R_2 - R_6 , independently, are selected from the group consisting of alkyl or alkenyl having from 1 to 16, preferably 1 to 12, especially preferably 1 to 6 carbon atoms, with the proviso that the total number of carbon atoms in all the aliphatic hydrocarbon groups R_1 - R_6 is no more than about 50, preferably no more than about 35, and with the further proviso that no more than 2, preferably no more than 1, and most preferably none of R_2 - R_6 have more than 12 carbon atoms; and alkanol groups of the formula

$(\text{CH}_2\text{CH}_2\text{O})_m(\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_2\text{O})_n\text{H}$

wherein m and n may be 0 or a positive number such that the sum of m plus n in all of the alkanol groups R_2 - R_6 is at least 3 but no more than 25, preferably no more than 15, with the still further proviso that at least one, preferably at least two of R_2 - R_6 is said alkanol group;

R_7 is an alkylene of 2 to 4 carbon atoms, such as ethylene ($-\text{CH}_2\text{CH}_2-$), propylene ($-\text{CH}_2\text{CH}_2\text{CH}_2-$), isopropylene ($-\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_2-$), butylene ($-\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2-$), etc., or such alkylene having one or more, such as one or two substituents, such as hydroxyl, C_1 - C_4 lower alkyl, hydroxylower (C_1 - C_4) alkyl, etc., preferably $-\text{CH}_2\text{CH}_2-$ or $-\text{CH}_2\text{CH}_2\text{CH}_2-$, most preferably $-\text{CH}_2\text{CH}_2\text{CH}_2-$; and

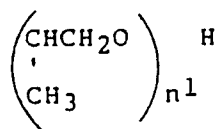
X is a water-soluble salt-forming anion, such as, for example, halide, e.g. bromide, chloride or iodide; a sulfate, methosulfate, ethosulfate, hydroxide, acetate, propionate; or other similar inorganic or organic solubilizing monovalent anion.

Examples of preferred R_1 groups include stearyl, tallow, hydrogenated tallow, eicosyl, soya, and the like.

Examples of preferred alkyl and alkenyl groups for R_2 to R_6 include, methyl, ethyl, propyl, isopropyl, n-butyl, tert-butyl, n-butenyl, octyl, 1-octenyl, etc. Methyl, ethyl, propyl and isopropyl are especially preferred.

