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(54) **Title**: HIGH SUDS DETERGENT COMPOSITIONS COMPRISING ISOPRENOID-BASED SURFACTANTS

(57) **Abstract**: The present invention relates to detergent compositions containing a specific blend of isoprenoid-based surfactants to deliver high suds cleaning performance.

HIGH SUDS DETERGENT COMPOSITIONS COMPRISING ISOPRENOID-BASED SURFACTANTS

FIELD OF THE INVENTION

The present invention relates to detergent compositions containing a specific blend of isoprenoid-based surfactants to deliver high suds cleaning performance.

BACKGROUND OF THE INVENTION

Most conventional detergent compositions contain mixtures of various detersive surfactant components. Commonly encountered surfactant components include various anionic surfactants, especially the alkyl benzene sulfonates, alkyl sulfates, alkyl alkoxy sulfates and various nonionic surfactants, such as alkyl ethoxylates and alkylphenol ethoxylates. Surfactants have found use as detergent components capable of the removal of a wide variety of soils and stains. A consistent effort has been made by detergent manufacturers to improve detersive properties of detergent compositions by providing new and improved surfactants. Today, challenges facing detergent manufacturers include colder wash temperatures, less efficient builders, liquid or powder products without calcium control, and the desire to reduce surfactant use overall.

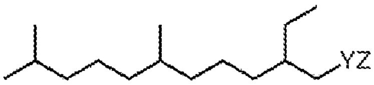
Isoprenoid-based poly-branched detergent alcohols, including 4,8,12-trimethyltridecan-1-ol and 3-ethyl-7,11-dimethyldodecan-1-ol, and poly-branched detergent surfactants, which may be derived from natural derived farnesene, farnesene obtained from genetically modified organisms, synthetically derived trimers of isoprene, or mixtures thereof, are known. Processes of making such detergent alcohols and surfactants are also known. Moreover, the use of individual surfactants in detergent compositions, such as surfactant A alone or surfactant B alone (surfactant A and surfactant B are defined below), is known. However, such single-surfactant compositions do not create a sufficient suds profile for some products. And, single-surfactant compositions tend to crystallize (especially at reduced temperatures) and the monolayers that single surfactants form at soil or fabric interfaces are not as kinetically mobile or flexible as desired (again, especially at reduced temperatures).

There continues to be a need in the detergent industry for high-sudsing surfactants, and, in particular, high-sudsing surfactants with superior grease cleaning and solubility at cold temperatures. It has now been surprisingly found that mixtures of surfactant A and surfactant B in ratios ranging from about 70:30 to about 99.5:0.5 are particularly effective in cold water grease cleaning and have desirable high sudsing properties.

SUMMARY OF THE INVENTION

This invention relates to a detergent composition comprising a surfactant system comprising a mixture of isoprenoid surfactants represented by formula A and formula B:

(A)



(B)

(where Y and Z are as defined below) and from about 5% to about 97% of one or more non-isoprenoid surfactants; and one or more adjunct cleaning additives; wherein the weight ratio of surfactant of formula A to surfactant of formula B is from about 70:30 to about 99.5:0.5.

DETAILED DESCRIPTION OF THE INVENTION

As used herein, the term "surfactant A+B", "A and B", or "A+B" refers to a blend of surfactant A and surfactant B (as defined below). For example, the term “A+B AE1.8S” refers to a mixture of surfactant A and surfactant B that has been derivatized into an alkyl ethoxy sulfate blend with an average of 1.8 mols of ethoxylation; likewise, the term “80A:20B amine oxide” refers to an 80:20 wt/wt mixture of surfactant A and surfactant B that has been derivatized into an amine oxide.

As used herein, the articles including “the”, “a” and “an” when used in a claim or in the specification, are understood to mean one or more of what is claimed or described.

As used herein, the terms “include”, “includes” and “including” are meant to be non-limiting.

As used herein, the terms “fabric”, “textile”, and “cloth” are used non-specifically and may refer to any type of flexible material consisting of a network of natural or artificial fibers, including natural, artificial, and synthetic fibers, such as, but not limited to, cotton, linen, wool, polyester, nylon, silk, acrylic, and the like, including blends of various fabrics or fibers.

As used herein, the phrase "detergent composition" includes compositions and formulations designed for treating, including cleaning, textiles, fabric, and hard surfaces. Such compositions include but are not limited to, laundry cleaning compositions and laundry detergents, fabric softening compositions, fabric enhancing compositions, fabric freshening compositions, laundry pre-wash compositions, laundry pre-treat compositions, laundry additives, a fabric treatment composition, a dry cleaning composition, a laundry soak or spray treatment, a laundry rinse additive, a wash additive, a post-rinse fabric treatment, an ironing aid, a liquid hand dishwashing composition, an automatic dishwashing detergent, and a hard surface cleaner. A detergent composition may be in the form of granules (e.g., powder), a liquid (including heavy duty liquid ("HDL") detergents), a gel, a paste, a bar, a single-phase or a multi-phase unit dose composition, a detergent contained in a single-phase or multi-phase or multi-compartment water soluble pouch, a detergent contained on or in a porous substrate or nonwoven sheet, a flake formulation, a spray product, or a delayed delivery formulation. In the context of laundry, such compositions may be used as a pre-laundering treatment, a post-laundering treatment, or may be added during the rinse or wash cycle of the laundering operation.

Detergent Composition

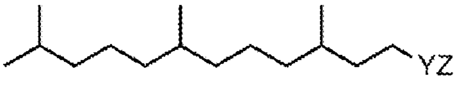
The present invention relates to a high sudsing detergent composition comprising a surfactant system, where the surfactant system comprises from about 0.01 to about 25% of a mixture of isoprenoid surfactants represented by formula A and formula B, one or more non-isoprenoid surfactants, and, optionally, an additional isoprenoid surfactant other than the surfactants represented by formula A and formula B; and one or more adjunct cleaning additives. The detergent compositions of the invention are generally free from suds suppressors.

Surfactant System

The high sudsing detergent compositions of the present invention comprise from about 0.001 wt% to about 100 wt% of a surfactant system, in certain aspects, from about 0.1 wt% to about 80 wt% of a surfactant system or from about 1 wt% to about 25 wt% of a surfactant system. The surfactant system of the present invention comprises a mixture of isoprenoid surfactants represented by formula A and formula B, one or more non-isoprenoid surfactants, and, optionally, an additional isoprenoid surfactant other than the surfactants represented by formula A and formula B.

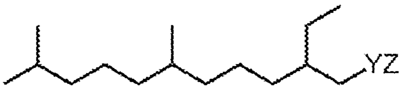
The surfactant system comprises from about 0.01 wt% to about 40wt% by weight of the surfactant system of a mixture of isoprenoid surfactants represented by formula A and formula B. In some aspects, the surfactant system comprises from about 0.01 wt% to about 25 wt%, or from about 1 wt% to about 30 wt%, or from about 5 wt% to about 25 wt%, by weight of the surfactant system, of a mixture of isoprenoid surfactants represented by formula A and formula B. The ratio by weight of "surfactant A" to "surfactant B" ranges from about 70:30 to about 99.5:0.5. In some aspects, the ratio of "surfactant A" to "surfactant B" ranges from about 80:20 to about 99:1 or from about 90:10 to about 98:2

"Surfactant A" or "A" is represented by formula A:



(A)

"Surfactant B" or "B" is represented by formula B:

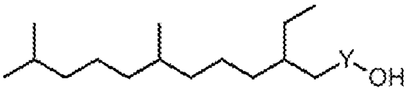


(B)

where Y is CH_2 or null, and Z may be chosen such that the resulting surfactant is selected from the following surfactants: an alkyl carboxylate surfactant, an alkyl polyalkoxy surfactant, an alkyl anionic polyalkoxy sulfate surfactant, an alkyl glycerol ester sulfonate surfactant, an alkyl dimethyl amine oxide surfactant, an alkyl polyhydroxy based surfactant, an alkyl phosphate ester surfactant, an alkyl glycerol sulfonate surfactant, an alkyl polygluconate surfactant, an alkyl polyphosphate ester surfactant, an alkyl phosphonate surfactant, an alkyl polyglycoside surfactant, an alkyl monoglycoside surfactant, an alkyl diglycoside surfactant, an alkyl sulfosuccinate surfactant, an alkyl disulfate surfactant, an alkyl disulfonate surfactant, an alkyl sulfosuccinamate surfactant, an alkyl glucamide surfactant, an alkyl taurinate surfactant, an alkyl sarcosinate surfactant, an alkyl glycinate surfactant, an alkyl isethionate surfactant, an alkyl dialkanolamide surfactant, an alkyl monoalkanolamide surfactant, an alkyl monoalkanolamide sulfate surfactant, an alkyl diglycolamide surfactant, an alkyl diglycolamide sulfate surfactant, an alkyl glycerol ester surfactant, an alkyl glycerol ester sulfate surfactant, an alkyl glycerol ether surfactant, an alkyl glycerol ether sulfate surfactant, alkyl methyl ester sulfonate surfactant, an alkyl polyglycerol ether surfactant, an alkyl polyglycerol ether sulfate surfactant, an alkyl sorbitan ester surfactant, an alkyl ammonioalkanesulfonate surfactant, an alkyl amidopropyl betaine surfactant, an alkyl allylated quat based surfactant, an alkyl monohydroxyalkyl-di-alkylated quat based surfactant, an alkyl di-hydroxyalkyl monoalkyl quat based surfactant, an alkylated quat surfactant, an alkyl trimethylammonium quat surfactant, an alkyl polyhydroxalkyl oxypropyl quat based surfactant, an alkyl glycerol ester quat surfactant, an alkyl glycol amine quat surfactant, an alkyl monomethyl dihydroxyethyl quaternary ammonium surfactant, an alkyl dimethyl monohydroxyethyl quaternary ammonium surfactant, an alkyl trimethylammonium surfactant, an alkyl imidazoline-based surfactant, an alken-2-yl-succinate surfactant, an alkyl α-sulfonated carboxylic acid surfactant, an alkyl α-sulfonated carboxylic acid alkyl ester surfactant, an alpha olefin sulfonate surfactant, an alkyl phenol ethoxylate surfactant, an alkyl benzenesulfonate surfactant, an alkyl sulfobetaine surfactant, an alkyl hydroxysulfobetaine surfactant, an alkyl ammoniocarboxylate betaine surfactant, an alkyl sucrose ester surfactant, an alkyl alkanolamide surfactant, an alkyl di(polyoxyethylene) monoalkyl ammonium surfactant, an alkyl mono(polyoxyethylene) dialkyl ammonium surfactant, an alkyl benzyl dimethylammonium surfactant, an alkyl aminopropionate surfactant, an alkyl amidopropyl dimethylamine surfactant, or a mixture thereof; and if Z is a charged moiety, Z is charge-balanced by a suitable metal or organic counter ion. Suitable counter ions include a metal counter ion, an amine, or an alkanolamine, e.g., C1-C6 alkanolammonium,. More specifically, suitable counter ions include Na+, Ca+, Li+, K+, Mg+, e.g., monoethanolamine (MEA), diethanolamine (DEA), triethanolamine (TEA), 2-amino-1-propanol, 1-aminopropanol, methyldiethanolamine, dimethylethanolamine, monoisopropanolamine, triisopropanolamine, 1-amino-3-propanol, or mixtures thereof.

The isoprenoid surfactants of the present invention may be derived from a blend of fatty alcohols. More specifically, surfactant A may be a surfactant derivative of “alcohol A” and surfactant B may be a surfactant derivative of “alcohol B.” “Alcohol A” refers to an isoprenoid-based alcohol of the following structure, where Y is CH_2 or null:

Examples of alcohol A are 4,8,12-trimethyltridecan-1-ol and 3,7,11-trimethyldodecan-1-ol. “Alcohol B” refers to an isoprenoid-based alcohol of the following structure, where Y is CH_2 or null:



An example of alcohol B is 3-ethyl-7,11-dimethyldodecan-1-ol.

The present invention also includes surfactants that have two or more isoprenoid-derived hydrophobes per molecule. These surfactants are generally cationic and may be represented by the following formula:

$$(T\text{-}U)_jV$$

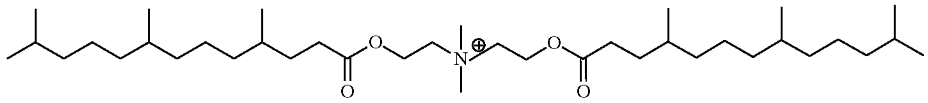
where V is a polyhydroxy moiety; a sucrose moiety; a mono-, di-, oligo-, or polysaccharide moiety; a polyglycerol moiety; a polyglycol moiety; a dialkyl ammonium moiety; a dimethylammonium moiety; or a gemini surfactant spacer moiety;

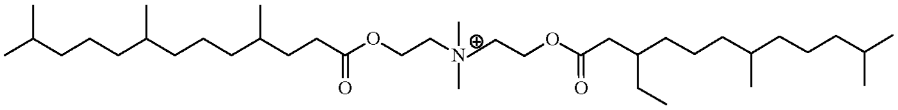
j ranges from 2 to 10, preferably 2, 3, or 4;

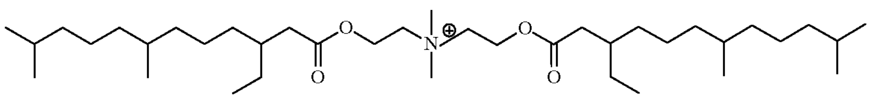
U is either absent or is selected from -CO_2-, -$CO_2CH_2CH_2$-, or a gemini surfactant polar or charged moiety; where if either U or V is a charged moiety, the charged moiety is charge balanced by a suitable counterion;

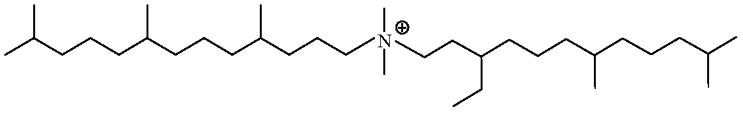
T is one or more of the isoprenoid-derived hydrophobes of surfactant A and surfactant B, where the ratio of total weight of surfactant A hydrophobe moieties to the total weight of surfactant B hydrophobe moieties ranges from about 70:30 to about 95.5:0.5 or from about 80:20 to about 99:1.

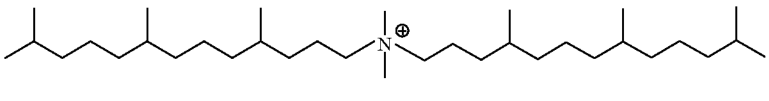
In one aspect, $(T\text{-}U)_2V$ is a di-hydrophobe substituted cationic surfactant where said hydrophobes are isoprenoid derived, where U is a spacer moiety or absent, and where V is a dialkylammonium moiety, e.g., dimethyl ammonium. Non-limiting examples of $(T\text{-}U)_2V$ are:

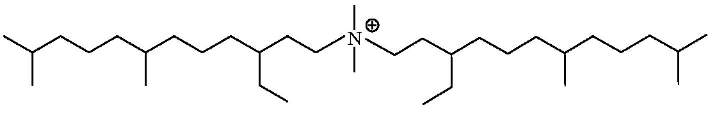


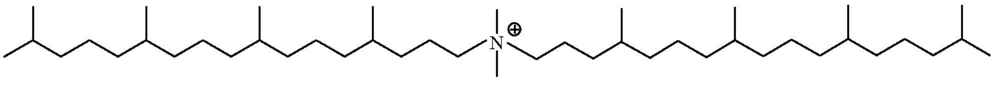












where the cationic moiety is charge balanced by a suitable anion.

In another aspect, $(T\text{-}U)_jV$ is a di- or poly-T-substituted monosaccharide, disaccharide (eg sucrose) or oligosaccharide moiety. In another aspect, $(T\text{-}U)_jV$ is a gemini surfactant where U is a charged or polar moiety, j is 2-4, preferably 2, and V is a gemini surfactant spacer moiety. As is well known in the art, Gemini surfactants typically (though not always) comprise two hydrophobes separated by two or more polar headgroups and a "spacer" moiety; hence according to the present invention, the T-substituted Gemini surfactants are of the structure:

T-(polar or charged headgroup)-spacer-(polar or charged headgroup)-T.

