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None

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C5D
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D06M

(54) **Liquid detergent/softener compositions**

(57) A stable liquid detergent composition based on one or more anionic surfactants contains a softener which is the product of acylation and quaternization of a polyalkylene polyamine.

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IMPROVEMENTS IN OR RELATING TO ORGANIC COMPOUNDS

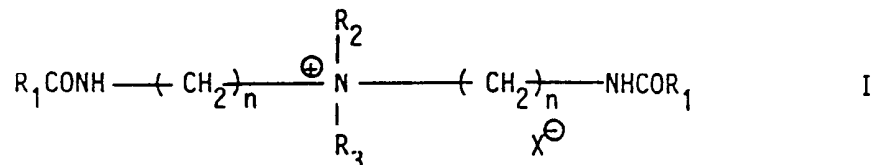
This invention relates to liquid laundry detergent compositions for use in domestic and industrial laundering.

Such liquid detergents mostly consist of a mixture of anionic and nonionic surfactants, but no builders, so that their washing power for fatty stains is only moderate despite their high surfactant content ($\sim 40\%$). For good washing effect on protein-containing stains it is also necessary to include enzymes in the formulation.

It has also been attempted to include softeners in liquid detergent compositions, to avoid the need for after-treatment with a solution or dispersion of a softener. It has however been found that conventional softeners tend to be incompatible with the anionic surfactants which are present so that the composition does not remain as a stable solution, but separates into two phases. When phase separation occurs, the composition must be shaken each time before use, and measurement of the correct dosage becomes unreliable. For this reason, liquid detergent compositions containing softeners have so far been made only on the basis of non-ionic surfactants, which tend to have inadequate washing power.

It has now been found that stable liquid detergent compositions based on anionic surfactants having excellent washing power can be made containing a selected group of softeners. Accordingly, the present invention provides a stable liquid detergent composition based

on one or more anionic surfactants, and containing a softener which is the product of acylation and quaternization of a polyalkylene polyamine. Preferred softeners are of formula I



in which each R_1 , independently, is C_{12-18} alkyl or C_{12-18} alkenyl;

each n , independently, is 2 or 3;

R_2 is C_{1-4} alkyl, C_{1-4} hydroxyalkyl, or C_{1-4} hydroxyalkyl etherified with 1-10 ethylene oxide groups;

R_3 is C_{1-4} alkyl or benzyl;

and X^\ominus is a halide, methylsulphate or ethylsulphate anion.

Preferred liquid detergent compositions according to the invention contain

- (A) 1-15 %, preferably 3-10% of softener of formula I
- (B) 0-25 %, preferably 4-20% of a partially carboxymethylated or carboxyethylated ethylene oxide adduct of a fatty alcohol or an alkylphenol
- (C) 5-30 %, preferably 10-25%, of one or more fatty acids
- (D) 2-20 %, preferably 5-15% of one or more other anionic surfactants.

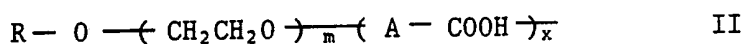
All percentages are by weight based on the total weight of the composition, including water. Preferably the active components (A)-(D) together make up 20-50%, preferably 30-50% of the total composition.

The composition also contains sufficient alkali to neutralise the anionic components. In addition the composition may contain other conventional components for example nonionic surfactants, hydrotropes,

sequestering agents, buffers, enzymes and optical brighteners.

The softeners of formula I may be prepared in conventional manner by the reaction of a dialkylene triamine with a fatty acid or a functional derivative thereof, followed by alkylation and quaternisation with an alkyl, hydroxyalkyl or benzyl derivative. Preferred softeners contain at least one hydroxyalkyl group, more preferably a β -hydroxyethyl group which may be etherified with ethylene oxide groups (preferably 1-5 EO groups), and at least one unsaturated fatty acid residue, for example an oleyl group. Preferably both groups R_1 are identical, or represent the same average mixture of groups, for example a mixture of 85% oleyl and 15 % stearyl groups.

Component (B) is preferably a compound of formula II



in which R is the residue of a C_{8-22} fatty alcohol or of an alkylphenol having 10-24 C atoms;
A is a methylene or ethylene group;
m is a number from 1-20;
and x is an average value from 0.1 to 1.

Compounds of formula II are known or may be prepared by conventional methods from available starting materials. The most preferred component (B) is a compound of formula II obtained by reacting a synthetic lauryl alcohol (C_{12-15}) with 4-5 moles ethylene oxide and subsequently with 0.8 mole chloracetic acid. The compounds are normally used in the form of their alkali metal salts, particularly sodium salts.

The fatty acids of component (C) are preferably saturated and unsaturated C_{5-22} carboxylic acids, more preferably C_{12-18} . The fatty acids, for example coco fatty acid or oleic acid are added as such and converted to the salt form by addition of alkali e.g. NaOH, KOH or an organic base e.g. triethanolamine.

