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(54) **Non-aqueous built liquid detergent composition.**

(57) The present invention relates to a non-aqueous built liquid detergent composition on the basis of nonionic detergent surfactants and builders.

By using particular nonionic detergent surfactants, which contain ethylene oxide and propylene oxide in a molar ratio of 1:17 to 2:1 (propylene oxide to ethylene oxide) instead of the known ethylene oxide condensation products, the rate of dissolution of the composition in the wash liquor is substantially improved.

Furthermore, a low temperature bleach activator such as tetraacetylenediamine is substantially much more stable in compositions containing the particular nonionic detergent surfactant than in compositions on the basis of the well-known ethylene oxide type nonionic detergent surfactants.

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NON-AQUEOUS BUILT LIQUID DETERGENT COMPOSITION

The present invention relates to non-aqueous built liquid or pasty detergent compositions comprising a non-aqueous liquid medium which contains a nonionic detergent surfactant, and a builder suspended or dispersed in said liquid medium.

Non-aqueous built liquid detergent compositions of this type have already been proposed in the prior art, vide our British Patent Specifications 1 205 711, 1 270 040, and 1 292 352. These prior proposals involve the use of a suspending agent for the builders. More recently, a non-aqueous built liquid detergent composition comprising a liquid nonionic detergent surfactant and being free from dispersants for the solids has been proposed in European Patent Application 0030096.

In all these prior proposals the nonionic detergent surfactant can be of any type within the class of alkylene oxide condensation products with alcohols, alkylphenols, amides and so on.

However, non-aqueous built liquid detergent compositions on the basis of nonionic detergent surfactants do not always dissolve in an aqueous wash liquor sufficiently quickly, and although the rate of dissolution can be improved by inclusion of high levels of non-aqueous solvents, that may jeopardize the storage stability of the non-aqueous liquid composition and may undesirably increase the costs of such compositions.

It has now been found that by using a specific class of nonionic detergent surfactants the rate of dissolution may be significantly improved in comparison with other nonionic surfactants, thereby obviating to a significant extent the use of non-aqueous solvents.

The specific class of nonionic detergent surfactants of the invention consists of an organic hydrophobic group, such as C_8 - C_{18} alkylphenols, C_8 - C_{18} primary or secondary, linear or branched-chain alcohols, C_8 - C_{18} fatty acid amides and so on, which has been condensed first with ethylene oxide (EO) and subsequently with propylene oxide (PO). The molar ratio of PO to EO in the condensation products is critical; too low a PO/EO ratio does not offer an advantage, and too high a PO/EO ratio influences the solubility negatively. The molar ratio of PO to EO in the nonionic detergent surfactants of the invention should lie within the range of 1:17 to 2:1, preferably of 7:4 to 1:2.

The nonionic detergent surfactants of the invention should furthermore not form high viscosity liquid crystalline phases in the presence of water, and should have cloud points of above 5°C. Suitable examples of nonionic detergent surfactants of the invention are C_{13} - C_{15} primary alcohol, condensed with 7 moles of ethylene oxide and 4 moles of propylene oxide and C_{12} - C_{15} alcohol, condensed with 4.9 moles of ethylene oxide and 2.7 moles of propylene oxide. Preferably, the nonionic detergent surfactants of the invention are low-foaming.

Mixtures of nonionic detergent surfactants of the invention with other detergent surfactants, such as anionic, cationic or ampholytic detergent surfactants, and soaps may also be used. If such mixtures are used, the mixture must be water-free and liquid at room temperature.

Examples of suitable anionic detergent surfactants are alkali metal, ammonium or alkylolamine salts of alkylbenzene sulphonates having from 10 to 18 carbon atoms in the alkyl group, alkyl and alkylether sulphates having from 10 to 24 carbon atoms in the alkyl group and from 1 to 5 ethylene oxide groups, olefin sulphonates prepared by sulphonation of C_{10} - C_{24} -olefins and subsequent neutralisation and hydrolysis of the sulphonation reaction product. Examples of cationic detergent surfactants are aliphatic or aromatic higher alkyl di(lower alkyl) ammonium halides and examples of soaps are the alkali metal salts of C_{12} - C_{24} fatty acids.

In general, the composition of the invention contains the nonionic detergent surfactant in an amount of at least 10% by weight of the total composition. The amount of nonionic detergent surfactant present in the composition may be as high as about 90%, but in most cases the practical amount will lie between 20 and 70% and preferably between 20 and 50% by weight of the composition.