Suitable structures of said Gemini "polar or charged headgroups" and "spacer" moieties may be found in the surfactant literature, for example, in "Gemini Surfactants: A distinct class of self-assembling Molecules" (S.P Moulik et al., *Current Science*, vol. 82, No. 9, 10 May 2002) and "Gemini Surfactants" (Surfactant Science Series Vol. 117, Ed. R. Zana, 2003, Taylor & Francis Publishers, Inc), which are hereby incorporated by reference. Additional suitable examples of spacers include -CH2-, -CH2CH2-; -CH2CH2-CH2-; -CH2CH2CH2CH2-; -CH2CH(OH)CH2-; -(CH2)xO(CH2CH2O)yCH2z- wherein x=0-3, y=0-3, z=0-3 and x+y+z >0; -(CH2)xN(CH3)(CH2)y- wherein x=1-3 and y=1-3.

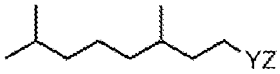
The surfactant system of the present invention may also comprise from about 0% to about 25 wt%, by weight of the surfactant system, of one or more additional isoprenoid-based surfactants. In some aspects, the surfactant system may comprise from about 2 wt% to about 20 wt% or from about 4 wt% to about 10 wt%, by weight of the surfactant system, of one or more additional isoprenoid-based surfactants.

Such additional isoprenoid surfactants include surfactants represented by the following structure:

E-Y-Z

where E is one or more saturated, acyclic C10-C24 isoprenoid-based hydrophobe(s) and Y and Z are as defined below; such additional isoprenoid surfactants are exemplified by formulas i through xiii below:

i.



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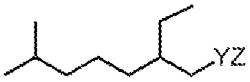

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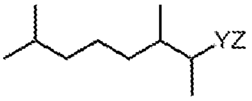
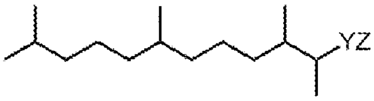


iv.

v.



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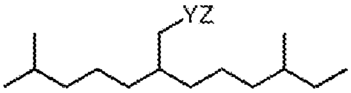

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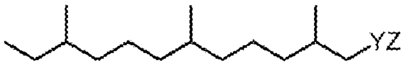
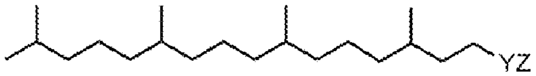
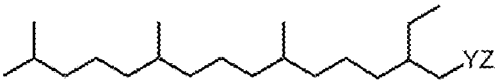


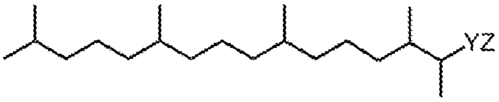
viii.



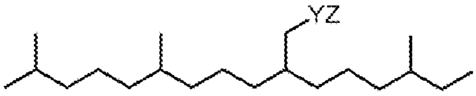
ix.



x.

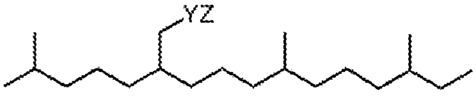


xi.



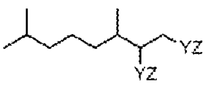
xii.

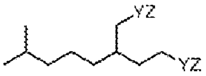
xiii.

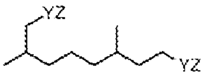


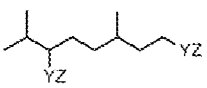
where Y is CH_2 or null and Z is selected such that the resulting surfactant is an alkyl carboxylate surfactant, an alkyl polyalkoxy surfactant, an alkyl anionic polyalkoxy sulfate surfactant, an alkyl glycerol ester sulfonate surfactant, an alkyl dimethyl amine oxide surfactant, an alkyl polyhydroxy based surfactant, an alkyl phosphate ester surfactant, an alkyl glycerol sulfonate surfactant, an alkyl polygluconate surfactant, an alkyl polyphosphate ester surfactant, an alkyl phosphonate surfactant, an alkyl polyglycoside surfactant, an alkyl monoglycoside surfactant, an alkyl diglycoside surfactant, an alkyl sulfosuccinate surfactant, an alkyl disulfate surfactant, an alkyl disulfonate surfactant, an alkyl sulfosuccinamate surfactant, an alkyl glucamide surfactant, an alkyl taurinate surfactant, an alkyl sarcosinate surfactant, an alkyl glycinate surfactant, an alkyl isethionate surfactant, an alkyl dialkanolamide surfactant, an alkyl monoalkanolamide surfactant, an alkyl monoalkanolamide sulfate surfactant, an alkyl diglycolamide surfactant, an alkyl diglycolamide sulfate surfactant, an alkyl glycerol ester surfactant, an alkyl glycerol ester sulfate surfactant, an alkyl glycerol ether surfactant, an alkyl glycerol ether sulfate surfactant, alkyl methyl ester sulfonate surfactant, an alkyl polyglycerol ether surfactant, an alkyl polyglycerol ether sulfate surfactant, an alkyl sorbitan ester surfactant, an alkyl ammonioalkanesulfonate surfactant, an alkyl amidopropyl betaine surfactant, an alkyl allylated quat based surfactant, an alkyl monohydroxyalkyl-di-alkylated quat based surfactant, an alkyl di-hydroxyalkyl monoalkyl quat based surfactant, an alkylated quat surfactant, an alkyl trimethylammonium quat surfactant, an alkyl polyhydroxalkyl oxypropyl quat based surfactant, an alkyl glycerol ester quat surfactant, an alkyl glycol amine quat surfactant, an alkyl monomethyl dihydroxyethyl quaternary ammonium surfactant, an alkyl dimethyl monohydroxyethyl quaternary ammonium surfactant, an alkyl trimethylammonium surfactant, an alkyl imidazoline-based surfactant, an alken-2-yl-succinate surfactant, an alkyl α-sulfonated carboxylic acid surfactant, an alkyl α-sulfonated carboxylic acid alkyl ester surfactant, an alpha olefin sulfonate surfactant, an alkyl phenol ethoxylate surfactant, an alkyl benzenesulfonate surfactant, an alkyl sulfobetaine surfactant, an alkyl hydroxysulfobetaine surfactant, an alkyl ammoniocarboxylate betaine surfactant, an alkyl sucrose ester surfactant, an alkyl alkanolamide surfactant, an alkyl di(polyoxyethylene) monoalkyl ammonium surfactant, an alkyl mono(polyoxyethylene) dialkyl ammonium surfactant, an alkyl benzyl dimethylammonium surfactant, an alkyl aminopropionate surfactant, an alkyl amidopropyl dimethylamine surfactant, or a mixture thereof; if Z is a charged moiety, Z is charge-balanced by a suitable metal or organic counter ion. Suitable counter ions include a metal counter ion, an amine, or an alkanolamine, e.g., C1-C6 alkanolammonium,. More specifically, suitable counter ions include Na+, Ca+, Li+, K+, Mg+, e.g., monoethanolamine (MEA), diethanolamine (DEA), triethanolamine (TEA), 2-amino-1-propanol, 1-aminopropanol, methyldiethanolamine, dimethylethanolamine, monoisopropanolamine, triisopropanolamine, 1-amino-3-propanol, or mixtures thereof.

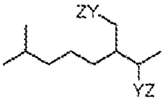
Such additional isoprenoid-based surfactants also include di-hydrophile substituted isoprenoid-derived surfactants having the following structures:

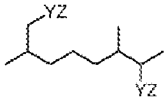


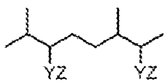


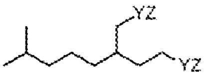


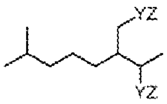


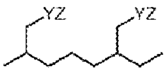


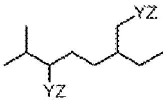


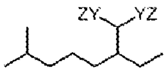


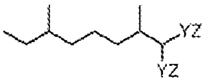


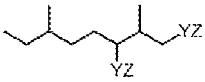


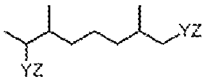


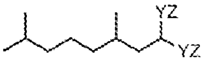


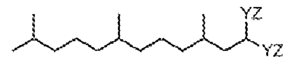








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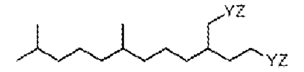
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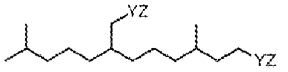
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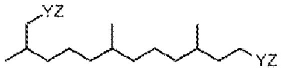
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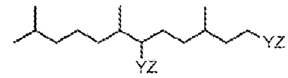
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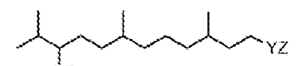
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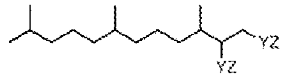
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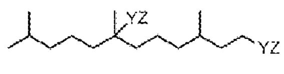
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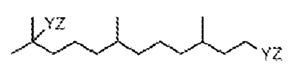
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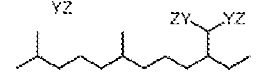
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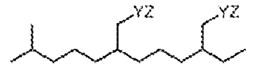
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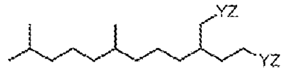
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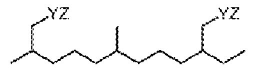
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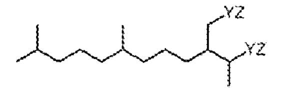
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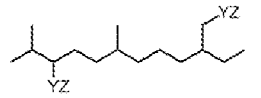
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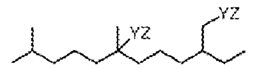
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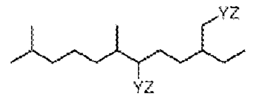
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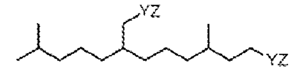
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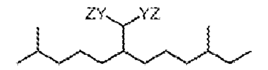
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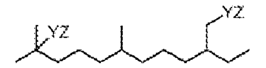
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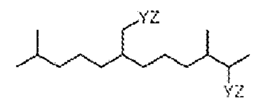
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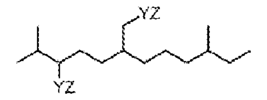
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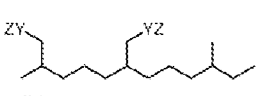
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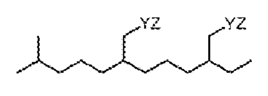
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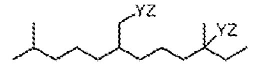
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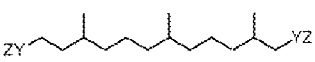
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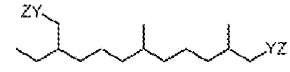
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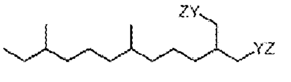
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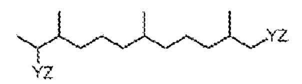
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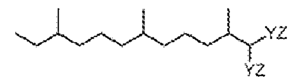
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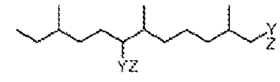
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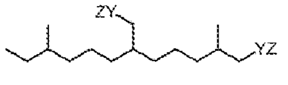
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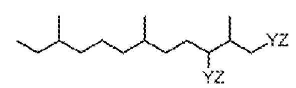
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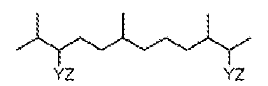
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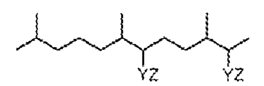
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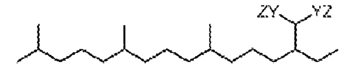
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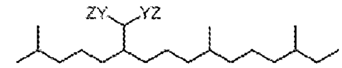
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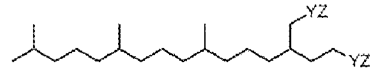
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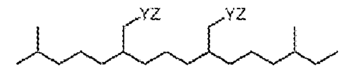
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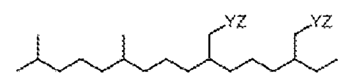
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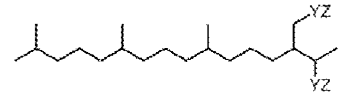
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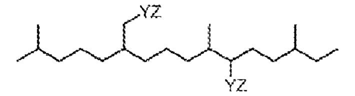
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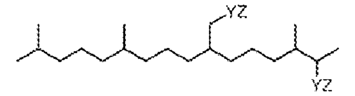
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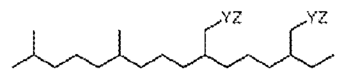
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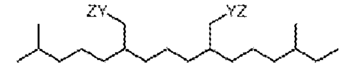
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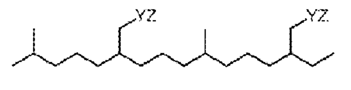
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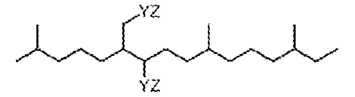
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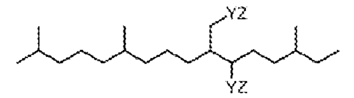
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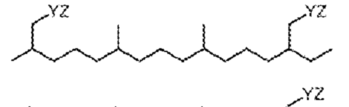
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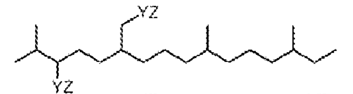
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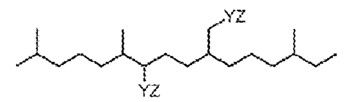
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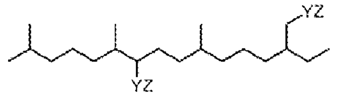
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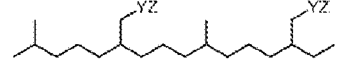
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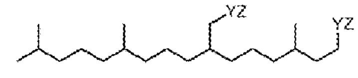
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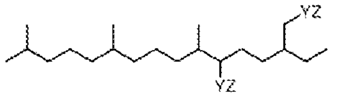
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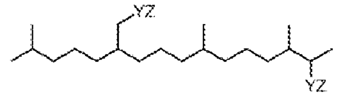
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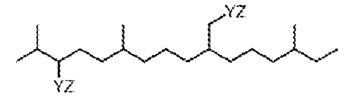
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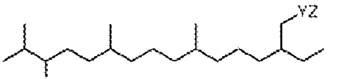
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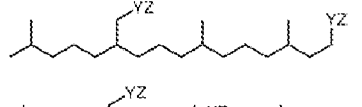
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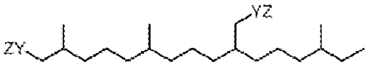
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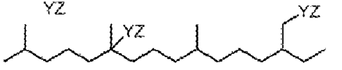
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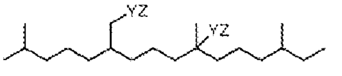
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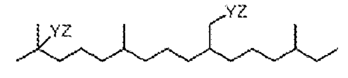
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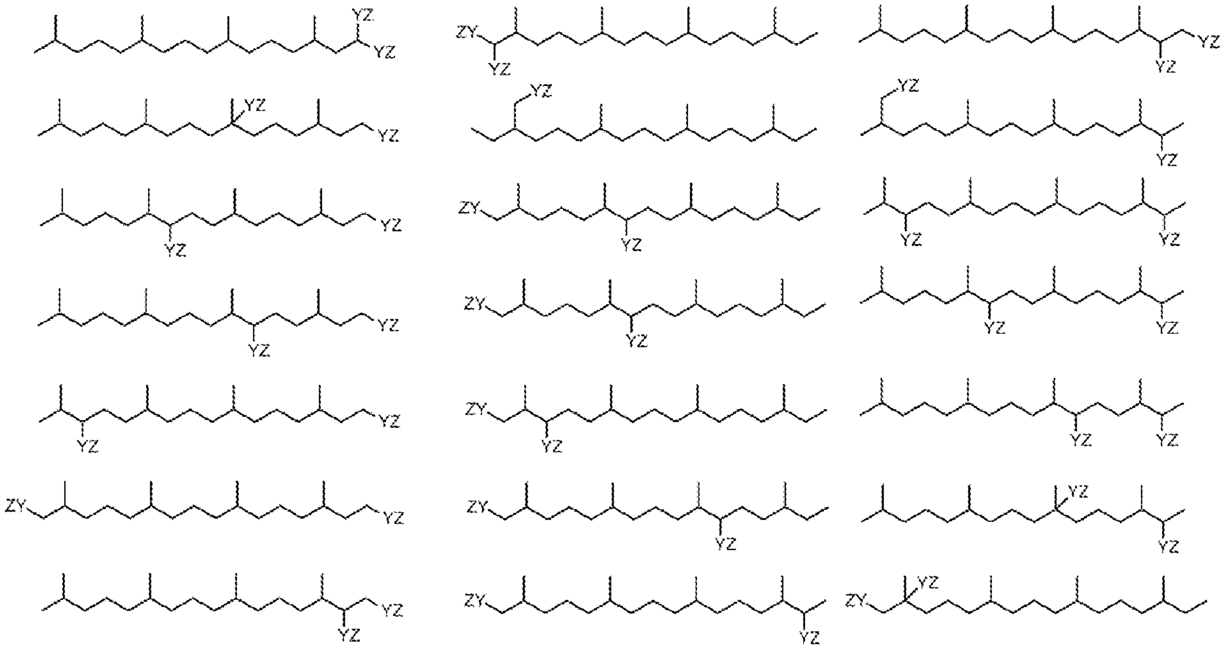


where Y is CH_2 or null and Z is as described above; if Z is a charged moiety, Z is charge-balanced by a suitable counterion, as defined above. In some aspects, Z is OSO_3^-, SO_3^-, $O(CH_2CH_2O)_pH$, or $O(CH_2CH_2O)_pSO3^-$, where p ranges from about 1 to about 30.