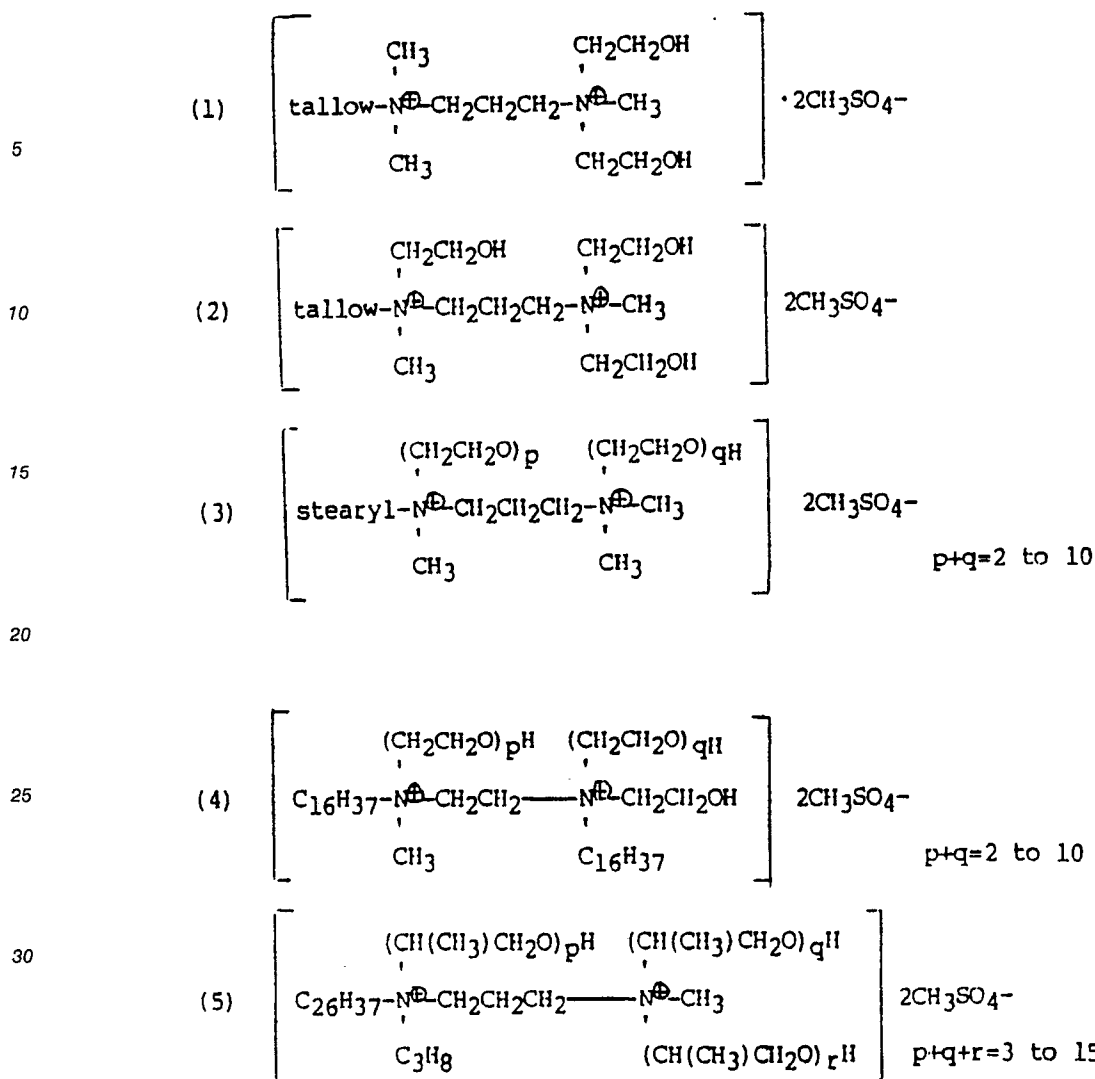
Methyl and ethyl are most preferred.

Examples of preferred alkanol groups for R_2 to R_6 include ethanol ($n=0$, $m=1$); propanol ($m=0$, $n=1$); and ethoxy propoxy-, and mixed (ethoxy) (propoxy) ethanol and/or propanol, such as $(\text{CH}_2\text{CH}_2\text{O})_{m^1}\text{H}$, where m^1 is from 2 to 4;



where n^1 is 2 to 4, and $(\text{CH}_2\text{CH}_2\text{O})_{m^1}(\text{CH}(\text{CH}_3)\text{CH}_2\text{O})_{n^1}$, where m^1 and n^1 are each numbers of from 1 to 4 and $m^1 + n^1 = 2$ to 6. In the mixed ethoxy-propoxy alkanol groups, the order of addition of the ethoxy and propoxy groups is not critical and it is understood that either blocks of the ethoxy groups or blocks of the propoxy groups can be bonded to the N-atom of the diammonium compound or that the ethoxy and propoxy groups may be randomly distributed. Thus, as is well known in the art, the distribution of the ethoxy and propoxy groups will be determined by the order in which the ethylene diamine or propylene diamine compound is condensed with ethylene oxide (or its precursor) and propylene oxide (or its precursor).

Specific examples of compounds of formula (V) which are either commercially available or readily manufactured by customary techniques include



etc. and the corresponding ethosulfate, halide, acetate, etc., water-soluble salts.

