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(54) **Detergent compositions containing mixture of alkylpolysaccharide and amine oxide surfactants and fatty acid soap.**

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EP-A- 0 070 074
EP-A- 0 070 075
EP-A- 0 070 076
EP-A- 0 070 077
DE-A- 2 732 734

(56) References cited :
DE-B- 593 422
US-A- 3 219 656
US-A- 3 721 633
US-A- 3 772 269
US-A- 3 867 301
US-A- 4 070 309
US-A- 4 230 592
US-A- 4 247 424
Chemiker Zeitung, 99. Jahrgang, April 1975, No.4, pp. 168-173

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Description

This invention relates to liquid surfactant combinations which provide good laundry detergency and, optionally, suds control and/or corrosion inhibition. Such compositions can be built or unbuilt and can contain the usual auxiliary ingredients common to such compositions.

Alkylpolyglucosides which are surfactants have been disclosed in U.S. Patents 3,598,865, 3,721,633 and 3,772,269. These patents also disclose processes for making alkylpolyglucoside surfactants and built liquid detergent compositions containing these surfactants. U.S. Patent 3,219,656 discloses alkylmonoglucosides and suggest their utility as foam stabilisers for other surfactants. Various polyglucoside surfactant structures and processes for making them are disclosed in U.S. Patents 2,974,134, 3,640,998, 3,839,318, 3,314,936, 3,346,558, 4,011,389 and 4,223,129.

Built detergent compositions containing aliylpolysaccharide surfactants are also disclosed in copending published EP-A-075995 and EP-A-0075996.

All percentages, parts and ratios used herein are by weight unless otherwise specified.

This invention relates to the discovery of certain combinations of surfactants which provide unusually good detergency, especially in cool water, for a variety of fabric types. Specifically this invention relates to liquid laundry detergent compositions comprising:

A. from 1% to 20%, preferably from 4% to 10% by weight, of an alkylpolyglucoside detergent surfactant having the formula $R^2O(C_nH_{2n}O)_t(\text{glucosyl})_x$ wherein R^2 is alkyl that contains from 12 to 18, preferably from 12 to 14 carbon atoms; n is 2 or 3, preferably 2; t is from 0 to 10, preferably 0; and x is from 1½ to 3, most preferably from 1.6 to 2.7.

B. from 1% to 10%, preferably from 2% to 6%, by weight, of an amine oxide detergent surfactant;

C. from 1% to 10%, preferably from 1% to 6%, by weight, of a water-soluble soap which has an unsaturated straight chain of from 16 to 22 carbon atoms;

D. from 0% to 40%, preferably from 10% to 30%, by weight, of a water-soluble detergency builder, preferably selected from the group consisting of pyrophosphates, nitrilotriacetates, and mixtures thereof;

E. from 0% to 10%, preferably from 0% to 5%, by weight, of water-soluble synthetic anionic detergent surfactant; and

F. up to 80% by weight of water.

Such detergent compositions can be formulated as flowing liquids and inhibit scum formation and provide excellent detergency, do not damage washing machines unacceptably, and can be formulated to provide different sudsing patterns by varying the amount and types of synthetic anionic detergent surfactant and the amount of unsaturated soap. Preferably such formulae do not contain more than 5% conventional ethoxylated non-ionic surfactants. Sodium, potassium, ammonium and alkanolammonium cations are preferred.

It has surprisingly been found that the cosurfactants interact with the alkylpolyglucoside surfactant to provide good laundry detergency for a wide range of fabrics. The alkylpolyglucosides are those having a hydrophobic alkyl group containing from 12 to 18 carbon atoms, preferably from 12 to 16 carbon atoms and a a polyglucoside hydrophilic group containing from 1½ to 3, most preferably from 1.6 to 2.7 glucoside units. Optionally the hydrophobic group is attached at the 2, 3, 4, etc., positions thus giving a glucose as opposed to a glucoside. The intersaccharide bonds can be, e.g., between the one position of the additional glucoside units and the 2-, 3-, 4-, and/or 6 positions on the preceding glucoside units. The glucoside is usually derived from glucose.

Optionally, and less desirably, there can be a polyalkoxide chain joining the hydrophobic moiety and the polyglucoside moiety. The preferred alkoxide is ethylene oxide. Typical hydrophobic groups include alkyl groups, either saturated or unsaturated, branched or unbranched containing from 8 to 18, preferably from 10 to 16 carbon atoms. Preferably, the alkyl group is a straight chain saturated alkyl group. The alkyl group can contain up to 3 hydroxy groups and/or the polyalkoxide chain can contain up to 10, preferably less than 5, most preferably 0 alkoxide moieties. Suitable alkyl polyglucosides are tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, and octadecyl, di- and tri-glucosides, or- glucoses. Suitable mixtures include coconut alkyl, di- and tri-glucosides.