The further anionic surfactants of component (D) may be any of the following conventional types:

- a) sulphates and sulphonates of fatty acids, fatty acid esters and fatty acid amides
- b) linear or branched C₅₋₁₈ alkyl sulphates and sulphonates
- c) sulphated ethoxylated compounds, particularly sulphated forms of any non-ionic surfactants which may be present
- d) polycarboxylic acid ester sulphates
- e) C₅₋₁₈ alkylbenzenesulphonates and C₁₋₄ alkyl and dialkyl-naphthalene sulphonates.

These compounds may be added in acid form and converted to their salt forms by addition of alkali.

Nonionic surfactants which may be present include ethylene oxide (EO) / propylene oxide (PO) block copolymers (Pluronics), and the addition products of EO or PO, preferably EO, to fatty alcohols, fatty amines, fatty acids, fatty acid alkanolamides and alkylphenols. Such non-ionic surfactants are conventional and commercially available.

Hydrotropic compounds which may be present include for example urea, dicyandiamide and its derivatives, alcohols, water-soluble glycols, glycol ethers and glycol esters and C₁₋₄ alkylbenzenesulphonates, provided that the compounds display no cloud point in distilled water up to 100°. They act so as to prevent phase separation, that is to stabilize the liquid composition.

Sequestering agents include citric acid, nitrilotriacetic acid and other complex formers. Buffers may be used to stabilise the pH of the wash liquor in the neutral or alkali region. Buffer substances

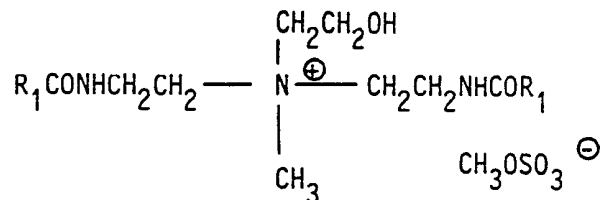
include sodium bicarbonate, sodium carbonate and sodium silicate.

By selection of these additional components, and optionally by use of enzymes and optical brighteners, the washing effect of the liquid detergent can be adjusted according to the desired field of use. The liquid detergent compositions of the invention are primarily useful as domestic laundry detergents. Not only do they display good washing power, they also produce a soft handle on laundered cotton goods. Being phosphate-free, they are ecologically acceptable. When used in conjunction with optical brighteners they do not cause quenching of the brightener, so that acceptable grades of whiteness are obtained. The liquid compositions are stable and do not separate into two phases on storage.

The following Examples, in which all percentages are percentages by weight of the entire composition, illustrate the invention:

Examples 1-7

In the following examples, component (A) is a compound of the formula



in which R_1 is a mixture of 85% oleyl groups and 15% stearyl groups, Component (B) is of the formula $\text{RO}(\text{CH}_2\text{CH}_2\text{O})_{4.5} - (\text{CH}_2\text{COONa})_{0.8}$ in which R is C_{12-15} alkyl, used in the form of a 67% aqueous paste. The components are added to demineralised water at room temperature, stirring until a homogenous solution is obtained. The final pH of the product is approx. 7.5. The components are in the proportions shown in the following Table.

Table

Example	Percentage by weight						
	1	2	3	4	5	6	7
<u>Component</u>							
Demineralised water	12.5	16.0	13.5	14.0	27.8	34.5	33.5
(A) softener	5.0	7.0	7.0	5.0	7.0	5.0	6.0
(B) Carboxymethylated adduct (67%)	10.0	10.0	-	10.0	10.0	8.0	5.0
(C) coco fatty acid	20.0	15.0	15.0	20.0	15.0	10.0	6.0
(C) oleic acid	5.0	5.0	5.0	5.0	5.0	-	4.0
(C) dodecylbenzene sulphonic acid	7.0	8.0	11.0	7.0	8.0	6.0	6.0
(D) lauryl ether sulphate	-	3.5	3.5	-	3.5	3.0	3.0
lauryl alcoholpoly- (7)ethylene-glycol- ether (SANDOXYLATE A 25-7)	-	-	7.5	-	-	-	3.0
triethanolamine	10.0	10.0	10.0	5.0	-	-	-
diethanolamine	-	-	-	-	10.7	14.0	14.0
caustic soda (30% aq)	15.0	12.5	14.5	18.5	-	-	-
isopropanol	12.0	12.0	12.0	12.0	12.0	8.0	8.0
ethylene glycol	-	-	-	-	-	8.0	8.0
optical brightener	1.0	1.0	1.0	1.0	1.0	0.5	0.5
citric acid	2.5	-	-	2.5	-	3.0	3.0

Application Example A

The compositions of Examples 1-7 are tested on cotton samples bleached without optical brightener. The washing tests are carried out with 2 kg polyester as ballast in a Schulthess Super 45 (Trade Mark) washing machine on programme 4. The washing conditions are as follows:

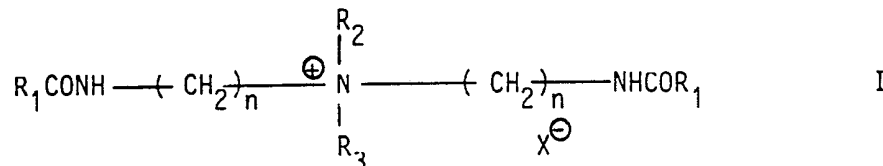
cylinder volume	43 l
amount of water	17 l
amount of detergent	8 g/l
temperature	60°C
heating time	about 11 min.
washing time	about 15 min.
water hardness	18°dH
pH of the wash liquor	7.

After washing the effect of the detergent composition on the cotton samples is measured by means of a spectrophotometer (Datacolor Type 70-80) and expressed as the CIE whiteness degree (CIE publication No. 15.2).

CLAIMS: -

1. A stable liquid detergent composition based on one or more anionic surfactants, and containing a softener which is the product of acylation and quaternization of a polyalkylene polyamine.

2. A composition according to Claim 1 in which the softener is of formula I



in which each R_1 , independently, is C_{12-18} alkyl or C_{12-18} alkenyl;

each n , independently, is 2 or 3;

R_2 is C_{1-4} alkyl, C_{1-4} hydroxyalkyl, or C_{1-4} hydroxyalkyl etherified with 1-10 ethylene oxide groups;

R_3 is C_{1-4} alkyl or benzyl;

and X^- is a halide, methylsulphate or ethylsulphate anion.

3. A composition according to Claim 2 containing

(A) 1-15 % of softener of formula I

(B) 0-25 % of a partially carboxymethylated or carboxyethylated ethylene oxide adduct of a fatty alcohol or an alkylphenol

(C) 5-30 % of one or more fatty acids

(D) 2-20 % of one or more other anionic surfactants,

by weight based on the total weight of the composition, including water.

4. A composition according to Claim 3 containing

3-10 % of component (A)

4-20 % of component (B)

10-25 % of component (C)

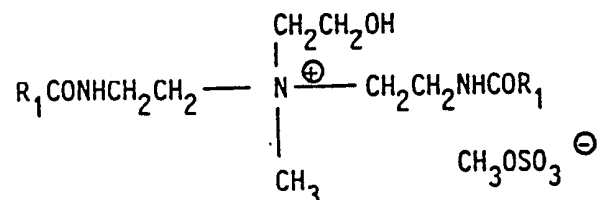
and 5-15 % of component (D)

by weight based on the total weight of the composition, including water.

5. A composition according to Claim 4 in which the active components (A)-(D) together make up 30-50% by weight of the composition.

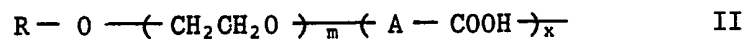
6. A composition according to any one of Claims 2-5 in which the softener (A) is a compound of formula I in which R₂ is a β-hydroxyethyl group or a β-hydroxyethyl group etherified with 1-5 ethylene oxide groups.

7. A composition according to Claim 6 in which the softener (A) is a compound of the formula



in which R₁ is a mixture of 85% oleyl groups and 15% stearyl groups.

8. A composition according to any one of the Claims 3-7 in which component B is a compound of formula II



in which R is the residue of a C₈₋₂₂ fatty alcohol or of an alkylphenol having 10-24 C atoms;

A is a methylene or ethylene group;

m is a number from 1-20;

and x is an average value from 0.1 to 1.

9. A compound according to Claim 8 in which component (B) is a compound of formula II obtained by reacting a synthetic lauryl alcohol (C₁₂₋₁₅) with 4-5 moles ethylene oxide and subsequently with 0.8 mole chloracetic acid.

10. A composition according to any one of Claims 3-9 in which component (C) is a saturated or unsaturated C₁₂₋₁₈ carboxylic acid.

11. A composition according to any one of Claims 3-10 in which component (D) is selected from

a) sulphates and sulphonates of fatty acids, fatty acid esters and fatty acid amides

b) linear or branched C₅₋₁₈ alkyl sulphates and sulphonates

c) sulphated ethoxylated compounds,

d) polycarboxylic acid ester sulphates

and e) C₅₋₁₈ alkylbenzenesulphonates and C₁₋₄ alkyl and dialkyl-naphthalene sulphonates.

12. A composition according to any one of the preceding claims containing additionally one or more components selected from non-ionic surfactants, hydrotropes and sequestering agents.

13. A composition according to any one of the preceding claims containing an optical brightener.

14. A composition as described in any one of the Examples.