The above compound (2) (N-methyl-N-(2-hydroxyethyl)-N-tallowalkyl-N'-methyl-N'-bis(2-hydroxyethyl)-propylene-diammonium ethosulfate is especially preferred. This compound is commercially available as Rewoquat DQ35 from Rewo Chemicals Co. of Germany and is a clear liquid solution with 35% solids dissolved therein. Rewoquat DQ35 has a free amine content of less than 2% by weight and has a pH (1% solution in water) in the range of from 3.5 to 5. This compound can be prepared in customary manner, for example, by reacting 1 mole of N-methyl-N-tallowalkyl-N-methyl propylene diamine with 3 moles ethylene oxide and then quaternizing the resulting compound with methylsulfate. By ethoxylating with more than 3 moles ethylene oxide, the corresponding higher ethoxylated compounds can be prepared.

The amount of the antistatic agent is such that the composition contain from about 0.4 to 15%, preferably from 1 to 12%, especially preferably from about 2 to 12%, by weight of the antistatic agent compound.

The use of bleaching agents as aids in laundering is well known and such agents may be advantageously incorporated into the present compositions. Of the many bleaching agents used for household applications, the chlorine-containing bleaches are most widely used at the present time. However, chlorine bleach has the serious disadvantage of being such a powerful bleaching agent that it causes measurable degradation of the fabric and can cause localized over-bleaching when used to spot-treat a fabric undesirably stained in some manner. Other active chlorine bleaches, such as chlorinated cyanuric acid, although somewhat safer than sodium hypochlorite, also suffer from the tendency to damage fabric and cause localized over-bleaching. For these reasons, chlorine bleaches can seldom be used on amide-containing fibers such as nylon, silk, wool and mohair. Furthermore, chlorine bleaches are particularly damaging to many flame retardant agents which they render ineffective after as little as five launderings.

Of the two major types of bleaches, oxygen-releasing and chlorine-releasing, the oxygen bleaches, sometimes referred to as non-chlorine bleaches or "all-fabric" bleaches, are more advantageous to use in that oxygen bleaching agents are not only more effective in whitening fabrics and removing stains, but they are also safer to use on colors. They do not attack fluorescent dyes commonly used as fabric brighteners or the fabrics to any serious degree and they do not, to any appreciable extent, cause yellowing of resin fabric finishes as chlorine bleaches are apt to do. Both chlorine and non-chlorine bleaches use an oxidizing agent, such as sodium hypochlorite in the case of chlorine bleaches and sodium perborate in the case of non-chlorine bleaches, that reacts with and, with the help of a detergent, lifts out a stain.

Among the various substances which may be used as oxygen bleaches, there may be mentioned hydrogen peroxide and other per compounds which give rise to hydrogen peroxide in aqueous solution, such as alkali metal persulfates, perborates, percarbonates, perphosphates, persulfates, perpyrophosphates, peroxides and mixtures thereof.

Although oxygen bleaches are not, as deleterious to fabrics, one major drawback to the use of an oxygen bleach is the high temperature and high alkalinity necessary to efficiently activate the bleach. Because many home laundering facilities, particularly in the United States, employ quite moderate washing temperatures (20° C. to 60° C), low alkalinity and short soaking times, oxygen bleaches when used in such systems are capable of only mild bleaching action. There is thus a great need for substances which may be used to activate oxygen bleach at lower temperatures.

Various activating agents for improving bleaching at lower temperatures are known. These activating agents are roughly divided into three groups, namely (1) N-acyl compounds such as tetracetylene diamine (TAED), tetraacetylglycoluril and the like; (2) acetic acid esters of polyhydric alcohols such as glucose penta acetate, sorbitol hexacetate, sucrose octa acetate and the like; and (3) organic acid anhydrides, such as phthalic anhydride and succinic anhydride. The preferred bleach activator being TAED. Oxygen bleach activators, such as TAED function non-catalytically by co-reaction with the per compound to form peracids, such as peracetic acid from TAED, or salts thereof which react more rapidly with oxidizable compounds than the per compound itself.

Various other detergent additives or adjuvants may be present in the detergent product to give it additional desired properties, either of functional or aesthetic nature. Thus, there may be included in the formulation, minor amounts of soil suspending or anti-redeposition agents, e.g. polyvinyl alcohol, fatty amides, sodium carboxymethyl cellulose, hydroxy-propyl methyl cellulose; optical brighteners, e.g. cotton, amine and polyester brighteners, for example, stilbene, triazole and benzidine sulfone compositions, especially, sulfonated substituted triazinyl stilbene, sulfonated naphthotriazole stilbene, benzidine sulfone, etc., most preferred are stilbene and triazole combinations.