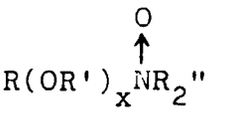
The glucosyl is preferably derived from glucose. To prepare compounds the alcohol or alkylpolyethoxy alcohol is formed first and then reacted with glucose, or a source of glucose, to form the glucoside (attachment at the 1-position). The additional glucosyl units are attached between their 1-position and the preceding glucosyl units 2-, 3-, 4- and/or 6- position, preferably predominately the 2-position.

Preferably the content of alkylmonoglucoside is low, preferably less than 60%, more preferably less than 50%.

Suitable water-soluble amine oxides containing one alkyl moiety of from 10 to 18 carbon atoms and 2 moieties selected from the group consisting of alkyl groups and hydroxyalkyl groups containing from 1 to 3 carbon atoms; water-soluble phosphine oxides containing one alkyl moiety of 10 to 18 carbon atoms and 2 moieties

selected from the group consisting of alkyl groups and hydroxyalkyl group containing from 1 to 3 carbon atoms; and water-soluble sulfoxides containing one alkyl moiety of from 10 to 18 carbon atoms and a moiety selected from the group consisting of alkyl and hydroxyalkyl moieties of from 1 to 3 carbon atoms.

Preferred semi-polar nonionic detergent surfactants are the amine oxide detergent surfactants having the formula



wherein R is an alkyl, hydroxy alkyl, or alkyl phenyl group or mixtures thereof containing from 10 to 18 carbon atoms, R′ is an alkylene or hydroxy alkylene group containing from 2 to 3 carbon atoms or mixtures thereof, x is from 0 to 2 and each R″ is an alkyl or hydroxy alkyl group containing from 1 to 3 carbon atoms or a polyethylene oxide group containing from one to 3 ethylene oxide groups and said R″ groups can be attached to each other, e.g., through an oxygen or nitrogen atom to form a ring structure.

Preferred amine oxide detergent surfactants are C_{10-18} alkyl dimethyl amine oxide, C_{8-18} alkyl dihydroxy ethyl amine oxide, and C_{8-12} alkoxy ethyl dihydroxy ethyl amine oxide.

The Unsaturated Soap

The unsaturated fatty acid soap contains from 16 to 22 carbon atoms, preferably in a straight chain configuration. Preferably the number of carbon atoms in the unsaturated fatty acid soap is from 16 to 18.

The unsaturated soap, in common with other anionic detergent and other anionic materials in the detergent compositions of this invention, has a cation which renders the soap water-soluble and/or dispersible. Suitable cations include sodium, potassium, ammonium, monoethanolammonium, diethanolamonium, triethanolammonium or tetramethylammonium cations. Sodium ions are preferred although in liquid formulations ammonium, and triethanolammonium cations are useful.

A level of at least 1% of the unsaturated fatty acid soap is desirable to provide a noticeable reduction in sudsing and corrosion. Preferred levels of unsaturated fatty acid soap are from 1% to 10%, most preferably from 2% to 5%. The unsaturated fatty acid soap is preferably present at a level that will provide a level of from 15 ppm to 200 ppm, preferably from 25 ppm to 125 ppm to 125 ppm in the wash solution at recommended U.S. usage levels and from 30 ppm to 1000 ppm, preferably from 50 ppm to 500 ppm for European usage levels.

Mono-, di-, and triunsaturated fatty acids are all essentially equivalent so it is preferred to use mostly monounsaturated soaps to minimize the risk of rancidity. Suitable sources of unsaturated fatty acids are well known. For example, see Bailey's Industrial Oil and Fat Products, Third Edition, Swern, published by interscience Publisher (1964).

Preferably, the level of saturated soaps is kept as low as possible, preferably less than 60%, preferably less than 50% of the total soap is saturated soap. However, low levels of saturated soaps can be used. Tallow and palm oil soaps can be used.

Useful synthetic anionic surfactants also include the water-soluble salts, preferably the alkali metal, ammonium and alkylolammonium salts, of organic sulfuric reaction products having in their molecular structure an alkyl group containing from 10 to 20 carbon atoms and a sulfonic acid of sulfuric acid ester group.

Such synthetic anionic detergent surfactants are desirable additives at a level of from 1% to 10% to increase the overall detergency effect and, if desired, increase the level of suds. (Included in the term "alkyl" is the alkyl portion of acyl groups.) Examples of this group of synthetic surfactants are the sodium and potassium alkyl sulfates, especially those obtained by sulfating the higher alcohols (C_8-C_{18} carbon atoms) such as those produced by reducing the glycerides of tallow or coconut oil; and the sodium and potassium alkylbenzene sulfonates in which the alkyl group contains from 9 to 15 carbon atoms, in straight chain or branched chain configuration, e.g., those of the type described in U.S. Pats. 2,220,099 and 2,477,383. Especially valuable are linear straight chain alkylbenzene sulfonates in which the average number of carbon atoms in the alkyl group is from 11 to 13, abbreviated as C_{11-13} LAS.

