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LIQUID DETERGENT COMPOSITIONS

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(71) Applicant(s)
UNILEVER PLC

(72) Inventor(s)
GUIDO CLEMENS VAN DEN BROM

(74) Attorney or Agent
GRIFFITH HACK & CO , GPO Box 1285K, MELBOURNE VIC 3001

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(57) Claim

1. An aqueous liquid detergent composition comprising soap and inorganic builder, the weight ratio of soap relative to inorganic builder being at least 1:2.75, the composition comprising more than 5% by weight of soap, the composition further comprising electrolyte in a quantity sufficient to cause formation of a lamellar phase having solid suspending capability, said composition yielding no more than 2% by volume phase separation after storage for 21 days at 25°C, and having a pH not exceeding 12.0, said composition having a viscosity of less than 2.5 Pas at 21 s^{-1}.

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Name of Applicant:
UNILEVER PLC

Address of Applicant: UNILEVER HOUSE
BLACKFRIARS
LONDON EC4
ENGLAND

Actual Inventor:

Address for Service: GRIFFITH HACK & CO.,
601 St. Kilda Road,
Melbourne, Victoria 3004,
Australia.

Complete Specification for the invention entitled:
LIQUID DETERGENT COMPOSITIONS.

The following statement is a full description of this invention including the best method of performing it known to me:-

LIQUID DETERGENT COMPOSITIONS

The present invention is concerned with aqueous liquid detergent compositions of the kind in which at least some of the surfactant material forms a structured phase which is capable of suspending solid particulate material.

The surfactant material in such compositions usually comprises one or more surfactants which may be soap or non-soap synthetic surfactants. Soap is a particularly useful material since it is capable of a multiplicity of roles. It can be used as a detergent-active agent, as a builder and as a fabric-softening agent. Thus, it is a very desirable aim to formulate liquid detergents which are relatively rich in soap. In the case of isotropic liquids containing little or no inorganic builder, it is relatively easy to formulate with high soap levels. It is much more difficult to incorporate large enough quantities in the aqueous structured liquids referred to above.

Aqueous structured liquid detergents with solid suspending capability and containing soap are disclosed in European Patent Specifications EP-A-38 101, EP-A-86 614 and EP-A-151 884. They are also disclosed in our non-prior published European patent applications EP 301 883 and EP 301 884. However, in none of these has a sufficient amount of soap been incorporated to function as a fabric-softening agent whilst simultaneously acting as a builder to such an extent that the amount of inorganic builder can be minimised to a level where it does not exert too much of a harshening effect on the fabric. Further possible disadvantages of these compositions are instability, resulting in more than 2% by volume phase separation after storage for 21 days at 25°C, and high viscosity, resulting in non-

pourable products.

Thus, according to the present invention, we provide an aqueous liquid detergent composition comprising soap and inorganic builder, the weight ratio of the soap relative to the inorganic builder being at least 1:2.75, the composition containing more than 5% by weight of soap, the composition further comprising electrolyte in a quantity sufficient to cause formation of a lamellar phase having suspending capability, said composition yielding no more than 2% by volume phase separation after storage for 21 days at 25°C, and having a pH of less than 12.0.

What is especially surprising here is that stable, pourable lamellar structured liquids of moderate pH can be formulated with the levels of soap and other specified ingredients as claimed herein. As far as we are aware, no compositions ratching these quantitative and qualitative requirements have been successfully formulated hitherto.

Thus, the compositions of the present invention are stable, ~~preferably~~ yielding no more than 2% by volume phase separation after storage for 21 days at 25°C. Such phase separation can manifest itself by the appearance of distinct layers or by the formation of distributed "cracks" containing predominantly aqueous phase containing dissolved electrolyte. The compositions are also pourable, ~~certainly~~ having a viscosity of no more than ~~6 Pas, preferably no more than~~ 2.5 Pas, most preferably no more than 1.5 Pas, especially 1 Pas or less, these viscosities being measured at a sheer rate of 21 s^{-1}.