Such additional isoprenoid-based surfactants also include surfactants that have two or more isoprenoid derived hydrophobes per molecule. These surfactants are generally cationic and may be represented by the following formula:

$$(T\text{-}U)_jV$$

where V is a polyhydroxy moiety; a sucrose moiety; a mono-, di-, oligo-, or polysaccharide moiety; a polyglycerol moiety; a polyglycol moiety; a dialkyl ammonium moiety; a dimethylammonium moiety; or a gemini surfactant spacer moiety;

j ranges from 2 to 10, preferably 2, 3, or 4;

U is either absent or is selected from $-CO_2-$, $-CO_2CH_2CH_2-$, or a gemini surfactant polar or charged moiety; where if either U or V is a charged moiety, the charged moiety is charge balanced by a suitable counterion;

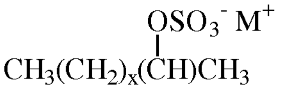
T is one or more of the isoprenoid-derived hydrophobes listed above, excluding the hydrophobes of surfactant A and surfactant B.

Still additional isoprenoids and isoprenoid derivatives may be found in the book entitled "*Comprehensive Natural Products Chemistry: Isoprenoids Including Carotenoids and Steroids (Vol. two)*", Barton and Nakanishi , © 1999, Elsevier Science Ltd and are included in the structure E, and are hereby incorporated by reference.

The surfactant system may also comprise a non-isoprenoid surfactant, such as one that is typically utilized in detergent or cleaning compositions. Such non-isoprenoid surfactants may include anionic surfactants, zwitterionic surfactants, amphoteric surfactants, cationic surfactants, or combinations thereof. The concentration of non-isoprenoid surfactant in the surfactant system of the composition may range from about 5% to about 97% by weight of the surfactant system. In certain aspects, the surfactant system of the composition may comprise from about 10 wt% to about 75 wt% or from about 20 wt % to about 50 wt% of non-isoprenoid surfactant.

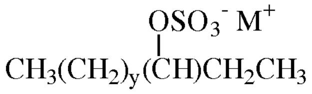
In some aspects, the non-isoprenoid surfactant is an anionic surfactant, including C_{10}-C_{15} alkyl benzene sulfonates (LAS), alkyl ethoxy sulfates, water-soluble salts of organic, sulfuric acid reaction products, reaction products of fatty acids esterified with isethionic acid, succinates, olefin sulfonates having about 10 to about 24 carbon atoms, and beta-alkyloxy alkane sulfonates.

Nonlimiting examples of anionic surfactants useful herein include: C_{10}-C_{20} primary, branched chain and random alkyl sulfates (AS); C_{10}-C_{18} secondary (2,3) alkyl sulfates; C_{10}-C_{18} alkyl alkoxy sulfates (AE_xS) wherein x is from 1-30; C_{10}-C_{18} alkyl alkoxy carboxylates comprising 1-5 ethoxy units; mid-chain branched alkyl sulfates as discussed in US 6,020,303 and US 6,060,443; mid-chain branched alkyl alkoxy sulfates as discussed in US 6,008,181 and US 6,020,303; modified alkylbenzene sulfonate (MLAS) as discussed in WO 99/05243, WO 99/05242 and WO 99/05244; methyl ester sulfonate (MES); and alpha-olefin sulfonate (AOS). Such surfactants include the alkyl benzene sulfonic acids and their salts as well as alkoxylated or non-alkoxylated alkyl sulfate materials. Exemplary anionic surfactants are the alkali metal salts of C_{10}-C_{16} alkyl benzene sulfonic acids, preferably C_{11}-C_{14} alkyl benzene sulfonic acids. In one aspect, the alkyl group is linear. Such linear alkyl benzene sulfonates are known as "LAS". Such surfactants and their preparation are described for example in U.S. Patent Nos. 2,220,099 and 2,477,383. Especially preferred are the sodium and potassium linear straight chain alkylbenzene sulfonates in which the average number of carbon atoms in the alkyl group is from about 11 to 14. Sodium C_{11}-C_{14} LAS, e.g., C_{12} LAS, are a specific example of such surfactants. Another exemplary type of anionic surfactant comprises linear or branched ethoxylated alkyl sulfate surfactants. Such materials, also known as alkyl ether sulfates or alkyl polyethoxylate sulfates, are those which correspond to the formula: R'-O-$(C_2H_4O)_n$-SO_3M wherein R' is a C_8-C_{20} alkyl group, n is from about 1 to 20, and M is a salt-forming cation. In a specific embodiment, R' is C_{10}-C_{18} alkyl, n is from about 1 to 15, and M is sodium, potassium, ammonium, alkylammonium, or alkanolammonium. In more specific embodiments, R' is a C_{12}-C_{16}, n is from about 1 to 6 and M is sodium. The alkyl ether sulfates will generally be used in the form of mixtures comprising varying R' chain lengths and varying degrees of ethoxylation. Frequently such mixtures will inevitably also contain some non-ethoxylated alkyl sulfate materials, i.e., surfactants of the above ethoxylated alkyl sulfate formula wherein n=0. Non-ethoxylated alkyl sulfates may also be added separately to the compositions of this invention and used as or in any anionic surfactant component which may be present. Specific examples of non-alkoyxylated, e.g., non-ethoxylated, alkyl ether sulfate surfactants are those produced by the sulfation of higher C_8-C_{20} fatty alcohols. Conventional primary alkyl sulfate surfactants have the general formula: $R''OSO_3^-M^+$ wherein R" is typically a C_8-C_{20} alkyl group, which may be straight chain or branched chain, and M is a water-solubilizing cation. In specific embodiments, R" is a C_{10}-C_{15} alkyl group, and M is alkali metal, more specifically R" is C_{12}-C_{14} alkyl and M is sodium. Specific, non-limiting examples of anionic surfactants useful herein include: a) C_{11}-C_{18} alkyl benzene sulfonates (LAS); b) C_{10}-C_{20} primary, branched-chain and random alkyl sulfates (AS); c) C_{10}-C_{18} secondary (2,3)-alkyl sulfates having following formulae:



$$CH_3(CH_2)_x\overset{\overset{\displaystyle OSO_3^-\,M^+}{|}}{(CH)}CH_3$$

or



$$CH_3(CH_2)_y\overset{\overset{\displaystyle OSO_3^-\,M^+}{|}}{(CH)}CH_2CH_3$$

wherein M is hydrogen or a cation which provides charge neutrality, and all M units, whether associated with a surfactant or adjunct ingredient, can either be a hydrogen atom or a cation depending upon the form isolated by the artisan or the relative pH of the system wherein the compound is used, with non-limiting examples of preferred cations including sodium, potassium, ammonium, and mixtures thereof, and x is an integer of at least about 7, preferably at least about 9, and y is an integer of at least 8, preferably at least about 9; d) C_{10}-C_{18} alkyl alkoxy sulfates (AE_zS) wherein preferably z is from 1-30; e) C_{10}-C_{18} alkyl alkoxy carboxylates preferably comprising 1-5 ethoxy units; f) mid-chain branched alkyl sulfates as discussed in U.S. Patent Nos. 6,020,303 and 6,060,443; g) mid-chain branched alkyl alkoxy sulfates as discussed in U.S. Patent Nos. 6,008,181 and 6,020,303; h) modified alkylbenzene sulfonate (MLAS) as discussed in WO 99/05243, WO 99/05242, WO 99/05244, WO 99/05082, WO 99/05084, WO 99/05241, WO 99/07656, WO 00/23549, and WO 00/23548.; i) methyl ester sulfonate (MES); and j) alpha-olefin sulfonate (AOS).

Anionic surfactants may exist in an acid form and the acid form may be neutralized to form a surfactant salt. Typical agents for neutralization include a metal counter ion base such as a hydroxide, eg, NaOH or KOH. Further agents for neutralizing anionic surfactants include ammonia, amines, or alkanolamines. Suitable non-limiting examples include monoethanolamine, diethanolamine, triethanolamine, and other linear or branched alkanolamines known in the art, for example, 2-amino-1-propanol, 1-aminopropanol, monoisopropanolamine, or 1-amino-3-propanol. Amine neutralization may be done to a full or partial extent, e.g. part of the anionic surfactant mix may be neutralized with sodium or potassium and part of the anionic surfactant mix may be neutralized with amines or alkanolamines.

Non-limiting examples of nonionic surfactants include: C_{12}-C_{18} alkyl ethoxylates, such as, NEODOL® nonionic surfactants from Shell; C_6-C_{12} alkyl phenol alkoxylates wherein the alkoxylate units are a mixture of ethyleneoxy and propyleneoxy units; C_{12}-C_{18} alcohol and C_6-C_{12} alkyl phenol condensates with ethylene oxide/propylene oxide block alkyl polyamine ethoxylates such as PLURONIC® from BASF; C_{14}-C_{22} mid-chain branched alcohols, BA, as discussed in US 6,150,322; C_{14}-C_{22} mid-chain branched alkyl alkoxylates, BAE_x, wherein x is from 1-30, as discussed in US 6,153,577, US 6,020,303 and US 6,093,856; alkylpolysaccharides as discussed in U.S. 4,565,647 Llenado, issued January 26, 1986; specifically alkylpolyglycosides as discussed in US 4,483,780 and US 4,483,779; polyhydroxy detergent acid amides as discussed in US 5,332,528; and ether capped poly(oxyalkylated) alcohol surfactants as discussed in US 6,482,994 and WO 01/42408.

Non-limiting examples of semi-polar nonionic surfactants include: water-soluble amine oxides containing one alkyl moiety of from about 10 to about 18 carbon atoms and 2 moieties selected from the group consisting of alkyl moieties and hydroxyalkyl moieties containing from about 1 to about 3 carbon atoms; water-soluble phosphine oxides containing one alkyl moiety of from about 10 to about 18 carbon atoms and 2 moieties selected from the group consisting of alkyl moieties and hydroxyalkyl moieties containing from about 1 to about 3 carbon atoms; and water-soluble sulfoxides containing one alkyl moiety of from about 10 to about 18 carbon atoms and a moiety selected from the group consisting of alkyl moieties and hydroxyalkyl moieties of from about 1 to about 3 carbon atoms. See WO 01/32816, US 4,681,704, and US 4,133,779.

Non-limiting examples of cationic surfactants include: the quaternary ammonium surfactants, which can have up to 26 carbon atoms include: alkoxylate quaternary ammonium (AQA) surfactants as discussed in US 6,136,769; dimethyl hydroxyethyl quaternary ammonium as discussed in 6,004,922; dimethyl hydroxyethyl lauryl ammonium chloride; polyamine cationic surfactants as discussed in WO 98/35002, WO 98/35003, WO 98/35004, WO 98/35005, and WO 98/35006; cationic ester surfactants as discussed in US Patents Nos. 4,228,042, 4,239,660 4,260,529 and US 6,022,844; and amino surfactants as discussed in US 6,221,825 and WO 00/47708, specifically amido propyldimethyl amine (APA).

Non-limiting examples of zwitterionic or ampholytic surfactants include: derivatives of secondary and tertiary amines, derivatives of heterocyclic secondary and tertiary amines, or derivatives of quaternary ammonium, quaternary phosphonium or tertiary sulfonium compounds. See U.S. Patent No. 3,929,678 at column 19, line 38 through column 22, line 48, for examples of zwitterionic surfactants; betaines, including alkyl dimethyl betaine and cocodimethyl amidopropyl betaine, C_8 to C_{18} (for example from C_{12} to C_{18}) amine oxides and sulfo and hydroxy betaines, such as N-alkyl-N,N-dimethylammino-1-propane sulfonate where the alkyl group can be C_8 to C_{18} and in certain embodiments from C_{10} to C_{14}. Non-limiting examples of ampholytic surfactants include: aliphatic derivatives of secondary or tertiary amines, or aliphatic derivatives of heterocyclic secondary and tertiary amines in which the aliphatic radical can be straight- or branched-chain. One of the aliphatic substituents may contain at least about 8 carbon atoms, for example from about 8 to about 18 carbon atoms, and at least one contains an anionic water-solubilizing group, e.g. carboxy, sulfonate, sulfate. See U.S. Patent No. 3,929,678 at column 19, lines 18-35, for suitable examples of ampholytic surfactants.

Nonlimiting examples of non-isoprenoid surfactants, e.g., anionic, zwitterionic, amphoteric surfactants, suitable for use in the compositions of the invention are also described in U.S. Pat. Nos. 3,929,678; 2,658,072; 2,438,091; 2,528,378; 2,486,921; 2,486,922; 2,396,278; and 3,332,880.

The non-isoprenoid surfactant may also be selected from linear surfactants derived from agrochemical oils. Agrochemical oils that are typically used to produce naturally-derived surfactants (anionic surfactants, non-ionic surfactants, cationic surfactants, zwitterionic surfactants) include coconut oil, palm kernel oil, soybean oil, or other vegertable-based oils.

Non-isoprenoid-derived surfactants also include lightly or highly branched surfactants of the type described in US Patent Application Nos. 2011/0171155A1 and 2011/0166370A1.

The detergent compositions according to the present invention may further comprise additional surfactants, herein also referred to as co-surfactants. Typically, fully-formulated cleaning compositions will contain a mixture of surfactant types in order to obtain broad-scale cleaning performance over a variety of soils and stains and under a variety of usage conditions. A wide range of these co-surfactants can be used in the detergent compositions of the present invention. A typical listing of anionic, nonionic, ampholytic and zwitterionic classes, and species of these co-surfactants, is given herein above, or may also be found in U.S. Pat. No. 3,664,961. In other words, the non-isoprenoid surfactants may also include one or more co-surfactants selected from nonionic, cationic, anionic, zwitterionic or mixtures thereof. The selection of co-surfactant may be dependent upon the desired benefit. The surfactant system may comprise from 0% to about 10%, or from about 0.1% to about 5%, or from about 1% to about 4% by weight of the composition of non-isoprenoid co-surfactant(s).

Adjunct Cleaning Additives

The detergent compositions of the invention may also contain adjunct cleaning additives. The adjunct cleaning additives may be selected from builders, structurants or thickeners, clay soil removal/anti-redeposition agents, suds boosters, polymeric soil release agents, polymeric dispersing agents, polymeric grease cleaning agents, enzymes, enzyme stabilizing systems, bleaching compounds, bleaching agents, bleach activators, bleach catalysts, brightners, dyes, fabric hueing agents, dye transfer inhibiting agents, chelating agents, fabric softeners, perfumes, or mixtures thereof. This listing of such ingredients is exemplary only, and not by way of limitation of the types of ingredients which can be used with surfactants systems herein. A detailed description of additional components can be found in U.S. Patent No. 6,020,303.

Suds Boosters

Although the suds performance of the surfactant systems of ratios of A+B which are high in A are already relatively high sudsing, a further aspect of the present invention is to combine said surfactants with other suds boosters to even further boost the suds profile of the detergent composition, for example in handwashing laundry detergent and methods or in hand dishwashing detergent compositions and methods. If higher sudsing is desired, suds boosters such as the C_{12}-C_{14} alkyl ethoxy sulfates, amine oxides, betaines, sultaines, alkyl polyglycosides, alkyl isentionates, C_{12}-C_{14} alkyl sulfates, C_{10}-C_{16} alkanolamides can be incorporated into the compositions, typically at levels ranging from about 1 wt% to about 10 wt% levels of the surfactant system. The C_{10}-C_{14} monoethanol and diethanol amides illustrate a typical class of such suds boosters. If desired, water-soluble magnesium and/or calcium salts such as $MgCl_2$, $MgSO_4$, $CaCl_2$, $CaSO_4$ and the like, can be added at levels of, typically, from about 0.1% to about 2%, to provide additional suds and to enhance grease removal performance.