Preferred anionic detergent surfactants are the alkyl polyethoxylate sulfates, particularly those in which the alkyl contains from 10 to 22 carbon atoms, preferably from 12 to 18 and wherein the polyethoxylate chain contains from 1 to 15 ethoxylate moieties preferably from 1 to 3 ethoxylate moieties. These anionic detergent surfactants are particularly desirable for formulating heavy-duty liquid laundry detergent compositions.

Other anionic surfactants herein are the sodium alkyl glyceryl ether sulfonates, especially those ethers of

higher alcohols derived from tallow and coconut oil; sodium coconut oil fatty acid monoglyceride sulfonates and sulfonates; sodium or potassium salts of alkyl phenol ethylene oxide ether sulfates containing from 1 to 10 units of ethylene oxide per molecule and wherein the alkyl groups contain from 8 to 12 carbon atoms; and sodium or potassium salts of alkyl ethylene oxide ether sulfates containing 1 to 10 units of ethylene oxide per molecule and wherein the alkyl group contains from 10 to 20 carbon atoms.

Other useful anionic surfactants herein include the water-soluble salts of esters of alpha-sulfonated fatty acid containing from 6 to 20 carbon atoms in the fatty acid group and from 1 to 10 carbon atoms in the ester group; water-soluble salts of 2-acyloxy-alkane-1-sulfonic acids containing from 2 to 9 carbon atoms in the acyl group and from 9 to 23 carbon atoms in the alkane moiety; alkyl ether sulfates containing from 10 to 20 carbon atoms in the alkyl group and from 1 to 30 moles of ethylene oxide; water-soluble salts of olefin sulfonates containing from 12 to 24 carbon atoms; and beta-alkyloxy alkane sulfonates containing from 1 to 3 carbon atoms in the alkyl group and from 8 to 20 carbon atoms in the alkane moiety.

The detergent compositions herein also contain from 0% to 40%, preferably from 5% to 40%, and more preferably from 10% to 30% of a detergent builder.

Examples of detergency builders include water-soluble neutral or alkaline salts.

Useful water-soluble salts include the compounds commonly known as detergent builder materials. Builders are generally selected from the various water-soluble, alkali metal, ammonium or substituted ammonium phosphates, polyphosphates, phosphonates, polyphosphonates, carbonates, silicates, borates, polyhydroxysulfonates, polyacetates, carboxylates, and polycarboxylates. Preferred are the alkali metal, especially sodium, salts of the above.

Specific examples of inorganic phosphate builders are sodium and potassium tripolyphosphate, pyrophosphate, polymeric metaphate having a degree of polymerization of from 6 to 21, and orthophosphate. Examples of polyphosphonate builders are the sodium and potassium salts of ethylene-1,1-diphosphonic acid, the sodium and potassium salts of ethane 1-hydroxy-1,1-diphosphonic acid and the sodium and potassium salts of ethane, 1,1,2-triphosphonic acid. Other phosphorus builder compounds are disclosed in U.S. Patents 3,159,581; 3,213,030; 3,422,021; 3,422,137; 3,400,176 and 3,400,148.

Examples of nonphosphorus, inorganic builders are sodium and potassium carbonate, bicarbonate, sesquicarbonate, tetraborate decahydrate, and silicate having a molar ratio of SiO_2 to alkali metal oxide of from 0.5 to 4.0, preferably from 1.0 to 2.4.

Water-soluble, nonphosphorus organic builders useful herein include the various alkali metal, ammonium and substituted ammonium polyacetates, carboxylates, polycarboxylates and polyhydroxysulfonates. Examples of polyacetate and polycarboxylate builders are the sodium, potassium, lithium, ammonium and substituted ammonium salts of ethylenediamine tetraacetic acid, nitrilotriacetic acid, oxydisuccinic acid, mellitic acid, benzene polycarboxylic acids, and citric acid.

Highly preferred polycarboxylate builders herein are set forth in U.S. Patent No. 3,308,067, Diehl, issued March 7, 1967. Such materials include the water-soluble salts of homo- and copolymers of aliphatic carboxylic acids such as maleic acid, itaconic acid, mesaconic acid, fumaric acid, aconitic acid, citraconic acid and methylenemalonic acid.

Other builders include the carboxylated carbohydrates of U.S. Patent 3,723,322, Diehl.

Other useful builders herein are sodium and potassium carboxymethyloxymalonate, carboxymethyloxysuccinate, cis-cyclohexanehexacarboxylate, cis-cyclopentanetetracarboxylate phloroglucinol trisulfonate, water-soluble polyacrylates (having molecular weights of from 2,000 to 200,000 for example), and the copolymers of maleic anhydride with vinyl methyl ether or ethylene.