The compositions of the present invention require sufficient electrolyte to cause the formation of a

lamellar phase by the soap/surfactant to endow solid suspending capability. The selection of the particular type(s) and amount of electrolyte to bring this into being for a given choice of soap/surfactant is effected using methodology very well known to those skilled in the art. It utilises the particular techniques described in a wide variety of references. One such technique entails conductivity measurements. The detection of the presence of such a lamellar phase is also very well known and may be effected by, for example, optical and electron microscopy or x-ray diffraction, supported by conductivity measurement.

As used herein, the term electrolyte means any water-soluble salt. The amount of electrolyte should be sufficient to cause formation of a lamellar phase by the soap/surfactant to endow solid suspending capability. Preferably the composition comprises at least 1.0% by weight, more preferably at least 5.0% by weight, most preferably at least 17.0% by weight of electrolyte. The electrolyte may also be a detergency builder, such as the inorganic builder sodium tripolyphosphate, or it may be a non-functional electrolyte such as sodium sulphate or chloride. Preferably the inorganic builder comprises all or part of the electrolyte.

The compositions must also be capable of suspending particulate solids, although particularly preferred are those systems where such solids are actually in suspension. The solids may be undissolved electrolyte, the same as or different from the electrolyte in solution, the latter being saturated in electrolyte. Additionally or alternatively, they may be materials which are substantially insoluble in water alone. Examples of such substantially insoluble materials are aluminosilicate builders and particles of calcite abrasive.

The compositions of the present invention must contain soap. This will usually be an alkali metal soap of a fatty acid, preferably one containing 12 to 18 carbon atoms. Typical such acids are oleic acid, ricinoleic acid and fatty acids derived from castor oil, rapeseed oil, groundnut oil, coconut oil, palmkernel oil or mixtures thereof. The sodium or potassium soaps of these acids can be used, the potassium soaps being preferred.

The compositions of the present invention ~~must~~ preferably also contain a non-soap synthetic surfactant. This may be selected from any of those known in the art for forming structured liquids and in general may be selected from one or more of anionic, cationic, nonionic, zwitterionic and amphoteric surfactants. However, one preferred combination of non-soap surfactants comprises:

a) a nonionic surfactant and/or polyalkoxylated anionic surfactant; and

b) a non-polyalkoxylated anionic surfactant.

Suitable nonionic surfactants which may be used include in particular the reaction products of compounds having a hydrophobic group and a reactive hydrogen atom, for example aliphatic alcohols, acids, amides or alkyl phenols with alkylene oxides, especially ethylene oxide either alone or with propylene oxide. Specific nonionic detergent compounds are alkyl (C_6-C_{22}) phenols - ethylene oxide condensates, the condensation products of aliphatic (C_8-C_{18}) primary or secondary, linear or branched alcohols with ethylene oxide, and products made by condensation of ethylene oxide with the reaction products of propylene oxide and ethylenediamine. Other so-called nonionic detergent compounds include long-chain tertiary amine oxides, long-chain tertiary

phosphine oxides and dialkyl sulphoxides.

The anionic surfactants are usually water-soluble alkali metal salts of organic sulphates and sulphonates having alkyl radicals containing from about 8 to about 22 carbon atoms, the term alkyl being used to include the alkyl portion of higher acyl radicals. Examples of suitable synthetic anionic detergent compounds are sodium and potassium alkyl sulphates, especially those obtained by sulphating higher (C_8-C_{18}) alcohols produced for example from tallow or coconut oil, sodium and potassium alkyl (C_9-C_{20}) benzene sulphonates, particularly sodium linear secondary alkyl (C_{10}-C_{15}) benzene sulphonates; sodium alkyl glyceryl ether sulphates, especially those ethers of the higher alcohols derived from tallow or coconut oil and synthetic alcohols derived from petroleum; sodium coconut oil fatty monoglyceride sulphates and sulphonates; sodium and potassium salts of sulphuric acid esters of higher (C_8-C_{18}) fatty alcohol-alkylene oxide, particularly ethylene oxide, reaction products; the reaction products of fatty acids such as coconut fatty acids esterified with isethionic acid and neutralised with sodium hydroxide; sodium and potassium salts or fatty acid amides of methyl taurine; alkane monosulphonates such as those derived by reacting alpha-olefin (C_8-C_{20}) with sodium bisulphite and those derived from reacting paraffins with SO_2 and Cl_2 and then hydrolysing with a base to produce a random sulphonate; and olefin sulphonates, which term is used to describe the material made by reacting olefins, particularly C_{10}-C_{20} alpha-olefins, with SO_3 and then neutralising and hydrolysing the reaction product. The preferred anionic detergent compounds are sodium (C_{11}-C_{15}) alkyl benzene sulphonates and sodium (C_{16}-C_{18}) alkyl sulphates.