The builder which is used according to the present invention may be either a preferably anhydrous inorganic builder or an organic builder. Suitable organic builders are the alkali metal salts of aminopolycarboxylic acids, such as ethylene diaminetetraacetic acid (EDTA), nitrilotriacetic acid (NTA), diethylenetriamine pentacetic acid (DEPTA), hydroxyethylaminodiacetic acid and the like; alkali metal salts of ethane hydroxyphosphonic acids, aminophosphonic acids and the like; polyelectrolytes such as alkali metal salts of hydrolysed copolymers of ethylene with maleic anhydride and alkali metal polyacrylates; alkali metal alkenylsuccinates and the like, and sodium phytate. Suitable inorganic builder are zeolites, the alkaline ortho-, poly-, pyro- and metaphosphates, silicates, borates, carbonates and the like. Also mixtures of organic and inorganic builders may be used. The organic builders need not be anhydrous, but can be used in the hydrated form in which they are normally sold, for example NTA $1H_2O$, EDTA $2H_2O$ and so on.

The amount of builder present in the composition may be from 1 to 70% by weight of the composition. For most commercial purposes the amount of builder is from about 10% to about 60% by weight of the composition. The builder should have a particle size of less than 300 μ , preferably less than 200 μ .

The weight ratio of the nonionic detergent surfactant to builder should generally lie within the range of 10:1 and 1:4, and for most commercial purposes within the range of 4:1 to 1:4, the preferred ratio being about 1:2.

The liquid detergent composition of the invention is substantially anhydrous, by which is to be understood that the final composition should contain not more than 5%, and preferably less than 2% by weight of water; this does not include any water of hydration.

The stability behaviour of the products may be further improved by the incorporation of a few per cent of an emulsifier or a thixotropic agent, such as lauric diethanolamide, ethoxylated lanolin, sodium dioctyl sulphosuccinate and the like.

The viscosity of the composition will vary, depending upon its constituents. In order to ensure that the composition may be poured satisfactorily, it is preferred that the viscosity should be in the range of from 100 to 3,000 cP, although higher viscosities up to 60,000 cP can be satisfactory. If desired, the viscosity of the composition may be adjusted by the addition of amounts of up to 20% of a thinning agent, for example ethyl alcohol, hexane, heptane, benzene, xylene, toluene, tetrahydrofuran, dimethyl sulphoxide, and the like.

The composition may furthermore contain other materials which are considered normal and desirable additives in detergent compositions. For instance, bleaching agents such as alkali metal perborates (either anhydrous or in one of their hydrate forms) may be incorporated in an amount of from about 5 to about 30% by weight of the composition. Without substantially modifying the fundamental characteristics of the compositions of the invention, there can furthermore be incorporated enzymes, such as amylases and proteases, lipases, colouring agents, fluorescers, bleaching agent precursors and activators, bleach stabilizers, perfumes, bactericides, soil suspending agents and corrosion-inhibitors.

In this respect, it has surprisingly been found that bleach precursors such as tetraacetylethylene diamine are more stable in the non-aqueous detergent compositions of the present invention than in non-aqueous liquid detergent compositions on the basis of nonionic detergents other than those according to the invention.

Optionally, suspending agents such as highly voluminous metal oxides and metalloid oxides such as silica may also be included in an amount of 1-5% by weight.

The invention is illustrated by the following Examples in which the percentages are by weight.

The rates of solution of the composition were measured by adding the non-aqueous liquid detergent at a concentration of 6.5 g/l to tapwater of room temperature under constant stirring (100 rpm) and measuring the conductivity of the resulting mixture. The time at which the conductivity does not change anymore is recorded as the dissolution time.

Example I

The following formulations with different nonionic detergent surfactants as specified in Table A were prepared, and their cloud point, liquid crystalline (L.C.) phase formation and dissolution time were measured. The following results were obtained:

45

	% by weight
nonionic detergent surfactant	50
anhydrous sodium triphosphate	27.5
anhydrous sodium carbonate	7.5
sodium perborate monohydrate	15.0

55

Table A

nonionic detergent surfactant	mol EO/mol PO	PO/EO ratio	cloud point (°C)	L.C. phase	Dissolution time (min.)
C ₁₃ -C ₁₅ primary alcohol, condensed with	7.0/-	-	46	+	8
C ₁₂ -C ₁₅ "	7.0/-	-	50	+	10
C ₁₂ -C ₁₃ "	6.5/-	-	39	+	8
C ₁₃ -C ₁₅ "	6.5/0.5	13:1	40	+	7
C ₁₃ -C ₁₅ "	7.0/4.0	1.75:1	32	-	2
C ₁₃ -C ₁₅ "	4.9/2.7	1.81:1	35	-	1
C ₁₃ -C ₁₅ "	2.0/4.0	1:2	0	-	10

EO = ethylene oxide

PO = propylene oxide

Example 2

Repeating Example 1, using a C₉-C₁₅ primary alcohol mixture having an overall PO/EO molar ratio of 1:1.6 (3.5 mol PO and 5.5 mol EO), with a cloud point of 31°C, and a C₉-C₁₅ primary alcohol mixture having an overall PO/EO molar ratio of 1:2.5 (2.3 mol PO and 5.7 mol EO), with a cloud point of 39°C, gave the following results:

1) no L.C. formation

2) dissolution time: total dissolution in 2, respectively 3 minutes.

Example 3

The following non-aqueous built liquid detergent was prepared:

15

	<u>% by weight</u>
nonionic detergent surfactant	38.6
glycerol triacetate	5.0
sodium triphosphate (anhydrous)	30.0
sodium carbonate (anhydrous)	4.0
sodium perborate monohydrate	13.4
sodium oxoborate	2.1
tetraacetyléthylenediamine	4.0
sodium carboxymethylcellulose	1.0
ethylenediamine tetraacetate (sodium salt)	0.15
ethylenediamine tetra(methylenephosphonic) acid (sodium salt)	0.1
fluorescer	0.3
protease (Savinase [®] T-granulate)	0.6
perfume	0.25
highly voluminous silica	1.0

The following nonionic detergent surfactants were used.

- A. C₁₃-C₁₅ primary alcohol, condensed with 4.9 moles EO and 2.7 moles PO,
- B. C₉-C₁₁ primary alcohol, condensed with 4 moles EO and 1.5 moles PO,
- C. C₉-C₁₁ primary alcohol, condensed with 5.5 moles EO and 0.5 moles PO, and
- D. C₉-C₁₁ primary alcohol, condensed with 6 moles of EO.

The stability of tetraacetyléthylenediamine (TAED) in each of these formulations was assessed by iodometric titration of the TAED which was left in the compositions after storage for 12 weeks at 37°C.

The following results were obtained:

% TAED left in the non-aqueous liquid detergent after storage for 12 weeks at 37°C:

with A: 79%

with B: 69%

with C: 45%

with D: 30%

Claims

1. A non-aqueous, built liquid detergent composition comprising a nonionic detergent surfactant and a builder, characterised in that the nonionic detergent surfactant consists of an organic hydrophobic group, which has been condensed first with ethylene oxide and subsequently with propylene oxide, whereby the molar ratio of propylene oxide to ethylene oxide in the nonionic detergent surfactant lies within the range of 1:17 to 2:1.
2. A composition according to claim 1, characterised in that the molar ratio lies within the range of 7:4 to 1:2.
3. A composition according to claim 1 or 2, characterised in that the organic hydrophobic group is a C_8-C_{18} alkylphenol or a C_8-C_{18} primary or secondary linear or branched-chain alcohol or a C_8-C_{18} fatty acid amide.
4. A composition according to any one of claims 1-3, characterised in that it contains an alkali metal perborate and a low temperature bleach activator.



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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	EP-A-0 014 980 (HENKEL KGAA) * claims 1, 2 *	1-3	C 11 D 1/722 C 11 D 3/39 C 11 D 17/00
Y	GB-A-1 172 931 (MARLES-KUHLMANN-WYANDOTTE) * claims 1-3 *	1,3	
Y	DE-A-2 810 703 (MITSUBISHI PETROCHEMICAL CO.) * claims 1, 2 *	1,3	
A	FR-A-1 551 810 (UNILEVER N.V.) * page 3, example 1, claims 1, 4 *	1,4	
D,A	EP-A-0 030 096 (IMPERIAL CHEMICAL INDUSTRIES LTD.) * page 4, lines 1-5, page 5, ex- ample, claims 1, 3, 6 *	1,4	TECHNICAL FIELDS SEARCHED (Int. Cl.4) C 11 D 1/00 C 11 D 3/00 C 11 D 17/00
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 20-02-1987	Examiner SCHULTZE D
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	