Builders

The detergent compositions of the present invention may optionally comprise a builder. Built detergents typically comprise at least about 1 wt% builder, based on the total weight of the detergent. Liquid formulations typically comprise up to about 10 wt%, more typically up to 8 wt% of builder to the total weight of the detergent. Granular formulations typically comprise up to about 30%, more typically from up to 5% builder by weight of the detergent composition.

Detergent builders, when uses are selected from aluminosilicates and silicates to assist in controlling mineral, especially calcium and/or magnesium hardness in wash water or to assist in the removal of particulate soils from surfaces. Suitable builders can be selected from the group consisting of phosphates and polyphosphates, especially the sodium salts; carbonates, bicarbonates, sesquicarbonates and carbonate minerals other than sodium carbonate or sesquicarbonate; organic mono-, di-, tri-, and tetracarboxylates especially water-soluble nonsurfactant carboxylates in acid, sodium, potassium or alkanolammonium salt form, as well as oligomeric or water-soluble low molecular weight polymer carboxylates including aliphatic and aromatic types; and phytic acid. These may be complemented by borates, e.g., for pH-buffering purposes, or by sulfates, especially sodium sulfate and any other fillers or carriers which may be important to the engineering of stable surfactant and/or builder-containing detergent compositions. Other detergent builders can be selected from the polycarboxylate builders, for example, copolymers of acrylic acid, copolymers of acrylic acid and maleic acid, and copolymers of acrylic acid and/or maleic acid and other suitable ethylenic monomers with various types of additional functionalities. Also suitable for use as builders herein are synthesized crystalline ion exchange materials or hydrates thereof having chain structure and a composition represented by the following general Formula I an anhydride form: $x(M_2O)\cdot ySiO_2\cdot zM'O$ wherein M is Na and/or K, M' is Ca and/or Mg; y/x is 0.5 to 2.0 and z/x is 0.005 to 1.0 as taught in U.S. Pat. No. 5,427,711.

However, it has also been found that the isoprenoid-based A and B surfactants are particularly suited to performing well in un-built conditions. Therefore, lower levels of builders, including especially detergents having less than 1% by weight, and in particular builders that are essentially free of builders are of special relevance to the present invention. By "essentially free" it is meant that no builders are intentionally added to the desired detergent composition.

Structurant / Thickeners

Structured liquids can either be internally structured, whereby the structure is formed by primary ingredients (e.g. surfactant material) and/or externally structured by providing a three dimensional matrix structure using secondary ingredients (e.g. polymers, clay and/or silicate material). The composition may comprise a structurant, preferably from 0.01wt% to 5wt%, from 0.1wt% to 2.0wt% structurant. The structurant is typically selected from the group consisting of diglycerides and triglycerides, ethylene glycol distearate, microcrystalline cellulose, cellulose-based materials, microfiber cellulose, biopolymers, xanthan gum, gellan gum, and mixtures thereof. A suitable structurant includes hydrogenated castor oil, and non-ethoxylated derivatives thereof. A suitable structurant is disclosed in US Patent No. 6,855,680. Such structurants have a thread-like structuring system having a range of aspect ratios. Other suitable structurants and the processes for making them are described in WO2010/034736.

Clay Soil Removal/Anti-Redeposition Agents

The compositions of the present invention can also optionally contain water-soluble ethoxylated amines having clay soil removal and antiredeposition properties. Granular detergent compositions which contain these compounds typically contain from about 0.01% to about 10.0% by weight of the water-soluble ethoxylates amines; liquid detergent compositions typically contain about 0.01% to about 5% by weight.

Exemplary clay soil removal and antiredeposition agents are described in U.S. Pat. Nos. 4,597,898; 548,744; 4,891,160; European Patent Application Nos. 111,965; 111,984; 112,592; and WO 95/32272.

Polymeric Soil Release Agent

Known polymeric soil release agents, hereinafter "SRA" or "SRA's", can optionally be employed in the present detergent compositions. If utilized, SRA's will generally comprise from 0.01% to 10.0%, typically from 0.1% to 5%, preferably from 0.2% to 3.0% by weight, of the composition.

Preferred SRA's typically have hydrophilic segments to hydrophilize the surface of hydrophobic fibers such as polyester and nylon, and hydrophobic segments to deposit upon hydrophobic fibers and remain adhered thereto through completion of washing and rinsing cycles thereby serving as an anchor for the hydrophilic segments. This can enable stains occurring subsequent to treatment with SRA to be more easily cleaned in later washing procedures.

SRA's can include, for example, a variety of charged, e.g., anionic or even cationic (see U.S. Pat. No. 4,956,447), as well as noncharged monomer units and structures may be linear, branched or even star-shaped. They may include capping moieties which are especially effective in controlling molecular weight or altering the physical or surface-active properties. Structures and charge distributions may be tailored for application to different fiber or textile types and for varied detergent or detergent additive products. Examples of SRAs are described in U.S. Pat. Nos. 4,968,451; 4,711,730; 4,721,580; 4,702,857; 4,877,896; 3,959,230; 3,893,929; 4,000,093; 5,415,807; 4,201,824; 4,240,918; 4,525,524; 4,201,824; 4,579,681; and 4,787,989; European Patent Application 0 219 048; 279,134 A; 457,205 A; and DE 2,335,044.

Polymeric Dispersing Agents

Polymeric dispersing agents can advantageously be utilized at levels from about 0.1% to about 7%, by weight, in the compositions herein, especially in the presence of zeolite and/or layered silicate builders. Suitable polymeric dispersing agents include polymeric polycarboxylates and polyethylene glycols, although others known in the art can also be used. For example, a wide variety of modified or unmodified polyacrylates, polyacrylate/mealeates, or polyacrylate/methacrylates are highly useful. It is believed, though it is not intended to be limited by theory, that polymeric dispersing agents enhance overall detergent builder performance, when used in combination with other builders (including lower molecular weight polycarboxylates) by crystal growth inhibition, particulate soil release peptization, and anti-redeposition. Examples of polymeric dispersing agents are found in U.S. Pat. No. 3,308,067, European Patent Application No. 66915, EP 193,360, and EP 193,360.

Alkoxylated Polyamine Polymers

Soil suspension, grease cleaning, and particulate cleaning polymers may include the alkoxylated polyamines. Such materials include but are not limited to ethoxylated polyethyleneimine, ethoxylated hexamethylene diamine, and sulfated versions thereof. Polypropoxylated derivatives are also included. A wide variety of amines and polyaklyeneimines can be alkoxylated to various degrees, and optionally further modified to provide the abovementioned benefits. A useful example is 600g/mol polyethyleneimine core ethoxylated to 20 EO groups per NH and is available from BASF.

Polymeric Grease Cleaning Polymers

Alkoxylated polycarboxylates such as those prepared from polyacrylates are useful herein to provide additional grease removal performance. Such materials are described in WO 91/08281 and PCT 90/01815. Chemically, these materials comprise polyacrylates having one ethoxy side-chain per every 7-8 acrylate units. The side-chains are of the formula $-(CH_2CH_2O)_m$

$(CH_2)_nCH_3$ wherein m is 2-3 and n is 6-12. The side-chains are ester-linked to the polyacrylate "backbone" to provide a "comb" polymer type structure. The molecular weight can vary, but is typically in the range of about 2000 to about 50,000. Such alkoxylated polycarboxylates can comprise from about 0.05% to about 10%, by weight, of the compositions herein.

The isoprenoid-derived surfactants of the present invention, and their mixtures with other cosurfactants and other adjunct ingredients, are particularly suited to be used with an amphiphilic graft co-polymer, preferably the amphiphilic graft co-polymer comprises (i) polyethyelene glycol backbone; and (ii) and at least one pendant moiety selected from polyvinyl acetate, polyvinyl alcohol and mixtures thereof. A preferred amphiphilic graft co-polymer is Sokalan HP22, supplied from BASF.

Enzymes

Enzymes, including proteases, amylases, other carbohydrases, lipases, oxidases, and cellulases may be used as adjunct ingredients. Enzymes are included in the present cleaning compositions for a variety of purposes, including removal of protein-based, carbohydrate-based, or triglyceride-based stains from substrates, for the prevention of refugee dye transfer in fabric laundering, and for fabric restoration. Suitable enzymes include proteases, amylases, lipases, cellulases, peroxidases, and mixtures thereof of any suitable origin, such as vegetable, animal, bacterial, fungal and yeast origin. Preferred selections are influenced by factors such as pH-activity and/or stability optima, thermostability, and stability to active detergents, builders and the like. In this respect bacterial or fungal enzymes are preferred, such as bacterial amylases and proteases, and fungal cellulases.

Enzymes are normally incorporated into detergent or detergent additive compositions at levels sufficient to provide a "cleaning-effective amount". The term "cleaning effective amount" refers to any amount capable of producing a cleaning, stain removal, soil removal, whitening, deodorizing, or freshness improving effect on substrates such as fabrics, dishware and the like. In practical terms for current commercial preparations, typical amounts are up to about 5 mg by weight, more typically 0.01 mg to 3 mg, of active enzyme per gram of the household cleaning composition. Stated otherwise, the compositions herein will typically comprise from 0.001% to 5%, preferably 0.01%-1% by weight of a commercial enzyme preparation.

A range of enzyme materials and means for their incorporation into synthetic detergent compositions is also disclosed in WO 9307263 A; WO 9307260 A; WO 8908694 A; U.S. Pat. Nos. 3,553,139; 4,101,457; and U.S. Pat. No. 4,507,219. Enzyme materials useful for liquid detergent formulations, and their incorporation into such formulations, are disclosed in U.S. Pat.

No. 4,261,868.. Enzymes for use in detergents can be stabilized by various techniques. Enzyme stabilisation techniques are disclosed and exemplified in U.S. Pat. Nos. 3,600,319 and 3,519,570; EP 199,405, EP 200,586; and WO 9401532 A.

Enzyme Stabilizing System

The enzyme-containing compositions herein may optionally also comprise from about 0.001% to about 10%, preferably from about 0.005% to about 8%, most preferably from about 0.01% to about 6%, by weight of an enzyme stabilizing system. The enzyme stabilizing system can be any stabilizing system which is compatible with the detersive enzyme. Such a system may be inherently provided by other formulation actives, or be added separately, e.g., by the formulator or by a manufacturer of detergent-ready enzymes. Such stabilizing systems can, for example, comprise calcium ion, boric acid, propylene glycol, short chain carboxylic acids, boronic acids, and mixtures thereof, and are designed to address different stabilization problems depending on the type and physical form of the detergent composition.

Bleaching Compounds, Bleaching Agents, Bleach Activators, and Bleach Catalysts

The cleaning compositions herein may further contain bleaching agents or bleaching compositions containing a bleaching agent and one or more bleach activators. Bleaching agents will typically be at levels of from about 1 wt% to about 30 wt%, more typically from about 5 wt% to about 20 wt%, based on the total weight of the composition, especially for fabric laundering. If present, the amount of bleach activators will typically be from about 0.1 wt% to about 60 wt%, more typically from about 0.5 wt% to about 40 wt% of the bleaching composition comprising the bleaching agent-plus-bleach activator.

Examples of bleaching agents include oxygen bleach, perborate bleache, percarboxylic acid bleach and salts thereof, peroxygen bleach, persulfate bleach, percarbonate bleach, and mixtures thereof. Examples of bleaching agents are disclosed in U.S. Pat. No. 4,483,781, U.S. patent application Ser. No. 740,446, European Patent Application 0,133,354, U.S. Pat. No. 4,412,934, and U.S. Pat. No. 4,634,551.

Examples of bleach activators (e.g., acyl lactam activators) are disclosed in U.S. Pat. Nos. 4,915,854; 4,412,934; 4,634,551; 4,634,551; and 4,966,723.

Preferably, a laundry detergent composition comprises a transition metal catalyst. Preferably, the transition metal catalyst may be encapsulated. The transition metal bleach catalyst typically comprises a transition metal ion, preferably selected from transition metal selected from the group consisting of Mn(II), Mn(III), Mn(IV), Mn(V), Fe(II), Fe(III), Fe(IV), Co(I), Co(II), Co(III), Ni(I), Ni(II), Ni(III), Cu(I), Cu(II), Cu(III), Cr(II), Cr(III), Cr(IV), Cr(V), Cr(VI), V(III), V(IV), V(V), Mo(IV), Mo(V), Mo(VI), W(IV), W(V), W(VI), Pd(II), Ru(II), Ru(III), and Ru(IV), more preferably Mn(II), Mn(III), Mn(IV), Fe(II), Fe(III), Cr(II), Cr(III), Cr(IV), Cr(V), and Cr(VI). The transition metal bleach catalyst typically comprises a ligand, preferably a macropolycyclic ligand, more preferably a cross-bridged macropolycyclic ligand. The transition metal ion is preferably coordinated with the ligand. Preferably, the ligand comprises at least four donor atoms, at least two of which are bridgehead donor atoms. Suitable transition metal bleach catalysts are described in U.S. 5,580,485, U.S. 4,430,243; U.S. 4,728,455; U.S. 5,246,621; U.S. 5,244,594; U.S. 5,284,944; U.S. 5,194,416; U.S. 5,246,612; U.S. 5,256,779; U.S. 5,280,117; U.S. 5,274,147; U.S. 5,153,161; U.S. 5,227,084; U.S. 5,114,606; U.S. 5,114,611, EP 549,271 A1; EP 544,490 A1; EP 549,272 A1; and EP 544,440 A2. A suitable transition metal bleach catalyst is a manganese-based catalyst, for example disclosed in U.S. 5,576,282. Suitable cobalt bleach catalysts are described, for example, in U.S. 5,597,936 andU.S. 5,595,967. Such cobalt catalysts are readily prepared by known procedures, such as taught for example in U.S. 5,597,936, and U.S. 5,595,967. A suitable transition metal bleach catalyst is a transition metal complex of ligand such as bispidones described in WO 05/042532 A1.

Bleaching agents other than oxygen bleaching agents are also known in the art and can be utilized herein (e.g., photoactivated bleaching agents such as the sulfonated zinc and/or aluminum phthalocyanines (U.S. Pat. No. 4,033,718, incorporated herein by reference), or preformed organic peracids, such as peroxycarboxylic acid or salt thereof, or a peroxysulphonic acid or salt thereof. A suitable organic peracid is phthaloylimidoperoxycaproic acid. If used, household cleaning compositions will typically contain from about 0.025% to about 1.25%, by weight, of such bleaches, especially sulfonate zinc phthalocyanine.

Brighteners

Any optical brighteners or other brightening or whitening agents known in the art can be incorporated at levels typically from about 0.01% to about 1.2%, by weight, into the cleaning compositions herein. Commercial optical brighteners which may be useful in the present invention can be classified into subgroups, which include, but are not necessarily limited to, derivatives of stilbene, pyrazoline, coumarin, carboxylic acid, methinecyanines, dibenzothiophene-5,5-dioxide, azoles, 5- and 6-membered-ring heterocycles, and other miscellaneous agents. Examples of such brighteners are disclosed in "The Production and Application of Fluorescent Brightening Agents", M. Zahradnik, Published by John Wiley & Sons, New York (1982). Specific nonlimiting examples of optical brighteners which are useful in the present compositions are those identified in U.S. Pat. No. 4,790,856 and U.S. Pat. No. 3,646,015.

Fabric Hueing Agents

The composition may comprise a fabric hueing agent (sometimes referred to as shading, bluing or whitening agents). Typically the hueing agent provides a blue or violet shade to fabric. Hueing agents can be used either alone or in combination to create a specific shade of hueing and/or to shade different fabric types. This may be provided for example by mixing a red and green-blue dye to yield a blue or violet shade. Hueing agents may be selected from any known chemical class of dye, including but not limited to acridine, anthraquinone (including polycyclic quinones), azine, azo (e.g., monoazo, disazo, trisazo, tetrakisazo, polyazo), including premetallized azo, benzodifurane and benzodifuranone, carotenoid, coumarin, cyanine, diazahemicyanine, diphenylmethane, formazan, hemicyanine, indigoids, methane, naphthalimides, naphthoquinone, nitro and nitroso, oxazine, phthalocyanine, pyrazoles, stilbene, styryl, triarylmethane, triphenylmethane, xanthenes and mixtures thereof.