Other suitable polycarboxylates for use herein are the polyacetal carboxylates described in U.S. Pat. 4,144,226, issued March 13, 1979 to Crutchfield et al, and U.S. Pat. 4,246,495, issued March 27, 1979 to Crutchfield et al. These polyacetal carboxylates can be prepared by bringing together under polymerization conditions an ester of glyoxylic acid and a polymerization initiator. The resulting polyacetal carboxylate ester is then attached to chemically stable end groups to stabilize the polyacetal carboxylate against rapid depolymerization in alkaline solution, converted to the corresponding salt, and added to a surfactant.

Other detergency builder materials useful herein are the "seeded builder" compositions disclosed in Belgian Patent No. 798,856, issued Oct. 29, 1973. Specific examples of such seeded builder mixtures are: 3:1 wt. mixtures of sodium carbonate and calcium carbonate having 5 micron particle diameter; 2.7:1 wt. mixtures of sodium sesquicarbonate and calcium carbonate having a particle diameter of 0.5 μm; 20:1 wt. mixtures of sodium sesquicarbonate and calcium hydroxide having a particle diameter of 0.01 μm; and a 3:3:1 wt. mixture of sodium carbonate, sodium aluminate and calcium oxide having a particle diameter of 5 μm.

Nonionic Surfactant

Ethoxylated nonionic surfactants, including those having an HLB of from 5 to 17, are well known in the detergency art. They can be included in the compositions of the present invention together with the, e.g., alkylpolyglycoside surfactants defined hereinbefore. They may be used singly or in combination with one or more of the preferred alcohol ethoxylate nonionic surfactants, described below, to form nonionic surfactant mixtures useful in combination with the alkylpolyglycosides. Examples of such surfactants are listed in U.S. Pat. No. 3,717,630, Booth, issued Feb. 20, 1973, and U.S. Pat. No. 3,332,880, Kessler et al, issued July 25, 1967. Nonlimiting examples of suitable ethoxylated nonionic surfactants wich may be used in the present invention are as follows:

(1) The polyethylene oxide condensates of alkyl phenols. These compounds include the condensation products of alkyl phenols having an alkyl group containing from 6 to 12 carbon atoms in either a straight chain or branched chain configuration with ethylene oxide, said ethylene oxide being present in an amount equal to 5 to 25 moles of ethylene oxide per mole of alkyl phenol. The alkyl substituent in such compounds can be derived, for example, from polymerized propylene or diisobutylene. Examples of compounds of this type include nonyl phenol condensed with 9.5 moles of ethylene oxide per mole of nonyl phenol; dodecylphenol condensed with 12 moles of ethylene oxide per mole of phenol; dinonyl phenol condensed with 15 moles of ethylene oxide per mole of phenol; and diisooctyl phenol condensed with 15 moles of ethylene oxide per mole of phenol. Commercially available nonionic surfactants of this type include Igepal® CO-630, marketed by the GAF Corporation, and Titron® X-45, X-114, X-100, and X-102, all marketed by the Rohm & Haas Company.

(2) The condensation products of aliphatic alcohols with from 1 to 25 moles of ethylene oxide. The alkyl chain of the aliphatic alcohol can either be straight or branched, primary or secondary, and generally contains from 8 to 22 carbon atoms. Examples of such ethoxylated alcohols include the condensation product of myristyl alcohol condensed with 10 moles of ethylene oxide per mole of alcohol; and the condensation product of 9 moles of ethylene oxide with coconut alcohol (a mixture of fatty alcohols with alkyl chains varying in length from 10 to 14 carbon atoms). Examples of commercially available nonionic surfactants in this type include Tergitol® 15-S-9, marketed by Union Carbide Corporation, Neodol 45-9, Neodol® 23-6.5, Neodol® 45-7, and Neodol® 45-4, marketed by Shell Chemical Company, and Kyro EOB®, marketed by the Procter & Gamble Company.

(3) The condensation products of ethylene oxide with a hydrophobic base formed by the condensation of propylene oxide with propylene glycol. The hydrophobic portion of these compounds has a molecular weight of from 1500 to 1800 and exhibits water insolubility. The addition of polyoxyethylene moieties to this hydrophobic portion tends to increase the water solubility of the molecule as a whole, and the liquid character of the product is retained up to the point where the polyoxyethylene content is 50% of the total weight of the condensation product, which corresponds to condensation with up to 40 moles of ethylene oxide. Examples of compounds of this type include certain of the commercially available Pluronic® surfactants, marketed by Wyandotte Chemical Corporation.

(4) The condensation products of ethylene oxide with the product resulting from the reaction of propylene oxide and ethylenediamine. The hydrophobic moiety of these products consists of the reaction product of ethylenediamine and excess propylene oxide, said moiety having a molecular weight of from 2500 to 3000. This hydrophobic moiety is condensed with ethylene oxide to the extent that the condensation product contains from 40% to 80% by weight of polyoxyethylene and has a molecular weight of from 5,000 to 11,000. Examples of this type of nonionic surfactant include certain of the commercially available Tetronic® compounds, marketed by Wyandotte Chemical Corporation.