The compositions of the present invention must contain

an inorganic builder, but may also contain an organic builder other than the soap. The non-soap builder is preferably present at a level of at least 5% by weight, the maximum level preferably being 30%. A detergency builder is any material capable of reducing the level of free calcium ions in the wash liquor and will preferably provide the composition with other beneficial properties such as the generation of an alkaline pH, and the suspension of soil removed from the fabric. They may be classed as inorganic, organic non-polymeric and organic polymeric. Generally, we prefer that the inorganic builder comprises all or part of the electrolyte (provided water-soluble).

Examples of phosphorus-containing inorganic detergency builders include the water-soluble salts, especially alkaline metal pyrophosphates, orthophosphates, polyphosphates and phosphonates. Specific examples of inorganic phosphate builders include sodium and potassium tripolyphosphates, phosphates and hexametaphosphates.

Examples of non-phosphorus-containing inorganic detergency builders, when present, include water-soluble alkali metal carbonates, bicarbonates, silicate and crystalline and amorphous aluminosilicates. Specific examples include sodium carbonate (with or without calcite seeds), potassium carbonate, sodium and potassium bicarbonates and silicates.

The weight ratio of soap relative to inorganic builder is at least 1:2.75, more preferably more than 1:2.25.

Examples of organic detergency builders include the alkali metal, ammonium and substituted ammonium polyacetates, carboxylates, polycarboxylates, polyacetyl carboxylates and polyhydroxysulphonates. Specific

examples include sodium, potassium, lithium, ammonium and substituted ammonium salts of ethylenediamine-tetraacetic acid, nitrilotriacetic acid, oxydisuccinic acid, melitic acid, benzene polycarboxylic acids and citric acid.

Apart from the ingredients already mentioned, a number of optional ingredients may also be present, such as lather boosters, e.g. alkanolamides, particularly the monoethanolamides derived from palmkernel fatty acids and coconut fatty acids, lather depressants, oxygen-releasing bleaching agents such as sodium perborate and sodium percarbonate, peracid bleach precursors, chlorine-releasing bleaching agents such as trichloroisocyanuric acid, inorganic salts such as sodium sulphate, and, usually present in very minor amounts, fluorescent agents, perfumes, enzymes such as proteases and amylases, germicides, colourants and fabric-softening clay materials.

The pH of the composition is not greater than 12.0, more preferably from 7.0 to 12.0, especially preferably between 7.0 and 11.0, most preferably between 7.0 and 8.0.

The compositions of the present invention may be prepared using the general techniques known in the art of the processing of liquid detergent products. However, the order of addition of components can be important. Thus, a preferred order of addition (with continuous mixing) is to add to the water the soluble electrolytes, then any insoluble material such as aluminosilicates, followed by the actives. The mixtures are then cooled below 30°C, whereafter any minors and additional ingredients can be added. Finally, if necessary, the pH of the composition can be adjusted, e.g. by addition of a small quantity of caustic material.

In use, the compositions of the present invention will generally be diluted with water to form a wash liquor preferably comprising from 0.1 to 10%, more preferably from 0.5 to 3% by weight of said composition. The wash liquor is used for the washing of fabrics, for instance in an automatic washing machine.

The invention will now be illustrated by the following non-limiting examples.

Examples 1-4

Ingredient	1	2	3	4
Na-LAS	10.0	10.0	10.5	10.5
Na-oleate	-	-	-	-
K-oleate	6.0	6.0	6.0	5.5
Synperonic A7	4.0	4.0	3.5	4.0
Glycerol	4.85	4.85	4.85	4.85
Borax	3.1	3.1	3.1	3.1
STP	15.0	15.0	15.0	15.0
SCMC	0.1	0.1	0.1	0.1
Fluorescer	0.1	0.1	0.1	0.1
Silicone oil	-	0.25	0.25	0.25
Synthetic amorphous silica	-	2.0	2.0	2.0
Perfume	-	0.3	0.3	0.3
Enzyme	-	0.5	0.5	0.5
Water	----------balance----------			
Viscosity (mPas, 21 s^{-1})	810	950	770	1500

Example 5

	wt.%
Na-LAS	4.0
Synperonic A3	3.0
STP	15.0
K-oleate	10.0
NaCl	2.0
Glycerol	4.85
Borax	3.1
Antifoam	0.2
Enzyme	0.5
Fluorescer	0.1
SCMC	0.1
Water	balance

Viscosity approx. 880 mPas at 21 s^{-1}

Example 6

	wt.%
Na-LAS	6.0
Synperonic A3	4.0
STP	15.0
K-oleate	10.0
PEG 400	3.0
Alcosperse 175	1.0
STS	0.5
Na_2SO_4	0.5
Glycerol	4.85
Borax	3.1
Antifoam	0.2
Enzyme	0.5
Fluorescer	0.1
SCMC	0.1
Water	balance

Viscosity approx. 880 mPas at 21 s^{-1}

Raw Material Specification

LAS - dodecyl benzene sulphonate

SCMC - sodium carboxymethylcellulose

STP - sodium tripolyphosphate

STS - sodium toluene sulphonate

PEG 400 - polyethylene glycol, average molecular weight 400

Alcosperse 175- 70/30 acrylate/maleate copolymer (molecular weight 20,000 ex Alco)

Synperonic A7 - C_{12}-C_{13} fatty alcohol alkoxylated with an average of 7 moles of ethylene oxide per molecule

Synperonic A3 - C_{12}-C_{13} fatty alcohol alkoxylated with an average of 3 moles of ethylene oxide per molecule.

The pH of the compositions of Examples 1-6 was between about 7 and 8. All compositions were pourable and all yielded less than 2% by volume phase separation after storage at ambient temperature for 2 months. The level of soap incorporated in the composition is sufficient to function as a fabric-softening agent whilst simultaneously acting as a builder to such an extent that the amount of inorganic builder is minimised to a level where it does not exert too much of a harshening effect on the fabric.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An aqueous liquid detergent composition comprising soap and inorganic builder, the weight ratio of soap relative to inorganic builder being at least 1:2.75, the composition comprising more than 5% by weight of soap, the composition further comprising electrolyte in a quantity sufficient to cause formation of a lamellar phase having solid suspending capability, said composition yielding no more than 2% by volume phase separation after storage for 21 days at 25°C, and having a pH not exceeding 12.0, said composition having a viscosity of less than 2.5 Pas at 21 S^{-1}.

2. An aqueous liquid detergent composition according to claim 1, characterised by a weight ratio of soap relative to the inorganic builder greater than 1:2.25.

3. An aqueous liquid detergent composition according to claim 1 or 2, characterised in that it comprises at least 1% by weight of electrolyte.

4. An aqueous liquid detergent composition according to claim 3, characterised in that it comprises at least 5% by weight of electrolyte.

5. An aqueous liquid detergent composition according to any one of claims 1 to 4, characterised in that the inorganic builder comprises all or part of the electrolyte.

6. An aqueous liquid detergent composition according to any one of claims 1 to 5, having a pH from 7.0 to 12.0.

7. Use of an aqueous liquor comprising from 0.1 to 10% by weight of a composition according to one or more of the preceding Claims for the washing of fabrics.

DATED THIS 15TH DAY OF MARCH 1991
UNILEVER PLC
By its Patent Attorneys:
GRIFFITH HACK & CO.
Fellows Institute of Patent
Attorneys of Australia.