Suitable fabric hueing agents include dyes, dye-clay conjugates, and organic and inorganic pigments. Suitable dyes include small molecule dyes and polymeric dyes. Suitable small molecule dyes include small molecule dyes selected from the group consisting of dyes falling into the Colour Index (C.I.) classifications of Direct, Basic, Reactive or hydrolysed Reactive, Solvent or Disperse dyes for example that are classified as Blue, Violet, Red, Green or Black, and provide the desired shade either alone or in combination. In another aspect, suitable small molecule dyes include small molecule dyes selected from the group consisting of Colour Index (Society of Dyers and Colourists, Bradford, UK) numbers Direct Violet dyes such as 9, 35, 48, 51, 66, and 99, Direct Blue dyes such as 1, 71, 80 and 279, Acid Red dyes such as 17, 73, 52, 88 and 150, Acid Violet dyes such as 15, 17, 24, 43, 49 and 50, Acid Blue dyes such as 15, 17, 25, 29, 40, 45, 75, 80, 83, 90 and 113, Acid Black dyes such as 1, Basic Violet dyes such as 1, 3, 4, 10 and 35, Basic Blue dyes such as 3, 16, 22, 47, 66, 75 and 159, Disperse or Solvent dyes such as those described in EP1794275 or EP1794276, or dyes as disclosed in US 7208459 B2, and mixtures thereof. In another aspect, suitable small molecule dyes include small molecule dyes selected from the group consisting of C. I. numbers Acid Violet 17, Direct Blue 71, Direct Violet 51, Direct Blue 1, Acid Red 88, Acid Red 150, Acid Blue 29, Acid Blue 113 or mixtures thereof.

Suitable polymeric dyes include polymeric dyes selected from the group consisting of polymers containing covalently bound (sometimes referred to as conjugated) chromogens, (dye-polymer conjugates), for example polymers with chromogens co-polymerized into the backbone of the polymer and mixtures thereof. Polymeric dyes include those described in WO2011/98355, WO2011/47987, US2012/090102, WO2010/145887, WO2006/055787 and WO2010/142503.

In another aspect, suitable polymeric dyes include polymeric dyes selected from the group consisting of fabric-substantive colorants sold under the name of Liquitint® (Milliken, Spartanburg, South Carolina, USA), dye-polymer conjugates formed from at least one reactive dye and a polymer selected from the group consisting of polymers comprising a moiety selected from the group consisting of a hydroxyl moiety, a primary amine moiety, a secondary amine moiety, a thiol moiety and mixtures thereof. In still another aspect, suitable polymeric dyes include polymeric dyes selected from the group consisting of Liquitint® Violet CT, carboxymethyl cellulose (CMC) covalently bound to a reactive blue, reactive violet or reactive red dye such as CMC conjugated with C.I. Reactive Blue 19, sold by Megazyme, Wicklow, Ireland under the product name AZO-CM-CELLULOSE, product code S-ACMC, alkoxylated triphenyl-methane polymeric colourants, alkoxylated thiophene polymeric colourants, and mixtures thereof.

Preferred hueing dyes include the whitening agents found in WO 08/87497 A1, WO2011/011799 and WO2012/054835. Preferred hueing agents for use in the present invention may be the preferred dyes disclosed in these references, including those selected from Examples 1-42 in Table 5 of WO2011/011799. Other preferred dyes are disclosed in US 8138222. Other preferred dyes are disclosed in WO2009/069077.

Suitable dye clay conjugates include dye clay conjugates selected from the group comprising at least one cationic/basic dye and a smectite clay, and mixtures thereof. In another aspect, suitable dye clay conjugates include dye clay conjugates selected from the group consisting of one cationic/basic dye selected from the group consisting of C.I. Basic Yellow 1 through 108, C.I. Basic Orange 1 through 69, C.I. Basic Red 1 through 118, C.I. Basic Violet 1 through 51, C.I. Basic Blue 1 through 164, C.I. Basic Green 1 through 14, C.I. Basic Brown 1 through 23, CI Basic Black 1 through 11, and a clay selected from the group consisting of Montmorillonite clay, Hectorite clay, Saponite clay and mixtures thereof. In still another aspect, suitable dye clay conjugates include dye clay conjugates selected from the group consisting of: Montmorillonite Basic Blue B7 C.I. 42595 conjugate, Montmorillonite Basic Blue B9 C.I. 52015 conjugate, Montmorillonite Basic Violet V3 C.I. 42555 conjugate, Montmorillonite Basic Green G1 C.I. 42040 conjugate, Montmorillonite Basic Red R1 C.I. 45160 conjugate, Montmorillonite

C.I. Basic Black 2 conjugate, Hectorite Basic Blue B7 C.I. 42595 conjugate, Hectorite Basic Blue B9 C.I. 52015 conjugate, Hectorite Basic Violet V3 C.I. 42555 conjugate, Hectorite Basic Green G1 C.I. 42040 conjugate, Hectorite Basic Red R1 C.I. 45160 conjugate, Hectorite C.I. Basic Black 2 conjugate, Saponite Basic Blue B7 C.I. 42595 conjugate, Saponite Basic Blue B9 C.I. 52015 conjugate, Saponite Basic Violet V3 C.I. 42555 conjugate, Saponite Basic Green G1 C.I. 42040 conjugate, Saponite Basic Red R1 C.I. 45160 conjugate, Saponite C.I. Basic Black 2 conjugate and mixtures thereof.

Suitable pigments include pigments selected from the group consisting of flavanthrone, indanthrone, chlorinated indanthrone containing from 1 to 4 chlorine atoms, pyranthrone, dichloropyranthrone, monobromodichloropyranthrone, dibromodichloropyranthrone, tetrabromopyranthrone, perylene-3,4,9,10-tetracarboxylic acid diimide, wherein the imide groups may be unsubstituted or substituted by C1-C3 -alkyl or a phenyl or heterocyclic radical, and wherein the phenyl and heterocyclic radicals may additionally carry substituents which do not confer solubility in water, anthrapyrimidinecarboxylic acid amides, violanthrone, isoviolanthrone, dioxazine pigments, copper phthalocyanine which may contain up to 2 chlorine atoms per molecule, polychloro-copper phthalocyanine or polybromochloro-copper phthalocyanine containing up to 14 bromine atoms per molecule and mixtures thereof.

In another aspect, suitable pigments include pigments selected from the group consisting of Ultramarine Blue (C.I. Pigment Blue 29), Ultramarine Violet (C.I. Pigment Violet 15) and mixtures thereof.

The aforementioned fabric hueing agents can be used in combination (any mixture of fabric hueing agents can be used).

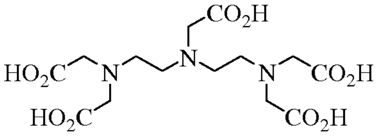
Chelating Agents

The detergent compositions herein may also optionally contain one or more iron and/or manganese and/or other metal ion chelating agents. Such chelating agents can be selected from the group consisting of amino carboxylates, amino phosphonates, polyfunctionally-substituted aromatic chelating agents and mixtures therein. If utilized, these chelating agents will generally comprise from about 0.1% to about 15% by weight of the detergent compositions herein. More preferably, if utilized, the chelating agents will comprise from about 0.1% to about 3.0% by weight of such compositions.

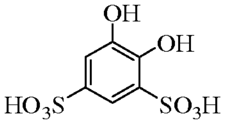
The chelant or combination of chelants may be chosen by one skilled in the art to provide for heavy metal (e.g. Fe) sequestration without negatively impacting enzyme stability through the excessive binding of calcium ions. Non-limiting examples of chelants of use in the present invention are found in USPN 7445644, 7585376 and 2009/0176684A1.

Useful chelants include heavy metal chelating agents, such as diethylenetriaminepentaacetic acid (DTPA) and/or a catechol including, but not limited to, Tiron. In embodiments in which a dual chelant system is used, the chelants may be DTPA and Tiron.

DTPA has the following core molecular structure:



Tiron, also known as 1,2-diydroxybenzene-3,5-disulfonic acid, is one member of the catechol family and has the core molecular structure shown below:



Other sulphonated catechols are of use. In addition to the disulfonic acid, the term "tiron" may also include mono- or di-sulfonate salts of the acid, such as, for example, the disodium sulfonate salt, which shares the same core molecular structure with the disulfonic acid.

Other chelating agents suitable for use herein can be selected from the group consisting of aminocarboxylates, aminophosphonates, polyfunctionally-substituted aromatic chelating agents and mixtures thereof. Chelants particularly of use include, but are not limited to: HEDP (hydroxyethanedimethylenephosphonic acid); MGDA (methylglycinediacetic acid); and mixtures thereof.

Without intending to be bound by theory, it is believed that the benefit of these materials is due in part to their exceptional ability to remove heavy metal ions from washing solutions by formation of soluble chelates; other benefits include inorganic film or scale prevention. Other suitable chelating agents for use herein are the commercial DEQUEST series, and chelants from Monsanto, DuPont, and Nalco, Inc.

Aminocarboxylates useful as chelating agents include, but are not limited to, ethylenediaminetetracetates, N-(hydroxyethyl)ethylenediaminetriacetates, nitrilotriacetates, ethylenediamine tetraproprionates, triethylenetetraaminehexacetates, diethylenetriamine-pentaacetates, and ethanoldiglycines, alkali metal, ammonium, and substituted ammonium salts thereof and mixtures thereof. Aminophosphonates are also suitable for use as chelating agents in the compositions of the invention when at least low levels of total phosphorus are permitted in detergent compositions, and include ethylenediaminetetrakis (methylenephosphonates). Preferably, these aminophosphonates do not contain alkyl or alkenyl groups with more than about 6 carbon atoms. Polyfunctionally-substituted aromatic chelating agents are also useful in the compositions herein. See U.S. Patent 3,812,044, issued May 21, 1974, to Connor et al. Preferred compounds of this type in acid form are dihydroxydisulfobenzenes such as 1,2-dihydroxy-3,5-disulfobenzene.

A biodegradable chelator for use herein is ethylenediamine disuccinate ("EDDS"), especially (but not limited to) the [S,S] isomer as described in USPN 4,704,233. The trisodium salt is preferred though other forms, such as magnesium salts, may also be useful. The chelant system may be present in the detergent compositions of the present invention at from about .2% to about .7% or from about .3% to about .6% by weight of the detergent compositions disclosed herein.

Fabric Softeners

Various through-the-wash fabric softeners, especially the impalpable smectite clays of U.S. Pat. No. 4,062,647, as well as other softener clays known in the art, can optionally be used typically at levels of from about 0.5% to about 10% by weight in the present compositions to provide fabric softener benefits concurrently with fabric cleaning. Clay softeners can be used in combination with amine and cationic softeners as disclosed, for example, in U.S. Pat. No. 4,375,416, and U.S. Pat. No. 4,291,071. Cationic softeners can also be used without clay softeners.

Cationic Polymers

The compositions of the present invention may contain a cationic polymer. Concentrations of the cationic polymer in the composition typically range from about 0.05% to about 3%, in another embodiment from about 0.075% to about 2.0%, and in yet another embodiment from about 0.1% to about 1.0%. Suitable cationic polymers will have cationic charge densities of at least about 0.5 meq/gm, in another embodiment at least about 0.9 meq/gm, in another embodiment at least about 1.2 meq/gm, in yet another embodiment at least about 1.5 meq/gm, but in one embodiment also less than about 7 meq/gm, and in another embodiment less than about 5 meq/gm, at the pH of intended use of the composition, which pH will generally range from about pH 3 to about pH 9, in one embodiment between about pH 4 and about pH 8. Herein, "cationic charge density" of a polymer refers to the ratio of the number of positive charges on the polymer to the molecular weight of the polymer. The average molecular weight of such suitable cationic polymers will generally be between about 10,000 and 10 million, in one embodiment between about 50,000 and about 5 million, and in another embodiment between about 100,000 and about 3 million.

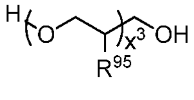
Suitable cationic polymers for use in the compositions of the present invention contain cationic nitrogen-containing moieties such as quaternary ammonium or cationic protonated amino moieties. Any anionic counterions can be used in association with the cationic polymers so long as the polymers remain soluble in water, in the composition, or in a coacervate phase of the composition, and so long as the counterions are physically and chemically compatible with the essential components of the composition or do not otherwise unduly impair product performance, stability or aesthetics. Nonlimiting examples of such counterions include halides (e.g., chloride, fluoride, bromide, iodide), sulfate and methylsulfate.

Other suitable cationic polymers for use in the composition include polysaccharide polymers, cationic guar gum derivatives, quaternary nitrogen-containing cellulose ethers, synthetic polymers, copolymers of etherified cellulose, guar and starch. When used, the cationic polymers herein are either soluble in the composition or are soluble in a complex coacervate phase in the composition formed by the cationic polymer and the anionic, amphoteric and/or zwitterionic surfactant component described hereinbefore. Complex coacervates of the cationic polymer can also be formed with other charged materials in the composition.

Suitable cationic polymers are described in U.S. Pat. Nos. 3,962,418; 3,958,581; and U.S. Publication No. 2007/0207109A1, which are all hereby incorporated by reference.

Nonionic Polymer

The composition of the present invention may include a nonionic polymer as a conditioning agent. Polyalkylene glycols having a molecular weight of more than about 1000 are useful herein. Useful are those having the following general formula:



where R^{95} is selected from the group consisting of H, methyl, and mixtures thereof. Conditioning agents, and in particular silicones, may be included in the composition. The conditioning agents useful in the compositions of the present invention typically comprise a water insoluble, water dispersible, non-volatile, liquid that forms emulsified, liquid particles. Suitable conditioning agents for use in the composition are those conditioning agents characterized generally as silicones (e.g., silicone oils, cationic silicones, silicone gums, high refractive silicones, and silicone resins), organic conditioning oils (e.g., hydrocarbon oils, polyolefins, and fatty esters) or combinations thereof, or those conditioning agents which otherwise form liquid, dispersed particles in the aqueous surfactant matrix herein. Such conditioning agents should be physically and chemically compatible with the essential components of the composition, and should not otherwise unduly impair product stability, aesthetics or performance.

The concentration of the conditioning agent in the composition should be sufficient to provide the desired conditioning benefits. Such concentration can vary with the conditioning agent, the conditioning performance desired, the average size of the conditioning agent particles, the type and concentration of other components, and other like factors.

The concentration of the silicone conditioning agent typically ranges from about 0.01% to about 10%. Non-limiting examples of suitable silicone conditioning agents, and optional suspending agents for the silicone, are described in U.S. Reissue Pat. No. 34,584, U.S. Pat. Nos. 5,104,646; 5,106,609; 4,152,416; 2,826,551; 3,964,500; 4,364,837; 6,607,717; 6,482,969; 5,807,956; 5,981,681; 6,207,782; 7,465,439; 7,041,767; 7,217,777; US Patent Application Nos. 2007/0286837A1; 2005/0048549A1; 2007/0041929A1; British Pat. No. 849,433; German Patent No. DE 10036533, which are all incorporated herein by reference; Chemistry and Technology of Silicones, New York: Academic Press (1968); General Electric Silicone Rubber Product Data Sheets SE 30, SE 33, SE 54 and SE 76; Silicon Compounds, Petrarch Systems, Inc. (1984); and in Encyclopedia of Polymer Science and Engineering, vol. 15, 2d ed., pp 204-308, John Wiley & Sons, Inc. (1989).

Organic Conditioning Oil

The compositions of the present invention may also comprise from about 0.05% to about 3% of at least one organic conditioning oil as the conditioning agent, either alone or in combination with other conditioning agents, such as the silicones (described herein). Suitable conditioning oils include hydrocarbon oils, polyolefins, and fatty esters. Also suitable for use in the compositions herein are the conditioning agents described by the Procter & Gamble Company in U.S. Pat. Nos. 5,674,478, and 5,750,122. Also suitable for use herein are those conditioning agents described in U.S. Pat. Nos. 4,529,586, 4,507,280, 4,663,158, 4,197,865, 4,217, 914, 4,381,919, and 4,422, 853, which are all hereby incorporated by reference.

Humectant

The compositions of the present invention may contain a humectant. The humectants herein are selected from the group consisting of polyhydric alcohols, water soluble alkoxylated nonionic polymers, and mixtures thereof. The humectants, when used herein, are preferably used at levels of from about 0.1% to about 20%, more preferably from about 0.5% to about 5%.

Suspending Agent

The compositions of the present invention may further comprise a suspending agent at concentrations effective for suspending water-insoluble material in dispersed form in the compositions or for modifying the viscosity of the composition. Such concentrations range from about 0.1% to about 10%, preferably from about 0.3% to about 5.0%.