Nonionic detergent surfactants (1)-(4) are conventional ethoxylated nonionic detergent surfactants.

Preferred alcohol ethoxylate nonionic surfactants for use in the compositions of the present invention are biodegradable and have the formula

$$R^8(OC_2H_4)_nOH,$$

wherein R^8 is a primary or secondary alkyl chain of from 8 to 22, preferably from 10 to 20, carbon atoms and n is an average of from 2 to 12, particularly from 2 to 9. The nonionics have an HLB (hydrophiliclipophilic balance) of from 5 to 17, preferably from 6 to 15. HLB is defined in detail in Nonionic Surfactants, by M. J. Schick, Marcel Dekker, Inc., 1966, pages 606-613. In preferred nonionic surfactants, n is from 3 to 7. Primary linear alcohol ethoxylates (e.g., alcohol ethoxylates produced from organic alcohols which contain 20% 2-methyl branched isomers, commercially available from Shell Chemical Company under the tradename Neodol) are preferred from a performance standpoint.

Particularly preferred nonionic surfactants for use in the compositions of the present invention include the condensation product of C_{10} alcohol with 3 moles of ethylene oxide; the condensation product of tallow alcohol

with 9 moles of ethylene oxide; the condensation product of coconut alcohol with 5 moles of ethylene oxide; the condensation product of coconut alcohol with 6 moles of ethylene oxide; the condensation product of C_{12} alcohol with 5 moles of ethylene oxide; the condensation product of C_{12-13} alcohol with 6.5 moles of ethylene oxide, and the same condensation product which is stripped so as to remove substantially all lower ethoxylate and nonethoxylated fractions; the condensation product of C_{12-13} alcohol with 2.3 moles of ethylene oxide, and the same condensation product which is stripped so as to remove substantially all lower ethoxylate and nonethoxylated fractions; the condensation product of C_{12-13} alcohol with 9 moles of ethylene oxide; the condensation product of C_{14-15} alcohol with 2.25 moles of ethylene oxide; the condensation product of C_{14-15} alcohol with 4 moles of ethylene oxide; the condensation product of C_{14-15} alcohol with 7 moles of ethylene oxide; and the condensation product of C_{14-15} alcohol with 9 moles of ethylene oxide.

The compositions of the present invention may contain mixtures of the preferred alcohol ethoxylate nonionic surfactants together with other types of ethoxylated nonionic surfactants. One of the preferred nonionic surfactant mixtures contains at least one of the preferred alcohol ethoxylate nonionics, and has a ratio of the preferred alcohol ethoxylate surfactant (or surfactants) to the other nonionic surfactant (or surfactants) of from 1:1 to 5:1. Specific examples of surfactant mixtures useful in the present invention include a mixture of the condensating product of C_{14-15} alcohol with 3 moles of ethylene oxide (Neodol® 45-3) and the condensation product of C_{14-15} alcohol with 9 moles of ethylene oxide (Neodol® 45-9), in a ratio of lower ethoxylate nonionic to higher ethoxylate nonionic of from 1:1 to 3:1; a mixture of the condensation product of C_{10} alcohol with 3 moles of ethylene oxide together with the condensation product of a secondary C_{15} alcohol with 9 moles of ethylene oxide (Tergitol® 15-S-9), in a ratio of lower ethoxylate nonionic to higher ethoxylate nonionic of from 1:1 to 4:1; a mixture of Neodol® 45-3 and Tergitol® 15-S-9, in a ratio of lower ethoxylate nonionic to higher ethoxylate nonionic of from 1:1 to 3:1; and a mixture of Neodol 45-3 with the condensation product of myristyl alcohol with 10 moles of ethylene oxide, in a ratio of lower ethoxylate to higher ethoxylate of from 1:1 to 3:1.

Preferred nonionic surfactant mixtures may also contain alkyl glyceryl ether compounds together with the preferred alcohol ethoxylate surfactants. Particularly preferred are glyceryl ethers having the formula

$$R^9\text{-}O(CH_2CH_2O)_nCH_2\underset{\underset{OH}{|}}{C}HCH_2OH$$

wherein R^9 is an alkyl or alkenyl group of from 8 to 18, preferably 8 to 12, carbon atoms or an alkaryl group having from 5 to 14 carbons in the alkyl chain, and n is from 0 to 6, together with the preferred alcohol ethoxylates, described above, in a ratio of alcohol ethoxylate to glyceryl ether of from 1:1 to 4:1, particularly 7:3. Glyceryl ethers of the type useful in the present invention are disclosed in U.S. Pat. No. 4,098,713, Jones, issued July 4, 1978.

The ratio of alkylpolyglycoside detergent surfactant to nonionic detergent surfactant is from 10:1 to 1:10, preferably from 3:1 to 1:3.