Bluing agents such as ultramarine blue; enzymes, preferably proteolytic enzymes, such as subtilisin, bromelin, papain, trypsin and pepsin, as well as amylase type enzymes; bactericides, e.g. tetrachlorosalicylanilide, hexachlorophene; fungicides; dyes; pigments (water dispersible) preservatives; ultraviolet absorbers; anti-yellowing agents, such as sodium carboxymethyl cellulose, complex of C₁₂ to C₂₂ alkyl alcohol with C₁₂ to C₁₈ alkylsulfate; pH modifiers and pH buffers; perfume, and anti-foam agents or suds-suppressors, e.g. silicon compounds can also be used.

The proportions of these components which may be present in the preferred total care compositions, in percent by weight (of actives) based on the total weight of the final product are as follows: enzymes - 0 to 2%, especially 0.7 to 1.3%; corrosion inhibitors - about 0 to 40%, and preferably 5 to 30%; anti-foam agents and suds-suppressors - 0 to 15%, preferably 0 to 5%, for example 0.1 to 3%; soil suspending or anti-redeposition agents and anti-yellowing agents - 0 to 10%, preferably 0.5 to 5%; colorants, perfumes, brighteners and bluing agents total weight 0% to about 2% and preferably 0% to about 1%; pH modifiers and pH buffers - 0 to 5%, preferably 0 to 2%; bleaching agent - 0% to about 40% and preferably 0% to about 25%, for example 2 to 20%; bleach stabilizers and bleach activators 0 to about 15%, preferably 0 to 10%, for example, 0.1. to 8%. In the selections of the adjuvants, they will be chosen to be compatible with the main constituents of the detergent composition.

While the nonionics and amphoteric are preferably the sole surface-active detergent compounds used in the compositions of this invention, small amounts of other surface-active compounds, including other nonionics, anionics, and zwitterionics can also be used, preferably in amounts up to 20% by weight, especially up to 10% by weight, and especially preferably up to 5% by weight.

The following example is presented for the purpose of illustrating the present invention and is not intended to be limitative. All percentages are by weight unless otherwise specified.

Example

The compositions set forth in Table I were prepared by mixing the various ingredients in water.

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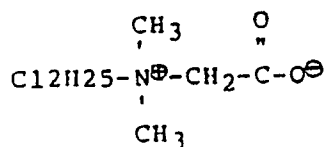
Table I

Ingredient	Composition	A (%)	B (%)
Neodol [®] 45-11 (Shell)	(1)	3	6
BA [®] 86/8141-5 (BASF)	(2)	3	-
Rewoteric AMDML (REWO)	(3)	1.5	1.5
Silicate	(4)	3.0	3.0
TPP	(5)	42	42
Optical Brightener	(6)	0.3	0.3
Perborate Tetrahydrate	(7)	20	20
TAED	(8)	4.1	4.1
Arosurf TA 100	(9)	5.5	5.5
Rewoquat DQ35 (REWO)	(10)	3.0	3.0
Alcalase 2T	(11)	1.0	1.0
CMC	(12)	2.0	2.0
Perfume	(13)	0.5	0.5
EDTA	(13)	0.5	0.5
Water		Q.S.	Q.S.

(1) - nonionic surfactant - ethylene oxide condensation product comprising 1 mole of higher fatty alcohol of 14 to 15 carbon atoms and 11 moles of ethylene oxide (Shell Chemical Company)

(2) - sugar ether - a mixture of monoalkylglucoside and dialkylglucoside having 12-14 carbon atoms in the alkyl group which is richer in the dialkylglucoside

(3) - amphoteric surfactant - a betaine of the formula



(4) - builder - sodium silicate

(5) - builder - sodium tripolyphosphate

(6) - optical brightener - an anionic optical brightener Tinopal ATS-X (Ciba-Geigy)