Suspending agents useful herein include anionic polymers and nonionic polymers (e.g., vinyl polymers, acyl derivatives, long chain amine oxides, and mixtures thereof, alkanol amides of fatty acids, long chain esters of long chain alkanol amides, glyceryl esters, primary amines having a fatty alkyl moiety having at least about 16 carbon atoms, secondary amines having two fatty alkyl moieties each having at least about 12 carbon atoms). Examples of suspending agents are described in U.S. Pat. No. 4,741,855.

Pearlescent Agents

Pearlescent agents as described in WO2011/163457 may be incorporated into the compositions of the invention.

Perfume

Preferably the composition comprises a perfume, preferably in the range from 0.001 to 3wt%, most preferably from 0.1 to 1 wt%. Many suitable examples of perfumes are provided in the CTFA (Cosmetic, Toiletry and Fragrance Association) 1992 International Buyers Guide, published by CFTA Publications and OPD 1993 Chemicals Buyers Directory 80th Annual Edition, published by Schnell Publishing Co. It is usual for a plurality of perfume components to be present in the compositions of the invention, for example four, five, six, seven or more. In perfume mixtures preferably 15 to 25 wt% are top notes. Top notes are defined by Poucher (Journal of the Society of Cosmetic Chemists 6(2):80 [1995]). Preferred top notes include rose oxide, citrus oils, linalyl acetate, lavender, linalool, dihydromyrcenol and cis-3-hexanol.

Other Adjunct Ingredients

A wide variety of other ingredients useful in the cleaning compositions can be included in the compositions herein, including other active ingredients, carriers, hydrotropes, processing aids, dyes or pigments, solvents for liquid formulations, and solid or other liquid fillers, erythrosine, colliodal silica, waxes, probiotics, surfactin, aminocellulosic polymers, Zinc Ricinoleate, perfume microcapsules, rhamnolipds, sophorolipids, glycopeptides, methyl ester sulfonates, methyl ester ethoxylates, sulfonated estolides, cleavable surfactants, biopolymers, silicones, modified silicones, aminosilicones, deposition aids, locust bean gum, cationic hydroxyethylcellulose polymers, cationic guars, hydrotropes (especially cumenesulfonate salts, toluenesulfonate salts, xylenesulfonate salts, and naphalene salts), antioxidants, BHT, PVA particle-encapsulated dyes or perfumes, pearlescent agents, effervescent agents, color change systems, silicone polyurethanes, opacifiers, tablet disintegrants, biomass fillers, fast-dry silicones, glycol distearate, hydroxyethylcellulose polymers, hydrophobically modified cellulose polymers or hydroxyethylcellulose polymers, starch perfume encapsulates, emulsified oils, bisphenol antioxidants, microfibrous cellulose structurants, properfumes, styrene/acrylate polymers, triazines, soaps, superoxide dismutase, benzophenone protease inhibitors, functionalized TiO2, dibutyl phosphate, silica perfume capsules, and other adjunct ingredients, diethylenetriaminepentaacetic acid, Tiron (1,2-diydroxybenzene-3,5-disulfonic acid), hydroxyethanedimethylenephosphonic acid, methylglycinediacetic acid, choline oxidase, pectate lyase, triarylmethane blue and violet basic dyes, methine blue and violet basic dyes, anthraquinone blue and violet basic dyes, azo dyes basic blue 16, basic blue 65, basic blue 66 basic blue 67, basic blue 71, basic blue 159, basic violet 19, basic violet 35, basic violet 38, basic violet 48, oxazine dyes, basic blue 3, basic blue 75, basic blue 95, basic blue 122, basic blue 124, basic blue 141, Nile blue A and xanthene dye basic violet 10, an alkoxylated triphenylmethane polymeric colorant; an alkoxylated thiopene polymeric colorant; thiazolium dye, mica, titanium dioxide coated mica, bismuth oxychloride, and other actives.

Fillers and Carriers

An important component of the detergent compositions herein are the fillers and carriers of the composition. As used herein, either in the specification or in a claim, the terms “filler” and “carrier” have the same meaning and can be used interchangeably; e.g. any of the following ingredients called a filler may also be considered a carrier.

Liquid detergent compositions, and other detergent forms including a liquid component (such as liquid-containing unit dose detergents) can contain water and other solvents as fillers or carriers. Low molecular weight primary or secondary alcohols exemplified by methanol, ethanol, propanol, and isopropanol are suitable. Monohydric alcohols are preferred for solubilizing surfactant, but polyols such as those containing from 2 to about 6 carbon atoms and from 2 to about 6 hydroxy groups (e.g., 1,3-propanediol, ethylene glycol, glycerine, and 1,2-propanediol) can also be used. Amine-containing solvents may also be used; suitable amines are described above in the section entitled "amine-neutralized surfactants" and may be used on their own in addition to be used to neutralize acid detergent components. The compositions may contain from 5% to 90%, typically 10% to 50% by weight of such carriers. The isoprenoid-derived surfactants of the present invention are particualarly suited for compact or super-compact liquid or liquid-containing detergent compositions. For compact or super-compact heavy duty liquid or other detergent forms, the use of water may be lower than 40%, or lower than 20%, or lower than 5wt%, or less than 4% or less than 3% free water, or less than 2% free water, or substantially free of free water (i.e. anhydrous).

For powder or bar detergent embodiments, and other detergent forms including a solid or powder component (such as powder-containing unit dose detergents), suitable fillers include but are not limited to sodium sulfate, sodium chloride, clay, or other inert solid ingredients. Fillers may also include biomass or decolorized biomass. Typically, fillers in granular, bar, or other solid detergents comprise less than 80wt%, preferably less than 50wt%. The isoprenoid-derived surfactants of the present invention are also particularly suited for compact or super-compact powder, solid or powder- or solid-containing detergent compositions. Compact or supercompact powder or solid detergents are included in the present invention, and may involve less than 40%, or less than 20%, or less than 10wt% filler.

For either compacted or supercompacted liquid detergents or powder detergents, or other detergent forms, the level of liquid or solid filler in the product is reduced, such that either the same amount of active chemistry is delivered to the wash liquor as compared to noncompacted detergents, or more preferably, the cleaning system (surfactants and other adjuncts named herein above) is more efficient such that less active chemistry is delivered to the wash liquor as compared to noncompacted detergents, such as via the use of the novel surfactant system described in the present invention. For example, the wash liquor may be formed by contacting the laundry detergent to water in such an amount so that the concentration of laundry detergent composition in the wash liquor is from above 0g/l to 4g/l, preferably from 1g/l, and preferably to 3.5g/l, or to 3.0g/l, or to 2.5g/l, or to 2.0g/l, or to 1.5g/l, or even to 1.0g/l, or even to 0.5g/l. These dosages are not intended to be limiting, and other dosages may be included in the present invention.

Buffer System

The cleaning compositions herein will preferably be formulated such that, during use in aqueous cleaning operations, the wash water will have a pH of between about 5.0 and about 12, preferably between about 7.0 and 10.5. Liquid dishwashing product formulations preferably have a pH between about 6.8 and about 9.0. Laundry products are typically at pH 7-11. Techniques for controlling pH at recommended usage levels include the use of buffers, alkalis, acids, etc., and are well known to those skilled in the art. These include the use of sodium carbonate, citric acid or sodium citrate, lactic acid, monoethanol amine or other amines, boric acid or borates, and other pH-adjusting compounds well known in the art.

Methods of Use

The present invention includes a method for cleaning a targeted surface. As used herein "targeted surface" may include such surfaces such as fabric, dishes, glasses, and other cooking surfaces, and hard surfaces. As used herein "hard surface" includes hard surfaces being found in a typical home such as hard wood, tile, ceramic, plastic, leather, metal, glass. Such method includes the steps of contacting the composition of the invention, in neat form or diluted in wash liquor, with at least a portion of a targeted surface then optionally rinsing the targeted surface. Preferably the targeted surface is subjected to a washing step prior to the aforementioned optional rinsing step. For purposes of the present invention, washing includes, but is not limited to, scrubbing, wiping and mechanical agitation.

As will be appreciated by one skilled in the art, the cleaning compositions of the present invention are ideally suited for use in home care (hard surface cleaning compositions) and/or laundry applications.

The compositions are preferably employed at concentrations of from about 200 ppm to about 10,000 ppm in solution. The water temperatures preferably range from about 5 °C to about 100 °C.

For use in laundry cleaning compositions, the compositions are preferably employed at concentrations from about 200 ppm to about 10000 ppm in solution (or wash liquor). The water temperatures preferably range from about 5°C to about 60°C. The water to fabric ratio is preferably from about 1:1 to about 20:1.

The method may include the step of contacting a nonwoven substrate impregnated with an embodiment of the composition of the present invention As used herein "nonwoven substrate" can comprise any conventionally fashioned nonwoven sheet or web having suitable basis weight, caliper (thickness), absorbency and strength characteristics. Examples of suitable commercially available nonwoven substrates include those marketed under the trade name SONTARA® by DuPont and POLYWEB® by James River Corp.

As will be appreciated by one skilled in the art, the cleaning compositions of the present invention are ideally suited for use in liquid dish cleaning compositions. The method for using a liquid dish composition of the present invention comprises the steps of contacting soiled dishes with an effective amount, typically from about 0.5 ml. to about 20 ml. (per 25 dishes being treated) of the liquid dish cleaning composition of the present invention diluted in water.

In addition, another advantage of the isoprenoid-derived surfactant-containing systems mixtures and the detergent compositions containing them is their desirable performance in cold water. The invention herein includes methods for laundering of fabrics at reduced wash temperatures. This method of laundering fabric comprises the step of contacting a laundry detergent composition to water to form a wash liquor, and laundering fabric in said wash liquor, wherein the wash liquor has a temperature of above 0 °C to about 20 °C, preferably to about 15 °C, or to about 10 °C or to about 5 °C. The fabric may be contacted to the water prior to, or after, or simultaneous with, contacting the laundry detergent composition with water.

Machine laundry methods herein typically comprise treating soiled laundry with an aqueous wash solution in a washing machine having dissolved or dispensed therein an effective amount of a machine laundry detergent composition in accord with the invention. By an effective amount of the detergent composition it is meant from 20 g to 300 g of product dissolved or dispersed in a wash solution of volume from 5 to 65 liters, as are typical product dosages and wash solution volumes commonly employed in conventional machine laundry methods.

Hand-washing methods, and combined handwashing with semiautomatic washing machines are also included.

As noted, the mixtures of isoprenoid-derived surfactant derivative and nonisoprenoid-derived surfactant derivative of present invention are used herein in cleaning compositions, preferably in combination with other detersive surfactants, at levels which are effective for achieving at least a directional improvement in cleaning performance and suds performance. In the context of a fabric laundry composition, such "usage levels" can vary depending not only on the type and severity of the soils and stains, but also on the wash water temperature, the volume of wash water and the type of washing machine (e.g., top-loading, front-loading, top-loading, vertical-axis Japanese-type automatic washing machine).

As can be seen from the foregoing, the amount of detergent composition used in a machine-wash laundering context can vary, depending on the habits and practices of the user, the type of washing machine, and the like.

A further method of use of the materials of the present invention involves pretreatment of stains prior to laundering.

Hand dishwashing methods are also included in the present invention.

Packaging for the Compositions

Commercially marketed executions of the compositions can be packaged in any suitable container including those constructed from paper, cardboard, plastic materials and any suitable laminates. An optional packaging execution is described in European Application No. 94921505.7.

Fabric Enhancing Softening Compositions

As used herein the term "Fabric Enhancing Composition" includes compositions and formulations designed for enhancing textiles, fabrics, garments and other articles containing a fabric surface. Such compositions include but are not limited to, fabric softening compositions, fabric enhancing compositions, or fabric freshening compositions, and may be of the rinse-added type, the “2-in-1” laundry detergent + fabric enhancer type, or the dryer-added type, and may have a form selected from granular, powder, liquid, gel, paste, bar, single-phase or multi-phase unit dose, fabric treatment compositions, laundry rinse additive, wash additive, post-rinse fabric treatment, ironing aid, delayed delivery formulation, and the like. Such compositions may be used as a pre-laundering treatment, a post-laundering treatment, or may be added during the rinse or wash cycle of the laundering operation. The Fabric Enhancing Compositions formulations of the present invention may be in the form of pourable liquids (under ambient conditions). Such compositions will therefore typically comprise an aqueous carrier, which is present at a levels described above (see “Filler” section).

In other embodiments, the invention relates to fabric softening compositions that include about 0.001 wt% to about 100 wt%, preferably about 0.1 wt% to about 80 wt%., more preferably about 1 wt% to about 25 wt%, by weight of the surfactant system.

EXAMPLES

The following examples illustrate the present invention. It will be appreciated that other modifications of the present invention within the skill of those in the art can be undertaken without departing from the spirit and scope of this invention. All of the formulations exemplified hereinafter are prepared via conventional formulation and mixing methods unless specific methods are given.

All parts, percentages, and ratios herein are by weight unless otherwise specified. Some components may come from suppliers as dilute solutions. The levels given reflect the weight percent of the active material, unless otherwise specified. The excluded diluents and other materials are included as “Minors”.

In the following examples, AS means alkyl sulfate anionic surfactant, AE means alkyl ethoxylate nonionic surfactant, LAS means linear alkylbenzene sulfonate or branched alkylbenzene sulfonate, AES means alkyl ethoxy sulfate anionic surfactant, AENS means alkyl ethoxy sulfate anionic surfactant with an average of N ethoxylation units per molecule, and APG means alkyl polyglycoside surfactant.

Example 1.

Granular Laundry Detergents

	A	B	C	D	E
Formula	wt%	wt%	wt%	wt%	Wt%
Surfactant mixture A+B[1] of the present invention	1.0[2]	3.0[2]	3.0[3]	2.0[3]	7.0[4]
Other isoprenoid-derived Surfactant(s) of the present invention	0	0	1.0[5]	2.0[6]	2.0[7]
LAS	20	15	10	10	0
Linear or branched alkyl ethoxy sulfate	0	0	0	5	10
C_{14-15} alkyl ethoxylate (EO=7)	1	1	0	0	0
Dimethyl hydroxyethyl lauryl ammonium chloride	0.5	0.5	0	0	0
Sodium tripolyphosphate	0	0	10	15	0
Zeolite	10	20	0	0	0
Silicate builder	10	7	5	0	0
Sodium Carbonate	0	20	10	10	20
Diethylene triamine penta acetate	0	1	0.5	0	0
Polyacrylate or polyacrylate/maleate	1	3	2	0	0
Carboxy Methyl Cellulose	0	0	1	1	0
Percarbonate or perborate	2	2	2	0	0
Nonanoyloxybenzenesulfonate, sodium salt	1.5	1.5	0	0	0
Tetraacetylethylenediamine	0	0	2	0	0
Zinc Phthalocyanine Tetrasulfonate	0.005				
Brightener	1	0.8	0.8	0.5	0
$MgSO_4$	0.5	1.0	0	0	0
Enzymes (protease, amylase, lipase, and or cellulases)	1.0	0.5	0.7	0.7	0
Minors (perfume, dyes, suds stabilizers) and fillers	balance	balance	balance	Balance	balance

1. “A” and “B” refer to surfactant derivatives of 4,8,12-trimethyltridecan-1-ol and 3-ethyl-7,11-dimethyldodecan-1-ol respectively, and “A+B” refers to mixtures of said surfactants.
2. Wherein A+B comprises a mixture in the ratio of 80A:20B alkyl sulfates
3. Wherein A+B comprises a mixture in the ratio of 90A:10B alkyl sulfates
4. Wherein A+B comprises a mixture in the ratio of 95:5 alkyl E1.8 sulfates
5. Additional isoprenoid-derived Surfactant(s) E-Y-Z of the present invention where E-Y-Z is a blend of one or more surfactants v.-vii. and where E-Y-Z is an alkyl AE1.8S surfactant
6. Additional isoprenoid-derived Surfactant(s) E-Y-Z of the present invention where E-Y-Z is a blend of one or more surfactants v.-vii. and where E-Y-Z is an alkyl dimethyl hydroxyethyl quaternary ammonium cationic surfactant
7. Additional isoprenoid-derived Surfactant(s) E-Y-Z of the present invention where E-Y-Z is a blend of one or more surfactants i.-iv. and where E-Y-Z is a nonionic AE7 surfactant

Example 2.