Other co-surfactants

In addition to the detergent surfactants described hereinbefore, the detergent compositions herein contain from 1% to 15%, preferably from 2% to 8%, of an organic surfactant selected from the group consisting of zwitterionic, ampholytic, and cationic surfactants, and mixtures thereof. Surfactants useful herein are listed in U.S. Pat. 3,664,961, Norris, issued May 23, 1972, and U.S. Pat. 3,919,678, Laughlin et al, issued Dec. 30, 1975. Useful cationic surfactants also include those described in U.S. Pat. 4,222,905, Cockrell, issued Sept. 16, 1980, and in U.S. Pat. 4,239,659, Murphy, issued Dec. 16, 1980. The following are representative examples of surfactants useful in the present compositions.

Ampholytic surfactants include derivatives of aliphatic or aliphatic derivatives of heterocyclic secondary and tertiary amines in which the aliphatic moiety can be straight chain or branched and wherein one of the aliphatic substituents contains from 8 to 18 carbon atoms and at least one aliphatic substituent contains an anionic water-solubilizing group.

Zwitterionic surfactants include derivatives of aliphatic quaternary ammonium, phosphonium, and sulfonium compounds in which one of the aliphatic substituents contains from 8 to 18 carbon atoms.

Particularly preferred auxiliary surfactants herein include linear alkylbenzene sulfonates containing from 11 to 14 carbon atoms in the alkyl group; tallowalkyl sulfates; coconutalkyl glyceryl ether sulfonates; alkyl ether sulfates wherein the alkyl moiety contains from 14 to 18 carbon atoms and wherein the average degree of ethox-

ylation is from 1 to 4; olefin or paraffin sulfonates containing from 14 to 16 carbon atoms; and alkyldimethylammonium propane sulfonates and alkyldimethylammonium hydroxy propane sulfonates wherein the alkyl group contains from 14 to 18 carbon atoms.

Specific preferred surfactants for use herein include: sodium, potassium, mono-, di-, and triethanolammonium C_{14-15} alkyl polyethoxylate$_{1-3}$ sulfates; sodium linear C_{11-13} alkylbenzene sulfonate; triethanolamine C_{11-13} alkylbenzene sulfonate; sodium tallow alkyl sulfate; sodium coconut alkyl glyceryl ether sulfonate; the sodium salt of a sulfated condensation product of a tallow alcohol with 4 moles of ethylene oxide; 3-(N,N-dimethyl-N-coconutalkylammonio)-2hydroxypropane-1-sulfonate; 3-(N,N-dimethyl-N-coconutalkylammoniopropane-1-sulfonate; 6-(N-dodecylbenzyl-N,N-dimethylammonio)-hexanoate; and coconut alkyldimethyl amine oxide.

Other adjunct components which may be included in the compositions of the present invention, in their conventional art-established levels for use (i.e., from 0 to 90%), include solvents, bleaching agents, bleach activators, soil-suspending agents, corrosion inhibitors, dyes, fillers, optical brighteners, germicides, pH adjusting agents (monoethanolamine, sodium carbonate, sodium hydroxide), enzymes, enzyme-stabilizing agents, perfumes, fabric softening components or static control agents.

Fatty acid amide detergent surfactants useful herein include those having the formula:

$$R^6-\overset{\overset{O}{\|}}{C}-NR^7_2$$

wherein R^6 is an alkyl group containing from 7 to 21 (preferably from 9 to 17) carbon atoms and each R^7 is selected from the group consisting of hydrogen, C_{1-4} alkyl, C_{1-4} hydroxy alkyl, and $-(C_2H_4O)_xH$ where x varies from 1 to 3.

Preferred amides are C_{8-20} ammonia amides, monoethanolammonium, diethanolamides, and isopropanol amides.

The compositions of the present invention can be used in the current U.S. laundering processes by forming aqueous solution containing from 0.01% to 1%, preferably from 0.05% to 0.5%, and most preferably from 0.05% to 0.25% of the composition in water and agitating the soiled fabrics in that aqueous solution. The fabrics are then rinsed and dried. When used in this manner the preferred compositions of the present invention yield exceptionally good detergency on a variety of fabrics.

The compositions of the invention provide excellent detergency, do not damage washing machines unacceptably, and can be formulated to provide different sudsing patterns by varying the amount and types of synthetic anionic detergent surfactant and the amount of unsaturated soap. Preferably such formulas do not contain more than 5% conventional ethoxylated nonionic surfactants. Sodium, potassium, ammonium, and alkanolammonium cations are preferred.

All percentages, parts, and ratios herein are by weight unless otherwise specified.

The following examples illustrate the compositions of the present invention.

EXAMPLE I

Combinations of alkyl polyglucosides and semi-polar nonionic and/or amide detergent surfactants are compatible with unsaturated soap, but not with saturated soap.

Formula	1	2	3	4	5
C_{12-13} alkylpolyglycoside$_{2-3}$	7.3	7.3	7.3	7.3	7.3
C_{12-15} alkyldimethylamine oxide	3.3	3.3	3.3	3.3	3.3
Sodium oleate	2.2	-	-	-	4.4

Sodium tallowate	-	2.2	-	-	-
Sodium stearate	-	-	4.4	-	-
Sodium C_{14-15} alkyl polyethoxylate 2.25 sulfate	1.45	1.45	-	2.9	-
Coconut diethanolamide	0.13	0.13	0.25	0.13	0.25
Sodium nitrilotriacetate	18.2	18.2	18.2	18.2	18.2
Sodium carbonate	2.8	2.8	2.8	2.8	2.8
Sodium toluene sulfonate	2	2	2	2	2
Ethyl alcohol	3	3	3	3	3
Water	Balance				

Compositions 1-3 and 5 were lower sudsing than formula 4 and were more compatible with washing machine surfaces (less corrosive). Composition 3 formed an unsightly soap scum in the rinse water despite the presence of materials known to inhibit formation of such scums. Composition 3 also formed a thick gel rather than a free flowing, clear liquid. It is clear that there must not be a substantial excess of saturated soap over unsaturated. The soap must be at least about 40% unsaturated soap.

It has additionally been discovered that the performance of these compositions is improved if the total free fatty alcohol containing from 8 to 20 carbon atoms is less than 5%, preferably less than 2%, most preferably less than 1%.

Claims

1. A liquid laundry detergent composition comprising:
   from 1% to 20% by weight, of an alkylpolyglucoside detergent surfactant having the formula $R^2O(C_nH_{2n}O)_t(\text{glucosyl})_x$ wherein R^2 is alkyl that contains
   from 12 to 18 carbon atoms, n is 2 or 3, t is 0 to 10 and x is a number from 1.5 to 3;
   from 0% to 40% by weight, of a water-soluble detergency builder, and mixtures thereof;
   from 0% to 10% by weight, of a water-soluble synthetic anionic detergent surfactant;
   up to 80% by weight of water;
   from 1% to 10% by weight, of an amine oxide detergent surfactant; and
   from 1% to 10% by weight of a water soluble soaps which has an unsaturated straight chain of from 16 to 22 carbon atoms.

2. The composition of claim 1 wherein the amine oxide detergent surfactant has the formula

$$R(OR')_x\overset{\overset{O}{\uparrow}}{N}R_2''$$

wherein R is an alkyl, hydroxy alkyl, or alkyl phenyl group or mixtures thereof containing from 10 to 18 carbon atoms, R′ is an alkylene or hydroxy alkylene group containing from 2 to 3 carbon atoms or mixtures thereof, x is from 0 to 2 and each R″ is an alkyl or hydroxy alkyl group containing from 1 to 3 carbon atoms or a polyethylene oxide group containing from one to 3 ethylene oxide groups and said R″ groups can be attached to each other through an oxygen or nitrogen atom to form a ring structure.

3. The composition of claim 2 containing from 10% to 30% by weight of a detergency builder selected from the group consisting of pyrophosphates, nitrilotriacetates, citrates, polymeric polycarboxylates, and carbonates.

4. The composition of claim 2 containing essentially no detergency builder.

5. The composition of claim 2 wherein R in the alkylpolyglycoside detergent surfactant is an alkyl group containing from 12 to 16 carbon atoms.

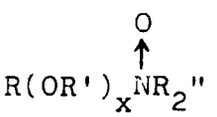
6. The composition of claim 5 wherein the cation of the unsaturated fatty acid soap is selected from the group consisting of sodium, potassium, ammonium, monoethanolammonium, diethanolammonium, triethanolammonium, and mixtures thereof.

7. The composition of claims 2 or 5 wherein the unsaturated fatty aid soap is an oleate.

Patentansprüche

1. Flüssige Wäschewaschdetergenszusammensetzung, enthaltend:
   1 Gew.-% bis 20 Gew.-% eines Alkylpolyglucosiddetergens-grenzflächenaktiven Mittels der Formel $R^2O(C_nH_{2n}O)_t(Glucosyl)_x$, worin R^2 Alkyl mit 12 bis 18 Kohlenstoffatomen darstellt, n 2 oder 3 ist, t von 0 bis 10 beträgt, und x eine Zahl von 1,5 bis 3 ist;
   0 Gew.-% bis 40 Gew.-% eines wasserlöslichen Detergensgerüststoffes, und von Mischungen davon;
   0 Gew.-% bis 10 Gew.-% eines wasserlöslichen synthetischen anionischen Detergens-grenzflächenaktiven Mittels;
   bis zu 80 Gew.-% Wasser;
   1 Gew.-% bis 10 Gew.-% eines Aminoxiddetergens-grenzflächenaktiven Mittels; und
   1 Gew.-% bis 10 Gew.-% einer wasserlöslichen Seife, welche eine ungesättigte gerade Kette mit 16 bis 22 Kohlenstoffatomen besitzt.

2. Die Zusammensetzung des Anspruchs 1, wobei das Aminoxiddetergens-grenzflächenaktive Mittel die Formel



hat, worin R eine Alkyl-, Hydroxyalkyl- oder Alkylphenylgruppe, oder Mischungen davon, enthaltend 10 bis 18 Kohlenstoffatome, ist, R′ eine Alkylen- oder Hydroxyalkylengruppe mit 2 bis 3 Kohlenstoffatomen, oder Mischungen davon, ist, x 0 bis 2 ist, und jedes R″ eine Alkyl- oder Hydroxyalkylgruppe mit 1 bis 3 Kohlenstoffatomen oder eine Polyethylenoxidgruppe mit 1 bis 3 Ethylenoxidgruppen ist, und die genannten R″-Gruppen aneinander über ein Sauerstoff- oder Stickstoffatom unter Bildung einer Ringstruktur gebunden sein können.

3. Die Zusammensetzung des Anspruchs 2, enthaltend 10 Gew.-% bis 30 Gew.-% eines Detergensgerüststoffes, der aus der Gruppe ausgewählt ist, welche aus Pyrophosphate, Nitrilotriacetaten, Citraten, polymeren Polycarboxylaten und Carbonaten besteht.

4. Die Zusammensetzung des Anspruchs 2, welche im wesentlichen keinen Detergensgerüststoff enthält.

5. Die Zusammensetzung des Anspruchs 2, wobei R in dem Alkylpolyglycosiddetergens-grenzflächenaktiven Mittel eine 12 bis 16 Kohlenstoffatome enthaltende Alkylgruppe ist.

6. Die Zusammensetzung des Anspruchs 5, wobei das Kation der ungesättigten Fettsäureseife aus der Gruppe ausgewählt ist, die aus Natrium, Kalium, Ammonium, Monoethanolammonium, Diethanolammonium, Triethanolammonium besteht.

7. Die Zusammensetzung des Anspruchs 2 oder 5, wobei die ungesättigte Fettsäureseife eine Oleat ist.

Revendications

1. Composition détergente liquide de blanchissage comprenant:

1 à 20 % en poids d'un tensio-actif détergent à base d'alkylpolyglucoside ayant pour formule $R^2O(C_nH_{2n}O)_t$(glucosyle)$_x$ dans laquelle R^2 est un groupe alkyle qui contient 12 à 18 atomes de carbone, n est égal à 2 ou 3, t est égal à 0 à 10 et x est un nombre de 1,5 à 3;

0 à 40 % en poids d'un adjuvant détergent soluble dans l'eau et de mélanges de ce dernier;

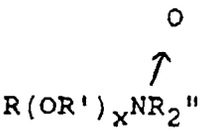
0 à 10 % en poids d'un tensio-actif détergent anionique synthétique soluble dans l'eau;

jusqu'à 80 % en poids d'eau;

1 à 10 % en poids d'un tensio-actif détergent à base d'oxyde d'amine; et

1 à 10 % en poids d'un savon soluble dans l'eau qui a une chaîne droite insaturée de 16 à 22 atomes de carbone.

2. Composition selon la revendication 1, dans laquelle le tensio-actif détergent à base d'oxyde d'amine a pour formule:



dans laquelle R est un groupe alkyle, hydroxy alkyle ou alkyl phényle ou des mélanges de ces groupes, contenant 10 à 18 atomes de carbone, R′ est un groupe alkylène ou hydroxy alkylène contenant 2 à 3 atomes de carbone ou leurs mélanges, x est un nombre de 0 à 2 et chaque groupe R″ est un groupe alkyle ou hydroxy alkyle contenant 1 à 3 atomes de carbone ou un groupe oxyde de polyéthylène contenant 1 à 3 groupes oxyde d'éthylène et les groupes R″ précités peuvent être fixés l'un à l'autre par un atome d'oxygène ou d'azote pour former une structure cyclique.

3. Composition selon la revendication 2 contenant 10 % à 30 % en poids d'un adjuvant détergent choisi parmi le groupe constitué par des pyrophosphates, des nitrilotriacétates, des citrates, des polycarboxylates, polymères et des carbonates.

4. Composition selon la revendication 2 ne contenant essentiellement pas d'adjuvant détergent.

5. Composition selon la revendication 2, dans laquelle le groupe R de l'agent tensio-actif détergent à base d'alkylpolyglucoside est un groupe alkyle contenant 12 à 16 atomes de carbone.

6. Composition selon la revendication 5, dans laquelle le cation du savon d'acide gras insaturé est choisi parmi le groupe constitué par le sodium, le potassium, l'ammonium, le monoéthanolammonium, le diéthanolammonium et le triéthanolammonium.

7. Composition selon la revendication 2 ou 5, dans laquelle le savon d'acide gras insaturé est un oléate.