TABLE I CONTINUED ON NEXT PAGE

TABLE I (CON'T)

- (7) - bleach - sodium perborate tetrahydrate
- (8) - bleach activator - tetracetylenediamine
- (9) - softening agent - distearyl dimethyl ammonium chloride
- (10) - softening booster and processing aid - N-methyl-N-(2-hydroxyethyl)-N-tallowalkyl-N'-methyl-N'-bis(2-hydroxyethyl) propylene diammonium methyl sulfate
- (11) - enzyme
- (12) - sodium carboxymethylcellulose
- (13) - ethylene diamine tetra-acetic acid

Compositions A and B were subjected to identical miniwascator tests (40° C; maximum of 6 wash cycles; 200 ppm water hardness; dosage 6 g/l; load: desized terry clothes) to evaluate whitening (Gardener XL 800). The results are shown in Table II.

Table II

Material	Improvement In Whitening (ΔRD) (1)		
	1	3	6
Cotton	+6.70	+8.15	+12.84
Cotton/Polyester Blend	+4.64	+5.42	+10.21

(1) $\Delta RD = RD_A - RD_B$ (RD_A = average RD value for formulation A; RD_B = average RD value for formulation B)

Similar results were obtained with other glucosides of the BA series (BASF) and also with Triton BG 10 (Rohm & Haas), which varied in the chain length of the alkyl groups.

In all cases, the softening performance level was preserved.

Claims

1. A laundry detergent comprising

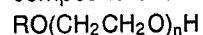
a deterensively effective amount of a mixture of non-sugar, nonionic surfactant and amphoteric surfactants;

a fabric softening effective amount of a water-insoluble quaternary ammonium compound;

a detergent building effective amount of at least one builder salt; and

a detergency boosting effective amount of a sugar ether containing at least two long chain alkyl groups.

2. The laundry detergent according to Claim 1, wherein said non-sugar, nonionic surfactant comprises a compound of the formula



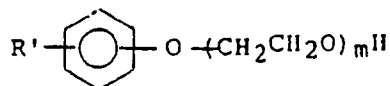
wherein R is a primary or secondary alkyl chain of from about 8 to 22 carbon atoms and n is an integer of from 3 to 14.

3. The laundry detergent according to Claim 2, wherein R is a primary or secondary alkyl chain of from

10 to 18 carbon atoms.

4. The laundry detergent according to Claim 3, wherein n is an integer of from 6 to 11.

5. The laundry detergent according to Claim 1, wherein said non-sugar, nonionic surfactant comprises a compound of the formula

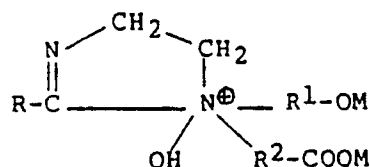


wherein R' is a primary or secondary alkyl chain of from 4 to 12 carbon atoms and m is an integer of from 3 to 14.

6. The laundry detergent according to Claim 5, wherein R' is a primary or secondary alkyl chain of 8 or 9 carbon atoms.

7. The laundry detergent according to Claim 6, wherein m is an integer of from 6 to 11.

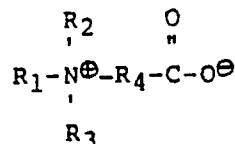
8. The laundry detergent according to Claim 1, wherein said amphoteric surfactant comprises a compound of the formula



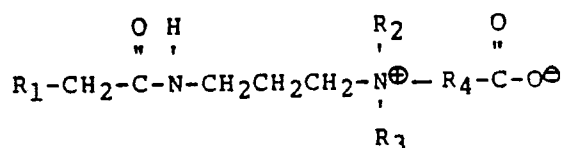
wherein R is a straight or branched, saturated or unsaturated aliphatic group having 10-18 carbon atoms; R¹ and R² are each, independently, a divalent aliphatic hydrocarbon group having 1-5 carbon atoms; and M is hydrogen or an alkali metal.