Granular Laundry Detergents

	A	**B**	**C**	**D**	**E**
Formula	wt%	wt%	wt%	wt%	Wt%
Surfactant mixture A+B of the present invention[1]	5.0[2]	2.0[3]	0.8[4]	1.5[5]	7.0[6]
Other isoprenoid-derived Surfactant(s) of the present invention	0	0	1.0[7]	1.7[8]	2.0[9]
LAS	40	15	5	5	0
MES	0	0	0	10	10
C_{14-15} alkyl ethoxylate (EO=7)	2	5	0	0	0
Cosurfactant	2	1	1	0	0
Sodium tripolyphosphate	0	0	10	0	0
Zeolite	10	20	0	0	0
Sodium Silicate	10	7	5	0	0
Sodium Carbonate	0	20	10	10	20
Diethylene triamine penta acetate	0	1	0.5	0	0
Polyacrylate or polyacrylate/maleate	0	3	2	0	0
Alkoxylated polyamine	0	1	1.5	0	0
Soil Release Polymer	0.5	0.3	0	0	0
Chelant	0.5	0.5	2	0	0
Grease Cleaning Polymer	1	1	0	0	1
Brightener	1	0.8	0.8	0.5	0
Enzymes (protease, amylase, lipase, and or cellulases)	2.0	0.5	1.0	0.7	0
Minors (perfume, dyes, suds stabilizers) and fillers	balance	Balance	balance	Balance	balance

1. Surfactant derivatives of 3,7,11-trimethyldodecan-1-ol and 2-ethyl-6,10-dimethylundecan-1-ol respectively, and “A+B” refers to mixtures of said surfactants.
2. Wherein A+B comprises a mixture in the ratio of 80A:20B alkyl sulfonates.
3. Wherein A+B comprises a mixture in the ratio of 80A:20B alkyl E1.8 ethoxy sulfates
4. Wherein A+B comprises a mixture in the ratio of 95A:5B alkyldimethylhydroxyethyl ammonium chloride
5. Wherein A+B comprises a mixture in the ratio of 90:10 alkyl E7 nonionic surfactants
6. Wherein A+B comprises a mixture in the ratio of 85:15 alkyl polyglycosides
7. Additional isoprenoid-derived Surfactant(s) E-Y-Z of the present invention where E-Y-Z is a blend of one or more surfactants v.-vii. and where E-Y-Z is an alkyl sulfate surfactant
8. Additional isoprenoid-derived Surfactant(s) E-Y-Z of the present invention where E-Y-Z is a blend of one or more surfactants v.-vii. and where E-Y-Z is an alkyl trimethyl ammonium cationic surfactant
9. Additional isoprenoid-derived Surfactant(s) E-Y-Z of the present invention where E-Y-Z is a blend of one or more surfactants viii.-xiii. and where E-Y-Z is a nonionic AE12 surfactant

Example 3.

Liquid Laundry Detergents

Ingredient	**A**	**B**	**C**	**D**	**E**
	Wt%	Wt%	wt%	wt%	wt%
Surfactant mixture A+B of the present invention[1]	5.0[2]	4.0[3]	2.0[4]	2.0[5]	6.5[6]
Other isoprenoid-derived Surfactant(s) of the present invention	3[7]	0	0	1[7]	2.5[8]
C12-15 $EO_{1.8}$ sulfate sodium salt	50	30	20	20	7
Cosurfactants (nonionic, amine oxide, cationic, anionic, mixtures thereof)	3	2	2	3	0
LAS	5	2	0	0	0
Citric acid	2.0	3.4	1.9	1.0	1.6
Protease	1.0	0.7	1.0	0	2.5
Amylase	0.2	0.2	0	0	0.3
Lipase	0	0	0.2	0	0
Borax	1.5	2.4	2.9	0	0
Calcium and sodium formate	0.2	0	0	0	0
Formic acid	0	0	0	0	1.1
Ethoxylated polyamine derivative polymer or grease cleaning polymers	1.7	2.0	0	0.8	0
Sodium polyacrylate copolymer	0	0	0.6	0	0
DTPA	0.1	0	0	0	0.9
DTPMP	0	0.3	0	0	0
EDTA	0	0	0	0.1	0
Fluorescent whitening agent	0.15	0.2	0.12	0.12	0.2
Ethanol	2.5	1.4	1.5	0	0
Propanediol	6.6	4.9	4.0	0	15.7
Sorbitol	0	0	4.0	0	0
Ethanolamine	1.5	0.8	0.1	0	11.0
Sodium hydroxide	3.0	4.9	1.9	1.0	0
Hydrotropes (sodium cumene sulfonate, sodium toluene sulfonate, sodium xylene sulfonate)	3.0	2.0	0	0	0
Silicone suds suppressor	0	0.01	0	0	0
Minors (perfume, dyes, opaciefier, adjuncts), water	balance	balance	balance	balance	balance

1. “A” and “B” refer to surfactant derivatives of 4,8,12-trimethyltridecan-1-ol and 3-ethyl-7,11-dimethyldodecan-1-ol respectively, and “A+B” refers to mixtures of said surfactants.
2. Wherein A+B comprises a mixture in the ratio of 80A:20B alkyl sulfates.
3. Wherein A+B comprises a mixture in the ratio of 80A:20B alkyl E3 ethoxy sulfates
4. Wherein A+B comprises a mixture in the ratio of 90A:10B alkyldimethy amine oxides
5. Wherein A+B comprises a mixture in the ratio of 90A:10B alkyl E7 nonionic surfactants
6. Wherein A+B comprises a mixture in the ratio of 95B:5B alkyl polyglycosides
7. Additional isoprenoid-derived Surfactant(s) E-Y-Z of the present invention where E-Y-Z is a blend of one or more surfactants v.-vii. and where E-Y-Z is an alkyl dimethyl amine oxide surfactant

8. Additional isoprenoid-derived Surfactant(s) E-Y-Z of the present invention where E-Y-Z is a blend of one or more surfactants i.-iv. and where E-Y-Z is an alkyl trimethyl ammonium cationic surfactant

Example 4

Liquid Laundry Detergents

Ingredient	**F**	**G**	**H**	**I**	**J**
	Wt%				
Surfactant mixture A+B of the present invention[1]	5.0[2]	4.0[3]	2.0[4]	2.0[5]	7.0[6]
Other isoprenoid-derived Surfactant(s) of the present invention	2[7]	2[8]	0	0	1[8]
LAS	5	0	0	1.2	10
C12-14 EO_3 sulfate, sodium salt	2.3	0	4.5	4.5	7
MES	30	20	-	-	-
Cosurfactant	-	-	-	0.5	-
C12-18 fatty acid	2.6	3	4	0	0
Citric acid	2.6	0	0	2	0
Polymer(s) (chosen from the group consisting of grease cleaning polymer, ethoxylated polyamine derivative polymer, modified polyacrylate polymer, dye-transfer inhibition polymer, soil release polymer)	1	1	0	0	0.5
Enzymes – chosen from the group consisting of proteases(s), amylase(s), pectate lyase(s), cellulases, lipases	2.0	1	0.6	0.3	0
Diethylenetriaminepenta(methylenephosphonic) acid	0.2	0.3	0	0	0.2
Hydroxyethane diphosphonic acid	0	0	0.45	0	0
Brightener	0.1	0.1	0.1	0	0
Solvents (1,2 propanediol, ethanol), stabilizers	3	4	1.5	1.5	2
Structurant	0.4	0.3	0.3	0.1	0.3
Boric acid	1.5	2	1	0	0
Na formate	-	1	-	1	-
Reversible protease inhibitor	-	-	0.002	-	-
Buffers (sodium hydroxide, Monoethanolamine, etc), minors, antifoam, perfume, dyes, water	Balance				

1. Surfactant derivatives of 4,8,12-trimethyltridecan-1-ol and 3-ethyl-7,11-dimethyldodecan-1-ol respectively, and "A+B" refers to mixtures of said surfactants.
2. Wherein A+B comprises a mixture in the ratio of 80A:20B alkyl sulfates.
3. Wherein A+B comprises a mixture in the ratio of 97A:3B alkyl E3 ethoxy sulfates
4. Wherein A+B comprises a mixture in the ratio of 80A:20B alkyldimethy amine oxides
5. Wherein A+B comprises a mixture in the ratio of 90A:10B alkyl E7 nonionic surfactants
6. Wherein A+B comprises a mixture in the ratio of 95A:5B betaine type surfactants
7. Additional isoprenoid-derived Surfactant(s) E-Y-Z of the present invention where E-Y-Z is a blend of one or more surfactants v.-vii. and where E-Y-Z is an alkyl dimethyl amine oxide surfactant
8. Additional isoprenoid-derived Surfactant(s) E-Y-Z of the present invention where E-Y-Z is a blend of one or more surfactants i.-iv. and where E-Y-Z is an alkyl dimethyl amine oxide surfactant

Example 5

Liquid Laundry Detergents

Ingredient	**K**	**L**	**M**	**N**	O
	Wt%				
Surfactant mixture A+B of the present invention[1]	4.0[2]	3.0[3]	1.5[4]	2.0[5]	8.0[6]
Other isoprenoid-derived Surfactant(s) of the present invention	0	2[7]	0	0	0
MES	0	10	0	0	0
Alkyl ethoxy sulfate AE1.0S	0	0	2	0	7
NI surfactant	20	10	2	1	0
Cosurfactant	0	0.5	1	1	1
LAS	0	5	20	15	0
C12-18 fatty acid	2.2	2.0	-	1.3	2.6
Citric acid	7	0	0	0	2.5
Polymer(s) (chosen from the group consisting of grease cleaning polymer, ethoxylated polyamine derivative polymer, modified polyacrylate polymer, dye-transfer inhibition polymer)	1.7	1.4	0.4	0	0.5
Enzymes – chosen from the group consisting of proteases(s), amylase(s), pectate lyase(s), cellulases, lipases	0.4	0.3	1.0	0	0
Chelant(s)	0.2	1.0	0	0	0.2
Solvents	7	7.2	3.6	3.7	1.9
Structurant	0.3	0.2	0.2	0.2	0.35
Borax	3	3	2	1.3	-
Boric acid	1.5	2	2	1.5	1.5
Perfume	0.5	0.5	0.5	0.8	0.5
Buffers (sodium hydroxide, monoethanolamine)	0.5	1	2	2	3.3
Water, dyes and miscellaneous	Balance				

1. Surfactant derivatives of 4,8,12-trimethyltridecan-1-ol and 3-ethyl-7,11-dimethyldodecan-1-ol respectively, and "A+B" refers to mixtures of said surfactants.
2. Wherein A+B comprises a mixture in the ratio of 90A:10B alkyl sulfates.
3. Wherein A+B comprises a mixture in the ratio of 80A:20B alkyl E3 ethoxy sulfates
4. Wherein A+B comprises a mixture in the ratio of 80A:20B alkyldimethyl amine oxides
5. Wherein A+B comprises a mixture in the ratio of 95A: 5B alkyl E7 nonionic surfactants
6. Wherein A+B comprises a mixture in the ratio of 85A:15B alkyl sulfate type surfactants
7. Additional isoprenoid-derived Surfactant(s) E-Y-Z of the present invention where E-Y-Z is a blend of one or more surfactants v.-vii. and where E-Y-Z is an alkyl sulfate surfactant

Example 6.

Liquid Laundry Detergent

	P	Q	R
Ingredient	Wt%		
Surfactant mixture A+B of the present invention[1]	0.5[2]	1.0[3]	5.0[4]
Other isoprenoid-derived Surfactant(s) of the present invention	0	0	0
NI Surfactant	1	0	5
LAS	5	10	1
Minors (NaOH, buffersm dye, perfume), and water	Balance to 100		

1. Surfactant derivatives of 4,8,12-trimethyltridecan-1-ol and 3-ethyl-7,11-dimethyldodecan-1-ol respectively, and “A+B” refers to mixtures of said surfactants.
2. Wherein A+B comprises a mixture in the ratio of 90A:10B alkyl sulfates.
3. Wherein A+B comprises a mixture in the ratio of 95A:5B alkyl ethoxy 1.8 sulfates
4. Wherein A+B comprises a mixture in the ratio of 80A:20B alkyl ethoxy 3 sulfates

Example 7.

Liquid Hand Dishwashing Detergents

Composition	A	B
	wt%	wt%
Surfactant mixture A+B of the present invention[1]	2[2]	5[3]
Other isoprenoid-derived Surfactant(s) of the present invention	1	0
C_{12-13} Natural AE0.6S	20	0
LAS	0	10
Cosurfactant (chosen from the group consisting of linear amine oxide, SAFOL 23 AS, Lutensol XL, C11E9 NI, LAS)	2	1
Ethanol	4	0
Sodium cumene sulfonate	2.0	1.5
Polypropylene glycol 2000	1.0	0
NaCl	0.8	0.8
1,3 BAC Diamine (1,3 bis(methylamine)-cyclohexane)	0.5	0
Suds boosting polymer ((N,N-dimethylamino)ethyl methacrylate homopolymer)	0.3	0
Water	Balance	Balance

1. Surfactant derivatives of 4,8,12-trimethyltridecan-1-ol and 3-ethyl-7,11-dimethyldodecan-1-ol respectively, and “A+B” refers to mixtures of said surfactants.
2. Wherein A+B comprises a mixture in the ratio of 90A:10B alkyl sulfates.
3. Wherein A+B comprises a mixture in the ratio of 80A:20B alkyl dimethyl amine oxides

Example 8.

Hard Surface Cleaner

	A	**B**	**C**	**D**	**E**
	wt%	wt%	wt%	wt%	wt%
Surfactant mixture A+B of the present invention[1]	1.0[2]	0.5[3]	0.5[3]	0.8[4]	2.0[4]
Non-isoprenoid surfactants (chosen from among the group consisting of anionic surfactants, and nonionic surfactants)	5[5]	10[5]	10[6]	5[7]	4[7]
Inorganic cleaning agents (chosen from among the group consisting of citric acid, sodium polyphosphate, soldium silicate, sodium carbonate)	0	0-40	10-20	0-2	0-5
Solvents	0-10	0-20	0-20	0-20	0-20
Fillers and minors (perfume, dyes and other adjuncts)	Balance to 100%	Balance to 100%	Balance to 100%	Balance to 100%	Balance to 100%

1. Surfactant derivatives of 4,8,12-trimethyltridecan-1-ol and 3-ethyl-7,11-dimethyldodecan-1-ol respectively, and “A+B” refers to mixtures of said surfactants.
2. Wherein A+B comprises a mixture in the ratio of 90A:10B alkyl dimethyl amine oxides.
3. Wherein A+B comprises a mixture in the ratio of 99A:1B alkyl E7-9 nonionic surfactants
4. Wherein A+B comprises a mixture in the ratio of 80A:20B alkyl ethoxy E2 sulfate surfactants
5. Additional isoprenoid-derived Surfactant(s) E-Y-Z of the present invention where E-Y-Z is a blend of one or more surfactants v.-vii. and where E-Y-Z is an alkyl dimethyl amine oxide surfactant
6. Additional isoprenoid-derived Surfactant(s) E-Y-Z of the present invention where E-Y-Z is a blend of one or more surfactants i.-iv. and where E-Y-Z is an alkyl dimethyl amine oxide surfactant
7. Additional isoprenoid-derived Surfactant(s) E-Y-Z of the present invention where E-Y-Z is a blend of one or more surfactants v.-vii. and where E-Y-Z is an alkyl ethoxy E2 sulfate surfactants

Example 9.

Comparison of Compositions of the Present Invention – Laundry Applications

To demonstrate the superiority of blends of surfactants A and B with high levels of A, over individual surfactant A or individual surfactant B, foam volume and micellar kinetics measurements are obtained. Methods are as shown below. Alkylsulfate forms of A, B, and A+B are used for the experiment.

The surfactant systems in Table 1 are analyzed via Foam Volume method. Ingredients listed are in ppm concentration as would be common in a detergent wash water solution. Analysis conditions are in water of 103 ppm Calcium/Magnesium water hardness level (3:1 Calcium : Magnesium), 25°C, pH 7.5, 0.002M Sodium Sulfate and 25 ppm Technical Body Soil (See definition in Method section).