9. The laundry detergent according to Claim 1, wherein said amphoteric surfactant is selected from the group consisting of

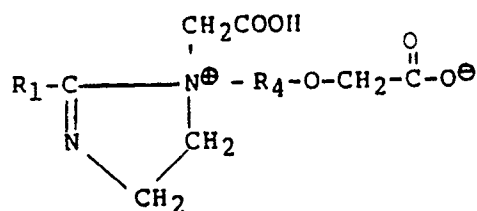
(1) betaine detergents of the formula



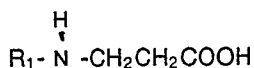
(2) alkyl bridged betaine detergents of the formula



(3) imidazoline detergents having the formula



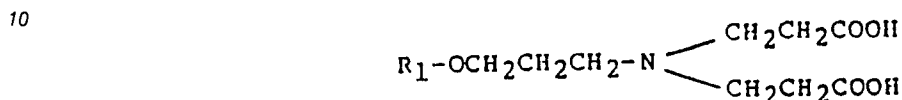
(4) alkyiminopropionate detergents having the formula



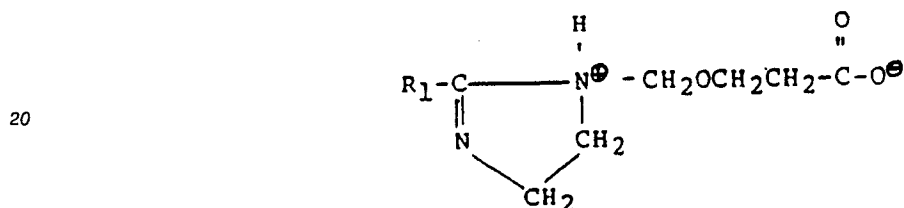
(5) alkyliminodipropionate detergents having the formula



(6) ether bridged alkyliminodipropionate detergents having the formula



(7) cocoimidazoline based detergents having the formula



(8) mixtures thereof

wherein R₁ is a straight or branched, saturated or unsaturated aliphatic radical containing from about 7 to about 20 carbon atoms; R₂ and R₃ are each lower alkyl of 1-4 carbon atoms; and R₄ is an alkylene of 1-4 carbon atoms.

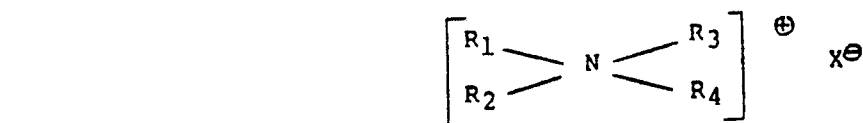
10. The laundry detergent according to Claim 9, wherein R₁ is an alkyl of from about 10 to 14 carbon atoms; R₂ and R₃ are each selected from the group consisting of methyl and ethyl; and R₄ is selected from the group consisting of methylene, ethylene and propylene.

11. The laundry detergent according to Claim 1, wherein the weight ratio of non-sugar, nonionic surfactant to amphoteric surfactant is from about 1:5 to 10:1.

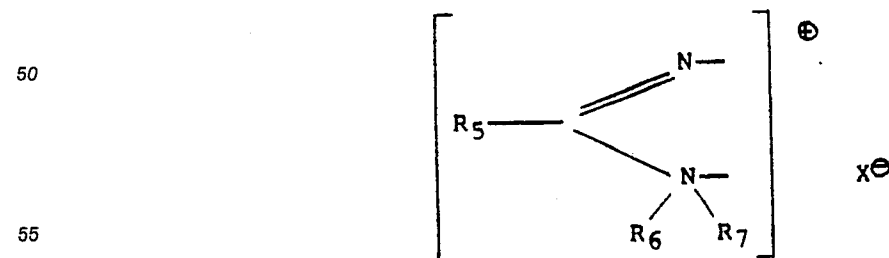
12. The laundry detergent according to Claim 11, wherein the weight ratio of non-sugar, nonionic surfactant to amphoteric surfactant is from about 1:3 to 6:1.

13. The laundry detergent according to Claim 12, wherein the weight ratio of non-sugar, nonionic surfactant to amphoteric surfactant is from about 1:2 to 4:1.

14. The laundry detergent according to Claim 1, wherein said water-insoluble quaternary ammonium compound comprises a compound represented by the formula



or by the formula



wherein R₁, R₂, R₅ and R₆ are each, independently, a straight or branched, saturated or unsaturated, long

chain aliphatic radical having from 16 to 22 carbon atoms;

R₃, R₄ and R₇ are each, independently, an alkyl of from 1 to 4 carbon atoms or a hydroxy substituted alkyl of from 1 to 4 carbon atoms; or

R₆ may be the group -R₉NH-



wherein R₈ is a straight or branched, saturated or unsaturated, long chain aliphatic radical having from 16 to 22 carbon atoms and R₉ is an alkylene of 1 to 3 carbon atoms; and

X[⊖] is a water-soluble salt-forming anion.

15. The laundry detergent according to Claim 1, wherein the weight ratio of non-sugar, nonionic surfactant to water-insoluble quaternary ammonium compound is from about 1:10 to 5:1.

16. The laundry detergent according to Claim 15, wherein the weight ratio of non-sugar, nonionic surfactant to water-insoluble quaternary ammonium compound is from about 1:8 to 4.5:1.

17. The laundry detergent according to Claim 1, wherein said builder salt is an inorganic salt.

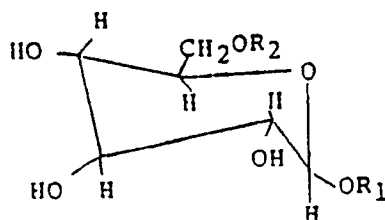
18. The laundry detergent according to Claim 17, wherein said builder salt is water-soluble.

19. The laundry detergent according to Claim 1, wherein said builder salt is an organic salt.

20. The laundry detergent according to Claim 1, wherein said sugar ether comprises a monosaccharide.

21. The laundry detergent according to Claim 20, wherein said monosaccharide is a glucoside.

22. The laundry detergent according to Claim 1, wherein said sugar ether comprises a compound of the formula

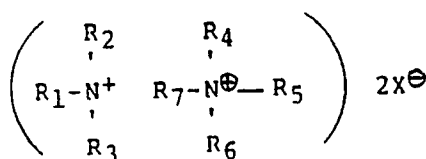


wherein R₁ and R₂ are each, independently, an alkyl group of from about 8 to 22 carbon atoms.

23. The laundry detergent according to Claim 22, wherein said alkyl group is of from 10 to 10 carbon atoms.

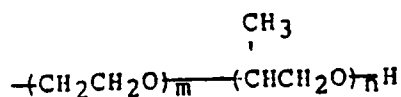
24. The laundry detergent according to Claim 1, further comprising an anti-static effective amount of a water-soluble diquaternary ammonium compound.

25. The laundry detergent according to Claim 24, wherein said diquaternary ammonium compound has the formula



wherein R₁ is an aliphatic hydrocarbon group of from about 12 to 30 carbon atoms;

R₂, R₃, R₄, R₅ and R₆ are each, independently, selected from the group consisting of (1) aliphatic hydrocarbon group of from 1 to 22 carbon atoms with the proviso that the total number of carbon atoms in all the aliphatic hydrocarbon groups, including R₁, is no more than about 75 and with the further proviso that no more than three of the R₂-R₆ groups have more than 12 carbon atoms and (2) an alkanol group of the formula



wherein m and n are independently 0 or positive numbers with the sum of m and n from all of the groups R₂-R₆ being at least 2 but no more than 30, with the still further proviso that at least one of R₂-R₆ is said alkanol group;

R₇ is an alkylene group of 1 to 4 carbon atoms; and

X is a water-soluble salt-forming anion.

26. The laundry detergent according to Claim 1, further comprising a bleaching effective amount of a bleaching agent.

5 27. The laundry detergent according to Claim 26, wherein said bleaching agent is an oxygen bleach.

28. The laundry detergent according to Claim 27, further comprising a bleach activating effective amount of a bleach activator.

29. The laundry detergent according to Claim 28, wherein said bleach activator is an N-acyl compound.

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