Table 1

	Formula A	Formula B	Formula C	Formula D
AES [1]	90 ppm	90 ppm	90 ppm	90 ppm
LAS [2]	40 ppm	40 ppm	40 ppm	40 ppm
Amine Oxide [3]	5 ppm	5 ppm	5 ppm	5 ppm
Surfonic® 24-9 [4]	6 ppm	6 ppm	6 ppm	6 ppm
Neodol® 67 AS [5]	40 ppm			
80A:20B AS [6]		40 ppm		
A AS [7]			40 ppm	
B AS [8]				40 ppm

1. Alkyl ethoxylate sulfate, sodium salt of the form C12-16 EO_2SO_3Na
2. C11-14 Alkylbenzene Sulfonic Acid, Sodium Salt
3. N,N-Dimethyldodecylamine Oxide
4. From Stepan
5. Sodium salt of branched Neodol® 67 alcohol sulfate
6. 80A:20B AS is comprised of a mixture of 80 wt% of the sodium salt of 4, 8, 12-trimethyltridecan-1-ol sulfate and 20 wt% of the sodium salt of 3-ethyl-7, 11-dimethyldodecan-1-ol sulfate as previously described.
7. A AS is the sodium salt of 4, 8, 12-trimethyltridecan-1-ol sulfate as previously described.
8. B AS is the sodium salt of 3-ethyl-7,11-dimethyldodecan-1-ol sulfate as previously described.

Table 2

Foam Volume Measures

	Formula A	Formula B	Formula C	Formula D
Foam Generation (Volume at 305 s)	175 ml	175 ml	187 ml	167 ml
Foam Stability (Volume at 500 s)	150 ml	147 ml	176 ml	149 ml

As seen in Table 2, Formula B, containing the 80A:20B AS mixture, yields the combination of high foam volume at the earlier time period and substantial foam volume dissipation at the later time period. Furthermore, Formula B closely resembles a current desirable foam profile exhibited by Formula A, which contains branched Neodol® 67 AS, a commercially available surfactant. Formula C, containing A AS, exhibits high foam volume at the earlier time period, but little foam volume dissipation at the later time period. Formula D, containing B AS, exhibits acceptable foam volume dissipation at the later time period, but low foam volume at the early time period.

Method: Foam Volume. The foam volume and foam mileage are measured by FOAMSCAN instrument manufactured by Teclis It-Concept, Longessaigne, France. The experiment is run at 25.0°C (+/- 0.5° C). A detergent solution (100 mL of concentration 200 ppm) to be tested is prepared having pH 7.5 and 4 gpg water hardness, and with 25 ppm technical body soil (composed of: coconut oil 15%, oleic acid 15%, paraffin oil 15%, olive oil 15%,cottonseed oil 15%, squalene 5%, cholesterol 5%, myristic acid 5%, palmitic acid5%, stearic acid 5%). It is mixed and aged at 60 ºC for an hour and placed into the FOAMSCAN sample chamber (a 1000 mL cylindrical transparent plastic cell). The solution is oscillated for five minutes at 1800 rpm at 3 second time interval, and continuously monitored for ten minutes to measure the time course of the foam height, via two CCD cameras. The foam volume recorded at the end of stirring is defined as the foam volume generated. The foam mileage is measured by the time course of the foam height at 5 minutes to 10 minutes. The hardness is indicated by a calculation where both calcium and magnesium values are reported as mg/L (ppm) (Ca x 2.5) + (Mg x 4.12) = Hardness in mg/L. Grains per Gallon (gpg) is Defined as 1 grain (64.8 mg) of calcium carbonate per U.S. gallon (3.79 litres), or 17.118 ppm.

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as "40 mm" is intended to mean "about 40 mm."

Every document cited herein, including any cross referenced or related patent or application, is hereby incorporated herein by reference in its entirety unless expressly excluded or otherwise limited. The citation of any document is not an admission that it is prior art with respect to any invention disclosed or claimed herein or that it alone, or in any combination with any other reference or references, teaches, suggests or discloses any such invention. Further, to the extent that any meaning or definition of a term in this document conflicts with any meaning or definition of the same term in a document incorporated by reference, the meaning or definition assigned to that term in this document shall govern.

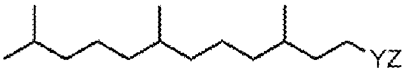
While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

CLAIMS

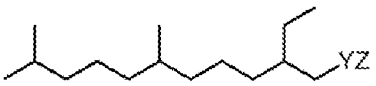
What is claimed is:

1. A detergent composition comprising

A. a surfactant system comprising a mixture of isoprenoid surfactants represented by formula A and formula B:



(A)



(B)

wherein Y is CH_2 or null and Z is selected such that the resulting surfactant is an alkyl carboxylate surfactant, an alkyl polyalkoxy surfactant, an alkyl anionic polyalkoxy sulfate surfactant, an alkyl glycerol ester sulfonate surfactant, an alkyl dimethyl amine oxide surfactant, an alkyl polyhydroxy based surfactant, an alkyl phosphate ester surfactant, an alkyl glycerol sulfonate surfactant, an alkyl polygluconate surfactant, an alkyl polyphosphate ester surfactant, an alkyl phosphonate surfactant, an alkyl polyglycoside surfactant, an alkyl monoglycoside surfactant, an alkyl diglycoside surfactant, an alkyl sulfosuccinate surfactant, an alkyl disulfate surfactant, an alkyl disulfonate surfactant, an alkyl sulfosuccinamate surfactant, an alkyl glucamide surfactant, an alkyl taurinate surfactant, an alkyl sarcosinate surfactant, an alkyl glycinate surfactant, an alkyl isethionate surfactant, an alkyl dialkanolamide surfactant, an alkyl monoalkanolamide surfactant, an alkyl monoalkanolamide sulfate surfactant, an alkyl diglycolamide surfactant, an alkyl diglycolamide sulfate surfactant, an alkyl glycerol ester surfactant, an alkyl glycerol ester sulfate surfactant, an alkyl glycerol ether surfactant, an alkyl glycerol ether sulfate surfactant, alkyl methyl ester sulfonate surfactant, an alkyl polyglycerol ether surfactant, an alkyl polyglycerol ether sulfate surfactant, an alkyl sorbitan ester surfactant, an alkyl ammonioalkanesulfonate surfactant, an alkyl amidopropyl betaine surfactant, an alkyl allylated quat based surfactant, an alkyl monohydroxyalkyl-di-alkylated quat based surfactant, an alkyl di-hydroxyalkyl monoalkyl quat based surfactant, an alkylated quat surfactant, an alkyl trimethylammonium quat surfactant, an alkyl polyhydroxalkyl oxypropyl quat based surfactant, an alkyl glycerol ester quat surfactant, an alkyl glycol amine quat surfactant, an alkyl monomethyl dihydroxyethyl quaternary ammonium surfactant, an alkyl dimethyl monohydroxyethyl quaternary ammonium surfactant, an alkyl trimethylammonium surfactant, an alkyl imidazoline-based surfactant, an alken-2-yl-succinate surfactant, an alkyl α-sulfonated carboxylic acid surfactant, an alkyl α-sulfonated carboxylic acid alkyl ester surfactant, an alpha olefin sulfonate surfactant, an alkyl phenol ethoxylate surfactant, an alkyl benzenesulfonate surfactant, an alkyl sulfobetaine surfactant, an alkyl hydroxysulfobetaine surfactant, an alkyl ammoniocarboxylate betaine surfactant, an alkyl sucrose ester surfactant, an alkyl alkanolamide surfactant, an alkyl di(polyoxyethylene) monoalkyl ammonium surfactant, an alkyl mono(polyoxyethylene) dialkyl ammonium surfactant, an alkyl benzyl dimethylammonium surfactant, an alkyl aminopropionate surfactant, an alkyl amidopropyl dimethylamine surfactant, or a mixture thereof; and from 5% to 97% of one or more non-isoprenoid surfactants; and

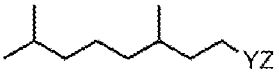
B. one or more adjunct cleaning additives.

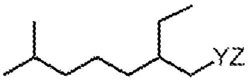
wherein the weight ratio of surfactant of formula A to surfactant of formula B is from 70:30 to 95.5:0.5, preferably from 80:20 to 99:1.

2. The detergent composition of claim 1 wherein said surfactant system comprises from 0.01 to 25% by weight of said mixture of isoprenoid surfactants.

3. The detergent composition of claim 1 wherein Z is selected such that the resulting surfactant is alkyl sulfate anionic surfactant, alkyl ethoxylate sulfate anionic surfactant, alkyl ethoxylate nonionic surfactant, alkyl benzene sulfonate surfactant, alkyl amine oxide surfactant, alkyl trimethylammonium or alkyl dimethylhydroxyethylammonium or alkyl methyl-dihydroxyethyl cationic surfactant, fatty acid soap surfactant, alkylpolyglycoside nonionic surfactant, methyl ester sulfonate anionic surfactant, alkylsulfobetaine zwitterionic surfactants, or a mixture thereof.

4. The detergent composition of claim 1 wherein said surfactant system further comprises from 2 wt% to 20 wt% of one or more isoprenoid surfactants represented by formulas i through xiii:

i.


ii.


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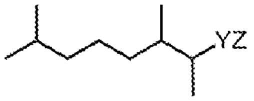

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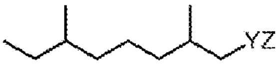
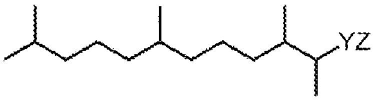
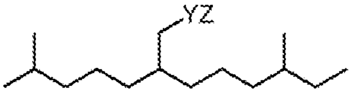
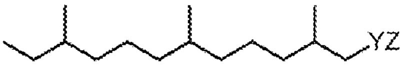
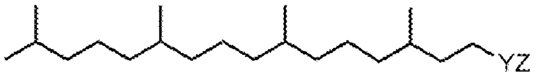
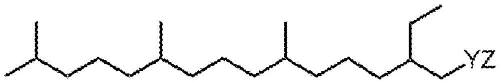


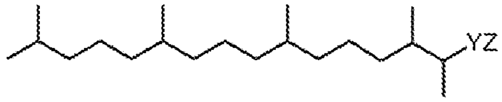
v.


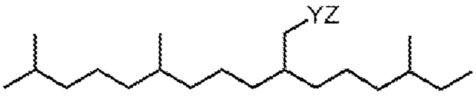
vi.


vii.


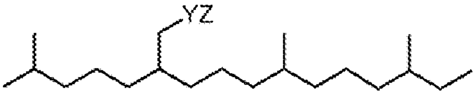
viii.


ix.


x.


xi.


xii.


xiii.


wherein Y is CH_2 or null and Z is selected such that the resulting surfactant is an alkyl carboxylate surfactant, an alkyl polyalkoxy surfactant, an alkyl anionic polyalkoxy sulfate surfactant, an alkyl glycerol ester sulfonate surfactant, an alkyl dimethyl amine oxide surfactant, an alkyl polyhydroxy based surfactant, an alkyl phosphate ester surfactant, an alkyl glycerol sulfonate surfactant, an alkyl polygluconate surfactant, an alkyl polyphosphate ester surfactant, an alkyl phosphonate surfactant, an alkyl polyglycoside surfactant, an alkyl monoglycoside surfactant, an alkyl diglycoside surfactant, an alkyl sulfosuccinate surfactant, an alkyl disulfate surfactant, an alkyl disulfonate surfactant, an alkyl sulfosuccinamate surfactant, an alkyl glucamide surfactant, an alkyl taurinate surfactant, an alkyl sarcosinate surfactant, an alkyl glycinate surfactant, an alkyl isethionate surfactant, an alkyl dialkanolamide surfactant, an alkyl monoalkanolamide surfactant, an alkyl monoalkanolamide sulfate surfactant, an alkyl diglycolamide surfactant, an alkyl diglycolamide sulfate surfactant, an alkyl glycerol ester surfactant, an alkyl glycerol ester sulfate surfactant, an alkyl glycerol ether surfactant, an alkyl glycerol ether sulfate surfactant, alkyl methyl ester sulfonate surfactant, an alkyl polyglycerol ether surfactant, an alkyl polyglycerol ether sulfate surfactant, an alkyl sorbitan ester surfactant, an alkyl ammonioalkanesulfonate surfactant, an alkyl amidopropyl betaine surfactant, an alkyl allylated quat based surfactant, an alkyl monohydroxyalkyl-di-alkylated quat based surfactant, an alkyl di-hydroxyalkyl monoalkyl quat based surfactant, an alkylated quat surfactant, an alkyl trimethylammonium quat surfactant, an alkyl polyhydroxalkyl oxypropyl quat based surfactant, an alkyl glycerol ester quat surfactant, an alkyl glycol amine quat surfactant, an alkyl monomethyl dihydroxyethyl quaternary ammonium surfactant, an alkyl dimethyl monohydroxyethyl quaternary ammonium surfactant, an alkyl trimethylammonium surfactant, an alkyl imidazoline-based surfactant, an alken-2-yl-succinate surfactant, an alkyl α-sulfonated carboxylic acid surfactant, an alkyl α-sulfonated carboxylic acid alkyl ester surfactant, an alpha olefin sulfonate surfactant, an alkyl phenol ethoxylate surfactant, an alkyl benzenesulfonate surfactant, an alkyl sulfobetaine surfactant, an alkyl hydroxysulfobetaine surfactant, an alkyl ammoniocarboxylate betaine surfactant, an alkyl sucrose ester surfactant, an alkyl alkanolamide surfactant, an alkyl di(polyoxyethylene) monoalkyl ammonium surfactant, an alkyl mono(polyoxyethylene) dialkyl ammonium surfactant, an alkyl benzyl dimethylammonium surfactant, an alkyl aminopropionate surfactant, an alkyl amidopropyl dimethylamine surfactant, or a mixture thereof.

5. The detergent composition of Claim 1 wherein said one or more adjunct cleaning additives is selected from a builder, an organic polymeric compound, an enzyme, an enzyme stabilizer, a brightener, a hueing agent, a bleach system, a chelating agent, a suds suppressor, a humectant, a perfume, a filler or carrier, an alkalinity system, a pH control system, a buffer, or a mixture thereof, preferably an enzyme.

6. The detergent composition of Claim 1, wherein said detergent composition is in the form of a granular detergent, a bar-form detergent, a liquid laundry detergent, a gel detergent, a single-phase or multi-phase unit dose detergent, a detergent contained in a single-phase or multi-phase or multi-compartment water soluble pouch, a liquid hand dishwashing composition, a laundry pretreat product, a detergent contained on or in a porous substrate or nonwoven sheet, an automatic dish-washing detergent, a hard surface cleaner, or a fabric softener composition.

7. The detergent composition of claim 1 wherein said detergent composition comprises from 0.1 wt% to 80 wt%, preferably from 5 wt% to 50 wt%, of said surfactant system.

8. The detergent composition of claim 1 wherein said non-isoprenoid surfactant is selected from C_{10}-C_{16} alkyl benzene sulfonates, alkyl sulfates, alkyl ethoxy sulfates, alkyl ethoxylates, or a mixture thereof.

9. The detergent composition of claim 1 further comprising an electrolyte.

10. The detergent composition of claim 1 wherein the detergent composition contains solid or liquid fillers or carriers in the amount of less than 50%.

11. A method of treating a surface with the detergent composition of claim 1 comprising the steps of contacting said composition with water to form a wash liquor and then contacting said surface with said wash liquor.

12. The method of claim 14 wherein said wash liquor has a temperature from 0°C to 20°C.

13. The detergent composition of claim 1 wherein said surfactant system further comprises a surfactant selected from near-terminal branched surfactants, even scattered branched surfactants, a di-hydrophobe, or a mixture thereof.

14. A detergent composition comprising

A. a cationic surfactant system comprising

i. From 0.01 to 25% of a blend of one or more polyalkyl isoprenoid based surfactants having the structure

$$(T\text{-}U)_jV$$

wherein:

V is a polyhydroxy moiety, a sucrose moiety, a mono-, di-, oligo-, or polysaccharide moiety, a polyglycerol moiety, a polyglycol moiety, a dialkyl ammonium moiety, a dimethylammonium moiety, or a gemini surfactant spacer moiety;

U is either absent or is selected from $-CO_2-$, $-CO_2CH_2CH_2-$, or a gemini surfactant polar or charged moiety where, wherein if either U or V is a charged moiety, the charged moiety is charge balanced by a suitable counterion;

T is one or more isoprenoid-derived hydrophobe moieties of A and B, j ranges from 2 to 10, and wherein the ratio of total A moieties to total B moieties ranges from 70:30 to 95.5:0.5, and

B. one or more adjunct additives.

15. The detergent composition according to Claim 18 wherein said blend of one or more polyalkyl isoprenoid based surfactant comprises at least one of the following structures: