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(54) **SELF-THICKENING DILUTABLE CONCENTRATE FOR HARD SURFACE & DISH WASH CLEANING APPLICATIONS**

(57) The present invention relates to concentrates to be diluted with water for hard surface cleaning purposes, comprising at least one fatty alcohol ether sulfate and at least one betaine or amino oxide in a weight ratio in the

range of about 50:50 to about 70:30. The present invention further relates to the use thereof as well as to a method of preparation, which comprises diluting the concentrate with water.

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## Description

**[0001]** The present invention relates to concentrates to be diluted with water for hard surface and dish wash cleaning purposes, comprising at least one fatty alcohol ether sulfate and at least one betaine or amino oxide in a weight ratio in the range of about 50:50 to about 70:30. The present invention further relates to the use thereof as well as to a method of preparation, which comprises diluting the concentrate with water.

**[0002]** To minimize packaging, storage and transport costs, many products in the homecare sector are now offered as concentrates, which contain a higher level of washing- and cleaning-active ingredients than conventional products. The concentrates are either used by the consumer directly for washing or cleaning, in which case a lower quantity corresponding to the concentration is required, or they are first diluted with a specified quantity of water and only then applied like a conventional product. In a number of countries, particularly countries in which the majority of people has low income, concentrates are offered, which, after dilution with water, are used by the consumer in the same way as conventional hand dishwashing detergents. Washing and cleaning compositions provided in the form of concentrates thus constitute an excellent solution for low-income consumers seeking financial leniency, since the production, packaging, transport and storage of concentrates is less costly compared to conventional product forms.

**[0003]** For exactly those reasons, concentrates are also appealing to sustainability-driven consumers, who make the reduction of emission at least one of their priorities when making shopping decisions.

**[0004]** However, in addition to any of the aforementioned advantages that can be associated with concentrates, a respective product must nonetheless fulfill a complex profile of requirements in order to find acceptance with consumers. In other words, in addition to the primary washing and cleaning effect as well as transport and storage stability, consumers expect not only an attractive appearance, a pleasant fragrance and good skin compatibility, but also, in particular, easy handling and dosing. For this reason, in a number of applications, such as manual dishwashing or the cleaning of other hard surfaces, consumers prefer products with an increased viscosity (compared to conventional, i.e. non-concentrated liquid products), which can be dosed more accurately and run more slowly on inclined and, in particular, vertical surfaces, i.e. act longer on the surface to be cleaned.

**[0005]** However, if the diluted concentrate is to have a sufficiently increased viscosity, this usually means that the viscosity of the undiluted concentrate is still much higher and, accordingly, that the handling properties and solubility of the concentrate are hardly or no longer acceptable.

**[0006]** Even though a plethora of liquid cleaning compositions in the form of concentrates is known in the art and widely marketed, the need for improved compositions, which on the one hand are easily flowable in concentrated form and on the other hand readily self-thicken upon dilution with water to a degree that is perceived as both functional and easy-to-handle by the consumer, remains.

**[0007]** This objective has been solved by the present inventors, who have surprisingly found that the addition of at least one fatty alcohol ether sulfate in combination with at least one betaine or amine oxide in a certain weight ratio provides for the desired properties in terms of viscosity of the concentrated and diluted product form.

**[0008]** Therefore, in a first aspect, the present invention relates to a liquid composition for the cleaning of hard surfaces, said composition being a concentrate to be diluted with water while maintaining or increasing viscosity, characterized in that it comprises at least one fatty alcohol ether sulfate and at least one betaine in a weight ratio in the range of about 50:50 to about 70:30, preferably in the range of about 55:45 to about 65:35, more preferably in the range of about 57:43 to about 63:37, such as about 60:40, or at least one fatty alcohol ether sulfate and at least one amine oxide in a weight ratio in the range of about 50:50 to about 70:30, preferably in the range of about 55:45 to about 65:35, more preferably in the range of about 57:43 to about 63:37, such as about 60:40.

**[0009]** The present invention further relates to the use of a liquid composition as disclosed herein for the cleaning of hard surfaces, and to the use of a liquid composition as disclosed herein for the preparation of a dilute aqueous hard surface or dish washing cleaning composition.

**[0010]** In yet another aspect, the present invention also relates to a method for the preparation of a dilute aqueous hard surface cleaning or dish washing composition, characterized in that a liquid composition as disclosed herein is diluted with about 0.5 to about 5 parts, preferably about 0.7 to about 4 parts, more preferably about 0.8 to about 3 parts of water, based on the volume of the liquid composition.

**[0011]** Preferred embodiments are set out in the dependent claims.

**[0012]** When wt.-% values are given, they are based on the total weight of the liquid composition, except explicitly stated otherwise. Numerical ranges given in the format "from x to y" include the above values. When multiple preferred numerical ranges are given in this format, it is understood that all ranges resulting from the combination of the various endpoints are also included.

**[0013]** "About", as used herein in relation to a numerical value, means said value  $\pm 10\%$ , preferably  $\pm 5\%$ .

**[0014]** The term "liquid", as used herein, refers to compounds or mixtures of compounds that are flowable and pourable at room temperature (about 15 °C to about 25 °C).

**[0015]** In the present specification, the terms "a" and "an" and "at least one" are the same as the term "one or more"

and can be employed interchangeably.

**[0016]** "One or more", as used herein, relates to at least one and comprises 1, 2, 3, 4, 5, 6, 7, 8, 9 or more of the referenced species. Similarly, "at least one," as used herein, includes but is not limited to 1, 2, 3, 4, 5, 6, and more. With respect to an ingredient, it refers to the type of ingredient and not to the absolute number of molecules. "At least one surfactant" thus means, for example, at least one type of surfactant, meaning that one type of surfactant or a mixture of several different surfactants may be meant. Together with weight indications, the indication refers to all compounds of the indicated type contained in the composition/mixture, i.e. that the composition does not contain any further compounds of this type beyond the indicated amount of the corresponding compounds.

**[0017]** Where reference is made herein to molar masses, this information always refers to the number-average molar mass  $M_n$ , unless explicitly stated otherwise. The number average molar mass can be determined, for example, by gel permeation chromatography (GPC) according to DIN 55672-1:2007-08 with THF as eluent. The weight average molecular weight  $M_w$  can also be determined by GPC as described for  $M_n$ .

**[0018]** Whenever alkaline earth metals are mentioned in the following as counterions for monovalent anions, this means that the alkaline earth metal is naturally present only in half the amount of substance - sufficient for charge balance - as the anion.

**[0019]** In the context of the present invention, fatty acids or fatty alcohols or derivatives thereof - unless otherwise indicated - are representative of branched or unbranched carboxylic acids or alcohols or derivatives thereof preferably having 6 to 22 carbon atoms. The former are preferred for ecological reasons, in particular because of their vegetable basis as being based on renewable raw materials, without, however, limiting the teaching according to the invention to them. In particular, the oxo-alcohols obtainable, for example, according to the ROELEN oxo-synthesis or their derivatives can also be used accordingly.

**[0020]** INCI means that the following or preceding name is a name according to the International Dictionary of Cosmetic Ingredients of The Cosmetic, Toiletry, and Fragrance Association (CTFA). The indication CAS means that the following sequence of numbers is a designation of the Chemical Abstracts Service.

**[0021]** The liquid compositions according to the present invention may be referred to as "homecare compositions" or "household cleaners". Household cleaners within the meaning of the present invention are, for example, cleaning agents for cleaning hard surfaces, such as window cleaners, bath cleaners, WC cleaners or dishwashing detergents, including hand dishwashing detergents and dishwashing detergents for machine use.

**[0022]** According to the present invention, the liquid compositions are in the form of concentrates to be diluted with water while maintaining or increasing their viscosity.

**[0023]** Viscosity maintenance in the sense of the teaching according to the invention also includes a decrease in viscosity which is not significant for the user, i.e. a decrease in the viscosity value determined as described below by not more than 50 %, preferably not more than 30 %, in particular not more than 10 % and particularly preferably not more than 5 %.

**[0024]** The liquid compositions of the present invention comprise at least one fatty alcohol ether sulfate and at least one betaine in a weight ratio in the range of about 50:50 to about 70:30, preferably in the range of about 55:45 to about 65:35, more preferably in the range of about 57:43 to about 63:37, such as about 57:43, 58:42, 59:41, 60:40, 61:39, 62:38 or 63:37, most preferably about 60:40; or the liquid compositions of the present invention comprise or at least one fatty alcohol ether sulfate and at least one amine oxide in a weight ratio in the range of about 50:50 to about 70:30, preferably in the range of about 55:45 to about 65:35, more preferably in the range of about 57:43 to about 63:37, such as about 57:43, 58:42, 59:41, 60:40, 61:39, 62:38 or 63:37, most preferably about 60:40.

#### *Alkyl Ether Sulfates*

**[0025]** Alkyl ether sulfates (fatty alcohol ether sulfates, INCI Alkyl Ether Sulfates) are products of sulfation reactions on alkoxyated alcohols. Alkoxyated alcohols are generally understood by the expert to be the reaction products of alkylene oxide, preferably ethylene oxide, with alcohols -in the context of the invention preferably with relatively long-chain alcohols, i.e. with aliphatic straight-chain or single- or multiple-branch, acyclic or cyclic, saturated or mono- or polyunsaturated, preferably straight-chain, acyclic saturated alcohols containing 6 to 22, preferably 8 to 18, more preferably 10 to 16 and most preferably 12 to 14 carbon atoms. Depending on the reaction conditions, a complex mixture of addition products with different degrees of ethoxylation is generally formed from  $n$  moles ethylene oxide and one mole alcohol ( $n = 1$  to 30, preferably 1 to 20, more preferably 1 to 10 and most preferably 1 to 5). Another embodiment of the alkoxylation consists in using mixtures of the alkylene oxides, preferably a mixture of ethylene oxide and propylene oxide. Fatty alcohols with low degrees of ethoxylation, i.e. with 1 to 4 ethylene oxide units (EO), more particularly 1 to 2 EO, for example 1.3 EO, such as  $\text{Na C}_{12-14}$  fatty alcohol+1.3 EO sulfate, are most particularly preferred for the purposes of the invention.

**[0026]** The alkyl ether sulfates (as well as other anionic surfactants) are normally used in the form of alkali metal, alkaline earth metal and/or mono-, di- or trialkanolammonium salts and/or in the form of the corresponding acids to be

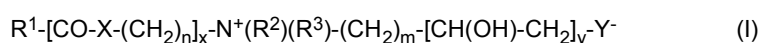
neutralized with the corresponding alkali metal hydroxide, alkaline earth metal hydroxide and/or mono-, di or tri-kanolamine. Preferred alkali metals are potassium and in particular sodium, preferred alkaline earth metals are calcium and in particular magnesium and preferred alkanolamines are mono-, di- or triethanolamine. The sodium salts are particularly preferred.

5 **[0027]** According to various embodiments, the at least one fatty alcohol ether sulfate is selected from the group consisting of Na C<sub>12-14</sub> fatty alcohol ether sulfate (1-4 EO), preferably Na C<sub>12-14</sub> fatty alcohol ether sulfate (1-2 EO).

**[0028]** In various embodiments, a liquid composition according to the present invention comprises the at least one fatty alcohol ether sulfate in an amount of about 0.5 to about 30 wt.-%, preferably in an amount of about 0.7 to about 20 wt.-%, more preferably in an amount of about 1 to about 10 wt.-%, for instance, but without limitation, in an amount of  
10 about 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10 wt.-%, based on the total weight of the liquid composition.

### Betaines

**[0029]** Betaines suitable for incorporation according to the present invention are the alkyl betaines, the alkylamido-  
15 betaines, the imidazolium betaines, the sulfobetaines (INCI Sultaines) and the phosphobetaines and preferably correspond to formula I:



20 in which

R<sup>1</sup> is a saturated or unsaturated C<sub>6-22</sub> alkyl group, preferably a C<sub>8-18</sub> alkyl group and more preferably a saturated C<sub>10-16</sub> alkyl group, for example a saturated C<sub>12-14</sub> alkyl group,

X is NH, NR<sup>4</sup> with the C<sub>1-4</sub> alkyl group R<sup>4</sup>, O or S,

25 n is a number of 1 to 10, preferably 2 to 5 and more preferably 3,

x is 0 or 1, preferably 1,

R<sup>2</sup> and R<sup>3</sup> independently of one another represent an optionally hydroxysubstituted C<sub>1-4</sub> alkyl group such as, for example, a hydroxyethyl group, but especially a methyl group,

m is a number of 1 to 4, more particularly 1, 2 or 3,

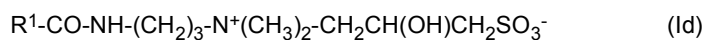
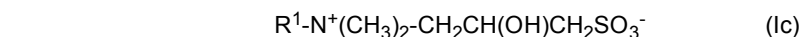
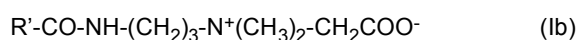
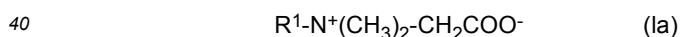
30 y is 0 or 1 and

Y is -COO-, -SO<sub>3</sub>-, -OPO(OR<sup>5</sup>)O or -P(O)(OR<sup>5</sup>)O, where R<sup>5</sup> is a hydrogen atom

H or a C<sub>1-4</sub> alkyl group.

**[0030]** The alkyl betaines and alkylamidobetaines, betaines corresponding to formula I with a carboxylate group (Y = COO<sup>-</sup>), are also known as carbobetaines.  
35

**[0031]** Preferred amphoteric surfactants are the alkyl betaines corresponding to formula (Ia), the alkylamidobetaines corresponding to formula (Ib), the sulfobetaines corresponding to formula (Ic) and the amidosulfobetaines corresponding to formula (Id):



in which R<sup>1</sup> is as defined for formula I.

**[0032]** Particularly preferred amphoteric surfactants are the carbobetaines and more particularly the carbobetaines corresponding to formulae (Ia) and (Ib), the alkylamidobetaines corresponding to formula (Ib) being most particularly preferred.

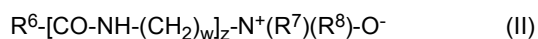
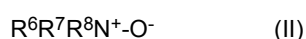
**[0033]** Examples of suitable betaines and sulfobetaines are the following compounds identified by their INCI names: Almondamidopropyl Betaine, Apricotamidopropyl Betaine, Avocadamidopropyl Betaine, Babassuamidopropyl Betaine, Behenamidopropyl Betaine, Behenyl Betaine, Betaine, Canolamidopropyl Betaine, Capryl/Capramidopropyl Betaine, Carnitine, Cetyl Betaine, Cocamidoethyl Betaine, Cocamidopropyl Betaine, Cocamidopropyl Hydroxysultaine, Coco-  
55 Betaine, Coco-Hydroxysultaine, Coco/Oleamidopropyl Betaine, Coco-Sultaine, Decyl Betaine, Dihydroxyethyl Oleyl Glycinate, Dihydroxyethyl Soy Glycinate, Dihydroxyethyl Stearyl Glycinate, Dihydroxyethyl Tallow Glycinate, Dimethicone Propyl PG-Betaine, Erucamidopropyl Hydroxysultaine, Hydrogenated Tallow Betaine, Isostearamidopropyl Betaine, Lau-

ramido-propyl Betaine, Lauryl Betaine, Lauryl Hydroxysultaine, Lauryl Sultaine, Milkamidopropyl Betaine, Minkamido-propyl Betaine, Myristamidopropyl Betaine, Myristyl Betaine, Oleamidopropyl Betaine, Oleamidopropyl Hydroxysultaine, Oleyl Betaine, Olivamidopropyl Betaine, Palmamidopropyl Betaine, Palmitamidopropyl Betaine, Palmitoyl Carnitine, Palm Kernelamidopropyl Betaine, Polytetrafluoroethylene Acetoxypropyl Betaine, Ricinoleamidopropyl Betaine, Sesamidopropyl Betaine, Soyamidopropyl Betaine, Stearamidopropyl Betaine, Stearyl Betaine, Tallowamidopropyl Betaine, Tallowamidopropyl Hydroxysultaine, Tallow Betaine, Tallow Dihydroxyethyl Betaine, Undecylenamidopropyl Betaine und Wheat Germamidopropyl Betaine. A preferred betaine is Cocamidopropyl Betaine (Cocoamidopropylbetaine).

**[0034]** In various embodiments, a liquid composition according to the present invention contains at least one betaine in an amount of about 0.1 to about 25 wt.-%, preferably in an amount of about 0.5 to about 15 wt.-%, more preferably in an amount of about 1 to about 7 wt.-%, for instance, but without limitation, in an amount of about 1, 2, 3, 4, 5, 6 or 7 wt.-%, based on the total weight of the liquid composition.

#### Amine Oxides

**[0035]** According to the invention, suitable amine oxides include alkyl amine oxides, more particularly alkyl dimethyl amine oxides, alkylamidoamine oxides and alkoxyalkyl amine oxides. Preferred amine oxides correspond to formula II:



in which

$R^6$  is a saturated or unsaturated  $C_{6-22}$  alkyl group, preferably a  $C_{8-18}$  alkyl group, more preferably a saturated  $C_{10-16}$  alkyl group, for example a saturated  $C_{12-14}$  alkyl group which, in the alkylamidoamine oxides, is attached to the nitrogen atom via a carbonylamidoalkylene group  $-CO-NH-(CH_2)_z-$  and, in the alkoxyalkyl amine oxides, via an oxa-alkylene group  $-O-(CH_2)_z-$  where  $z$  is a number of 1 to 10, preferably 2 to 5 and more preferably 3,  $R^7$  and  $R^8$  independently of one another represent an optionally hydroxysubstituted  $C_{1-4}$  alkyl group such as, for example, a hydroxyethyl group, more particularly a methyl group.

**[0036]** Examples of suitable amine oxides are the following compounds identified by their INCI names: Almondamidopropylamine Oxide, Babassuamidopropylamine Oxide, Behenamamine Oxide, Cocamidopropyl Amine Oxide, Cocamidopropylamine Oxide, Cocamine Oxide, Coco-Morpholine Oxide, Decylamine Oxide, Decyltetradecylamine Oxide, Diaminopyrimidine Oxide, Dihydroxyethyl  $C_{8-10}$  Alkoxypropylamine Oxide, Dihydroxyethyl  $C_{9-11}$  Alkoxypropylamine Oxide, Dihydroxyethyl  $C_{12-15}$  Alkoxypropylamine Oxide, Dihydroxyethyl Cocamine Oxide, Dihydroxyethyl Lauramine Oxide, Dihydroxyethyl Stearamine Oxide, Dihydroxyethyl Tallowamine Oxide, Hydrogenated Palm Kernel Amine Oxide, Hydrogenated Tallowamine Oxide, Hydroxyethyl Hydroxypropyl  $C_{12-15}$  Alkoxypropylamine Oxide, Isostearamidopropylamine Oxide, Isostearamidopropyl Morpholine Oxide, Lauramidopropylamine Oxide, Lauramine Oxide, Methyl Morpholine Oxide, Milkamidopropyl Amine Oxide, Minkamidopropylamine Oxide, Myristamidopropylamine Oxide, Myristamine Oxide, Myristyl/Cetyl Amine Oxide, Oleamidopropylamine Oxide, Oleamine Oxide, Olivamidopropylamine Oxide, Palmitamidopropylamine Oxide, Palmitamine Oxide, PEG-3 Lauramine Oxide, Potassium Dihydroxyethyl Cocamine Oxide Phosphate, Potassium Trisphosphonomethylamine Oxide, Sesamidopropylamine Oxide, Soyamidopropylamine Oxide, Stearamido-propylamine Oxide, Stearamine Oxide, Tallowamidopropylamine Oxide, Tallowamine Oxide, Undecylenamidopropylamine Oxide und Wheat Germamidopropylamine Oxide. A preferred amine oxide is, for example, Cocamidopropylamine Oxide (cocoamidopropyl amine oxide).

**[0037]** In various embodiments, the liquid composition comprises at least one amine oxide in an amount of about 0.1 to about 25 wt.-%, preferably in an amount of about 0.5 to about 15 wt.-%, more preferably in an amount of about 1 to about 7 wt.-%, for instance, but without limitation, in an amount of about 1, 2, 3, 4, 5, 6 or 7 wt.-%, based on the total weight of the composition.

#### Electrolyte Salts

**[0038]** An additional ingredient that may be present in the liquid compositions according to various further embodiments of the present invention is an electrolyte salt. Electrolyte salts in the context of the present invention are salts which break up into their ionic constituents in the water-based composition according to the invention. Preferred salts are the salts, more particularly alkali metal and/or alkaline earth metal salts, of an inorganic acid, preferably an inorganic acid from the group consisting of the hydrohalic acids, nitric acid and sulfuric acid, more particularly the chlorides and sulfates. A particularly preferred electrolyte salt is NaCl. Another preferred electrolyte salt is magnesium sulfate, more particularly the  $MgSO_4 \cdot 7H_2O$  also known as Epsom salt and occurring as the mineral epsomite. According to the invention, an electrolyte salt may also be used in the form of its corresponding acid/base pair, for example hydrochloric acid and

sodium hydroxide instead of sodium chloride.

**[0039]** The electrolyte salt may be present in an amount of about 0.1 to about 10 wt.-%, preferably about 0.5 to about 7 wt.-%, more preferably about 1 to about 5 wt.-%, for instance, but without limitation, in an amount of about 1, 2, 3, 4 or 5 wt.-%, based on the total weight of the liquid composition.

**[0040]** It is further preferable that the liquid composition comprises, in addition to any of the aforementioned ingredients, at least one further ingredient, which may improve cleaning performance, stability, aesthetics or other attributes and characteristics of the liquid composition. Thus, in various preferred embodiments, the liquid compositions further comprise at least one additive selected from the group consisting of additional surfactants, additional water-soluble salts, additional acids, perfumes, solvents, dyes, opacifiers, viscosity regulators, enzymes, corrosion inhibitors, pH-value adjuster, preservatives, UV stabilizers, skin-care substances, or mixtures thereof.

**[0041]** Whether or not additional surfactants are present in the liquid composition, that is, surfactants present in addition to the at least one fatty alcohol ether sulfate and betaine and/or amine oxide, according to various embodiments, the total amount of surfactants present in the liquid compositions according to the present invention amounts to about 1 to about 70 wt.-%, preferably about 1.5 to about 60 wt.-%, more preferably about 1.5 to about 50 wt.-%, for instance, but without limitation, about 1.5, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 25, 30, 35, 40, 45 or 50 wt.-%, based on the total weight of the composition.

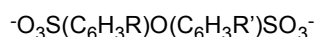
**[0042]** According to the present invention, the purposeful and advantageous surfactant combination, i.e. the combination of at least one fatty alcohol ether sulfate and at least one betaine or amine oxide in the above-indicated ratios constitutes the major part of the surfactant component of the liquid composition. Therefore, according to preferred embodiments, the amount of the at least one fatty alcohol ether sulfate and at least one betaine or amine oxide amounts to at least about 50 wt.-%, preferably at least about 60 wt.-%, more preferably at least about 65 wt.-%, still more preferably at least about 70 wt.-%, most preferably about 80 wt.-%, based on the total weight of the surfactant component present in the liquid composition, i.e. the total weight of all surfactants present in the liquid composition. It is thus also encompassed that, insofar the at least one fatty alcohol ether sulfate is combined in the above-detailed ratios with at least one betaine, at least one amine oxide may be additionally present, although not in an amount as high as the at least one betaine such that the combination of at fatty alcohol ether sulfate and betaine may constitute the major fraction of the surfactant component. Likewise, insofar the at least one fatty alcohol ether sulfate is combined in the above-detailed ratios with at least one amine oxide, at least one betaine may be additionally present, although not in an amount as high as the at least one amine oxide such that the combination of at fatty alcohol ether sulfate and amine oxide may constitute the major fraction of the surfactant component.

**[0043]** Additional surfactants suitable for incorporation according to the present invention may be generally selected from the group consisting of anionic surfactants, nonionic surfactants cationic, zwitterionic, and amphoteric surfactants. Combinations of the aforementioned types of surfactants are also anticipated.

#### *Anionic Surfactants*

**[0044]** The anionic surfactants, which may be used in accordance with the invention, include, in addition to fatty alcohol ether sulfates, other aliphatic sulfates, such as fatty alcohol sulfates, dialkyl ether sulfates, monoglyceride sulfates and aliphatic sulfonates such as alkane sulfonates, olefin sulfonates, ether sulfonates, n-alkyl ether sulfonates, ester sulfonates and lignin sulfonates. Also useful in the context of the present invention are alkyl benzene sulfonates, fatty acid cyanamides, sulfosuccinic acid esters, fatty acid isethionates, acylaminoalkane sulfonates (fatty acid taurides), fatty acid sarcosinates, ether carboxylic acids and alkyl (ether) phosphates.

**[0045]** Suitable anionic surfactants also include anionic gemini surfactants with a diphenyl oxide basic structure, two sulfonate groups and an alkyl group on one or both benzene rings corresponding to the formula



in which R is an alkyl group containing, for example, 6, 10, 12 or 16 carbon atoms and R' stands for R or H (Dowfax® Dry Hydrotrope Powder containing C<sub>16</sub> alkyl group(s); INCI: Sodium Hexyldiphenyl Ether Sulfonate, Disodium Decyl Phenyl Ether Disulfonate, Disodium Lauryl Phenyl Ether Disulfonate, Disodium Cetyl Phenyl Ether Disulfonate) and fluorinated anionic surfactants, more particularly perfluorinated alkyl sulfonates, such as ammonium C<sub>9/10</sub> perfluoroalkyl sulfonate (Fluorad® FC 120) and perfluoro-octane sulfonic acid potassium salt (Fluorad® FC 95).

#### *Alkyl Sulfonates*

**[0046]** The alkyl sulfonates (INCI Sulfonic Acids) normally contain an aliphatic, straight-chain or single- or multiple-branch, acyclic or cyclic, saturated or mono- or polyunsaturated, preferably branched, acyclic, saturated alkyl group containing 6 to 22, preferably 9 to 20, more preferably 11 to 18 and most preferably 13 to 17 carbon atoms. Accordingly,

suitable alkyl sulfonates are the saturated alkane sulfonates, the unsaturated olefin sulfonates and the ether sulfonates (formally derived from the alkoxyated alcohols on which the alkyl ether sulfates are also based) where terminal ester sulfonates (n-ether sulfonates) with the sulfonate function attached to the polyether chain and internal ester sulfonates (i-ester sulfonates) with the sulfonate function attached to the alkyl group. According to the invention, the alkane sulfonates, more particularly alkane sulfonates with a branched, preferably secondary, alkyl group, for example the secondary alkanesulfonate sec. Na C<sub>13-17</sub> alkane sulfonate (INCI Sodium C<sub>14-17</sub> Alkyl Sec. Sulfonate), are preferred.

#### *Anionic Sulfosuccinic Acid Surfactants*

**[0047]** Particularly preferred anionic surfactants are the anionic sulfosuccinic acid surfactants sulfosuccinates, sulfosuccinamates and sulfosuccinamides, more particularly sulfosuccinates and sulfosuccinamates and most preferably sulfosuccinates. The sulfosuccinates are the salts of the mono- and diesters of sulfosuccinic acid HOOCCH(SO<sub>3</sub>H)CH<sub>2</sub>COOH while the sulfosuccinamates are understood to be the salts of the monoamides of sulfosuccinic acid and the sulfosuccinamides are understood to be the salts of the diamides of sulfosuccinic acid. A detailed description of these known anionic surfactants is provided by A. Domsch and B. Irrgang in *Anionic Surfactants: Organic Chemistry* (edited by H. W. Stache; Surfactant Science Series; Volume 56; ISBN 0-8247-9394-2; Marcel Dekker, Inc., New York 1996, pages 501-549).

**[0048]** The salts are preferably alkali metal salts, ammonium salts and mono-, di- and trialkanolammonium salts, for example mono-, di- and triethanolammonium salts, more particularly lithium, sodium, potassium and ammonium salts, more preferably sodium and ammonium salts and most preferably sodium salts.

**[0049]** In the sulfosuccinates, one or both carboxyl groups of the sulfosuccinic acid is/are preferably esterified with one or two identical or different unbranched, branched, saturated or unsaturated, acyclic or cyclic, optionally alkoxyated alcohols containing 4 to 22, preferably 6 to 20, more preferably 8 to 18, most preferably 10 to 16 and, in one most particularly preferred embodiment, 12 to 14 carbon atoms. Particular preference is attributed to the esters of unbranched and/or saturated and/or acyclic and/or alkoxyated alcohols, more particularly unbranched saturated fatty alcohols and/or unbranched saturated fatty alcohols alkoxyated with ethylene and/or propylene oxide, preferably ethylene oxide, with a degree of alkoxylation of 1 to 20, preferably 1 to 15, more preferably 1 to 10, most preferably 1 to 6 and, in one most particularly preferred embodiment, 1 to 4. According to the invention, the monoesters are preferably the diesters. A particularly preferred sulfosuccinate is sulfosuccinic acid lauryl polyglycol ester disodium salt (lauryl-EO-sulfosuccinate, disodium salt, INCI Disodium Laureth Sulfosuccinate) which is commercially obtainable, for example, as Tego® Sulfosuccinat F30 (Goldschmidt) with a sulfosuccinate content of 30% by weight.

**[0050]** In the sulfosuccinamates or sulfosuccinamides, one or both carboxyl groups of the sulfosuccinic acid preferably form a carboxylic acid amide with a primary or secondary amine which carries one or two identical or different, unbranched or branched, saturated or unsaturated, acyclic or cyclic, optionally alkoxyated alkyl groups containing 4 to 22, preferably 6 to 20, more preferably 8 to 18, most preferably 10 to 16 and, in one most particularly preferred embodiment, 12 to 14 carbon atoms. Unbranched and/or saturated and/or acyclic alkyl groups, more particularly unbranched saturated fatty alkyl groups, are particularly preferred.

**[0051]** Also suitable are, for example, the following sulfosuccinates and sulfosuccinamates referred to by their INCI names which are described in more detail in *International Cosmetic Ingredient Dictionary and Handbook*: Ammonium Dinonyl Sulfosuccinate, Ammonium Lauryl Sulfosuccinate, Diammonium Dimethicone Copolyol Sulfosuccinate, Diammonium Lauramido-MEA Sulfosuccinate, Diammonium Lauryl Sulfosuccinate, Diammonium Oleamido PEG-2 Sulfosuccinate, Diamyl Sodium Sulfosuccinate, Dicapryl Sodium Sulfosuccinate, Dicyclohexyl Sodium Sulfosuccinate, Diheptyl Sodium Sulfosuccinate, Dihexyl Sodium Sulfosuccinate, Diisobutyl Sodium Sulfosuccinate, Dioctyl Sodium Sulfosuccinate, Disodium Cetearyl Sulfosuccinate, Disodium Cocamido MEA-Sulfosuccinate, Disodium Cocamido MIPA-Sulfosuccinate, Disodium Cocamido PEG-3 Sulfosuccinate, Disodium Coco-Glucoside Sulfosuccinate, Disodium Cocoyl Butyl Gluceth-10 Sulfosuccinate, Disodium C<sub>12-15</sub> Pareth Sulfosuccinate, Disodium Deceth-5 Sulfosuccinate, Disodium Deceth-6 Sulfosuccinate, Disodium Dihydroxyethyl Sulfosuccinylundecylenate, Disodium Dimethicone Copolyol Sulfosuccinate, Disodium Hydrogenated Cottonseed Glyceride Sulfosuccinate, Disodium Isodecyl Sulfosuccinate, Disodium Isostearamido MEA-Sulfosuccinate, Disodium Isostearamido MIPA-Sulfosuccinate, Disodium Isostearyl Sulfosuccinate, Disodium Laneth-5 Sulfosuccinate, Disodium Lauramido MEA-Sulfosuccinate, Disodium Lauramido PEG-2 Sulfosuccinate, Disodium Lauramido PEG-5 Sulfosuccinate, Disodium Laureth-6 Sulfosuccinate, Disodium Laureth-9 Sulfosuccinate, Disodium Laureth-12 Sulfosuccinate, Disodium Lauryl Sulfosuccinate, Disodium Myristamido MEA-Sulfosuccinate, Disodium Nonoxynol-10 Sulfosuccinate, Disodium Oleamido MEA-Sulfosuccinate, Disodium Oleamido MIPA-Sulfosuccinate, Disodium Oleamido PEG-2 Sulfosuccinate, Disodium Oleth-3 Sulfosuccinate, Disodium Oleyl Sulfosuccinate, Disodium Palmitamido PEG-2 Sulfosuccinate, Disodium Palmitoleamido PEG-2 Sulfosuccinate, Disodium PEG-4 Cocamido MIPA-Sulfosuccinate, Disodium PEG-5 Laurylcitrate Sulfosuccinate, Disodium PEG-8 Palm Glycerides Sulfosuccinate, Disodium Ricinoleamido MEA-Sulfosuccinate, Disodium Sitostereth-14 Sulfosuccinate, Disodium Stearamido MEA-Sulfosuccinate, Disodium Stearyl Sulfosuccinamate, Disodium Stearyl Sulfosuccinate, Disodium Tallamido MEA-

Sulfosuccinate, Disodium Tallowamido MEA-Sulfosuccinate, Disodium Tallow Sulfosuccinamate, Disodium Tridecylsulfosuccinate, Disodium Undecylenamido MEA-Sulfosuccinate, Disodium Undecylenamido PEG-2 Sulfosuccinate, Disodium Wheat Germamido MEA-Sulfosuccinate, Disodium Wheat Germamido PEG-2 Sulfosuccinate, Di-TEA-Oleamido PEG-2 Sulfosuccinate, Ditridecyl Sodium Sulfosuccinate, Sodium Bisglycol Ricinosulfosuccinate, Sodium/MEA Laureth-2 Sulfosuccinate and Tetrasodium Dicarboxyethyl Stearyl Sulfosuccinamate. Another suitable sulfosuccinamate is disodium-C<sub>16-18</sub>-alkoxypropylene sulfosuccinamate.

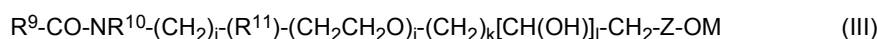
**[0052]** Preferred anionic sulfosuccinic acid surfactants are imidosuccinate, mono-Na-sulfosuccinic acid diisobutyl ester (Monawet<sup>®</sup>(MB 45), mono-Na-sulfosuccinic acid dioctyl ester (Monawet<sup>®</sup> MO-84 R2W, Rewopol<sup>®</sup> SB DO 75), mono-Na-sulfosuccinic acid di-tridecyl ester (Monawet<sup>®</sup> MT 70), fatty alcohol polyglycol sulfosuccinate-Na-NH<sub>4</sub> salt (sulfosuccinate, S-2), di-Na-sulfosuccinic acid mono-C<sub>12-14</sub>-3EO ester (Texapon<sup>®</sup> SB-3), sodium sulfosuccinic acid diisooctyl ester (Texin<sup>®</sup> DOS 75) and di-Na-sulfosuccinic acid mono-C<sub>12/18</sub> ester (Texin<sup>®</sup> 128-P), more particularly the mono-Na-sulfosuccinic acid dioctyl ester synergistically co-operating with the ternary surfactant combination according to the invention in regard to drainage and/or drying behavior.

#### Amphoteric Surfactants

**[0053]** The amphoteric surfactants (zwitterionic surfactants) which may be used in accordance with the invention include, in addition to the above-described betaines, alkyl amidoalkyl amines, alkyl-substituted amino acids, acylated amino acids and biosurfactants.

#### Alkylamido Alkylamines

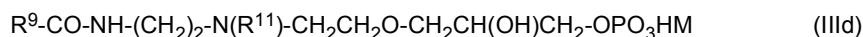
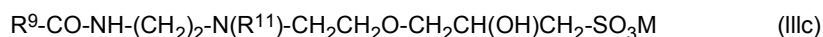
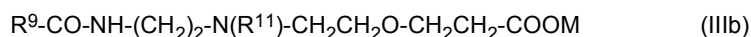
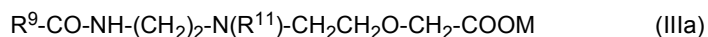
**[0054]** The alkylamido alkylamines (INCI Alkylamido Alkylamines) are amphoteric surfactants corresponding to formula (III):



in which

R<sup>9</sup> is a saturated or unsaturated C<sub>6-22</sub> alkyl group, preferably a C<sub>8-18</sub> alkyl group and more preferably a saturated C<sub>10-16</sub> alkyl group, for example a saturated C<sub>12-14</sub> alkyl group,  
 R<sup>10</sup> is a hydrogen atom H or a C<sub>1-4</sub> alkyl group, preferably H,  
 i is a number of 1 to 10, preferably 2 to 5, more preferably 2 or 3,  
 R<sup>11</sup> is a hydrogen atom H or CH<sub>2</sub>COOM (for M, see below),  
 j is a number of 1 to 4, preferably 1 or 2, more preferably 1,  
 k is a number of 0 to 4, preferably 0 or 1,  
 l is 0 or 1, k being 1 where l is 1,  
 Z is CO, SO<sub>2</sub>, OPO(OR<sup>12</sup>) or P(O)(OR<sup>12</sup>) where R<sup>12</sup> is a C<sub>1-4</sub> alkyl group or M (see below) and  
 M is a hydrogen atom, an alkali metal, an alkaline earth metal or a protonated alkanolamine, for example protonated mono-, di- or triethanolamine.

**[0055]** Preferred representatives correspond to formulae IIIa to IIId:



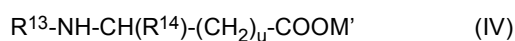
in which R<sup>11</sup> and M are as defined for formula (III).

**[0056]** Examples of alkylamido alkylamines are the following compounds identified by their INCI names: Cocoamphodipropionic Acid, Cocobetainamido Amphopropionate, DEA-Cocoamphodipropionate, Disodium Caproamphodiacetate, Disodium Caproamphodipropionate, Disodium Capryloamphodiacetate, Disodium Capryloamphodipropionate, Disodium Cocoamphocarboxyethylhydroxypropylsulfonate, Disodium Cocoamphodiacetate, Disodium Cocoamphodipropionate, Disodium Isostearoamphodiacetate, Disodium Isostearoamphodipropionate, Disodium Laureth-5 Carboxyamphodiacetate, Disodium Lauroamphodiacetate, Disodium Lauroamphodipropionate, Disodium Oleoamphodipro-

pionate, Disodium PPG-2-Isodeceth-7 Carboxyamphodiacetate, Disodium Stearoamphodiacetate, Disodium Tallowamphodiacetate, Disodium Wheatgermamphodiacetate, Lauroamphodipropionic Acid, Quaternium-85, Sodium Caproamphoacetate, Sodium Caproamphohydroxypropylsulfonate, Sodium Caproamphopropionate, Sodium Capryloamphoacetate, Sodium Capryloamphohydroxypropylsulfonate, Sodium Capryloamphopropionate, Sodium Cocoamphoacetate, Sodium Cocoamphohydroxypropylsulfonate, Sodium Cocoamphopropionate, Sodium Cornamphopropionate, Sodium Isostearoamphoacetate, Sodium Isostearoamphopropionate, Sodium Lauroamphoacetate, Sodium Lauroamphohydroxypropylsulfonate, Sodium Lauroampho PG-Acetate Phosphate, Sodium Lauroamphopropionate, Sodium Myristoamphoacetate, Sodium Oleoamphoacetate, Sodium Oleoamphohydroxypropylsulfonate, Sodium Oleoamphopropionate, Sodium Ricinoleoamphoacetate, Sodium Stearoamphoacetate, Sodium Stearoamphohydroxypropylsulfonate, Sodium Stearoamphopropionate, Sodium Tallamphopropionate, Sodium Tallowamphoacetate, Sodium Undecylenoamphoacetate, Sodium Undecylenoamphopropionate, Sodium Wheat Germamphoacetate und Trisodium Lauroampho PG-Acetate Chloride Phosphate.

*Alkyl-Substituted Amino Acids*

**[0057]** According to the invention, preferred alkyl-substituted amino acids (INCI: Alkyl-Substituted Amino Acids) are monoalkyl-substituted amino acids corresponding to formula (IV):



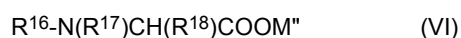
in which

R<sup>13</sup> is a saturated or unsaturated C<sub>6-22</sub> alkyl group, preferably a C<sub>8-18</sub> alkyl group and more preferably a saturated C<sub>10-16</sub> alkyl group, for example a saturated C<sub>12-14</sub> alkyl group,  
 R<sup>14</sup> is a hydrogen atom H or a C<sub>1-4</sub> alkyl group, preferably H,  
 u is a number of 1 to 4, preferably 0 or 1, more preferably 1, and  
 M' is a hydrogen atom, an alkali metal, an alkaline earth metal or a protonated alkanolamine, for example protonated mono-, di- or triethanolamine, alkyl-substituted imino acids corresponding to formula (V):



in which

R<sup>15</sup> is a saturated or unsaturated C<sub>6-22</sub> alkyl group, preferably a C<sub>8-18</sub> alkyl group and more preferably a saturated C<sub>10-16</sub> alkyl group, for example a saturated C<sub>12-14</sub> alkyl group,  
 v is a number of 1 to 5, preferably 2 or 3, more preferably 2, and  
 M'' is a hydrogen atom, an alkali metal, an alkaline earth metal or a protonated alkanolamine, for example protonated mono-, di- or triethanolamine; M'' in the two carboxy groups may have the same meaning or two different meanings, for example may be hydrogen and sodium or just sodium, and mono- or dialkyl-substituted natural amino acids corresponding to formula (VI):



in which

R<sup>16</sup> is a saturated or unsaturated C<sub>6-22</sub> alkyl group, preferably a C<sub>8-18</sub> alkyl group and more preferably a saturated C<sub>10-16</sub> alkyl group, for example a saturated C<sub>12-14</sub> alkyl group,  
 R<sup>17</sup> is a hydrogen atom or an optionally hydroxy- or amine-substituted C<sub>1-4</sub> alkyl group, for example a methyl, ethyl, hydroxyethyl or aminopropyl group,  
 R<sup>18</sup> is the residue of one of the 20 natural α-amino acids H<sub>2</sub>NCH(R<sup>18</sup>)COOH and  
 M'' is a hydrogen atom, an alkali metal, an alkaline earth metal or a protonated alkanolamine, for example protonated mono-, di- or triethanolamine.

**[0058]** Particularly preferred alkyl-substituted amino acids are the aminopropionates corresponding to formula (IVa):



in which R<sup>13</sup> and M' have the same meanings as in formula (IV).

**[0059]** Examples of alkyl-substituted amino acids are the following compounds identified by their INCI names: Aminopropyl Laurylglutamine, Cocaminobutyric Acid, Cocaminopropionic Acid, DEA-Lauraminopropionate, Disodium Cocaminopropyl Iminodiacetate, Disodium Dicarboxyethyl Cocopropylendiamine, Disodium Lauriminodipropionate, Disodium Steariminodipropionate, Disodium Tallowiminodipropionate, Lauraminopropionic Acid, Lauryl Aminopropylglycine, Lauryl Diethylenediaminoglycine, Myristaminopropionic Acid, Sodium C12-15 Alkoxypropyl Iminodipropionate, Sodium Cocaminopropionate, Sodium Lauraminopropionate, Sodium Lauriminodipropionate, Sodium Lauroyl Methylaminopropionate, TEA-Lauraminopropionate und TEA-Myristamino-propionate.

#### *Acylated Amino Acids*

**[0060]** Acylated amino acids are amino acids, more particularly the 20 natural  $\alpha$ -amino acids, which carry the acyl group  $R^{19}CO$  of a saturated or unsaturated fatty acid  $R^{19}COOH$  at the amino nitrogen atom ( $R^{19}$  being a saturated or unsaturated  $C_{6-22}$  alkyl group, preferably a  $C_{8-18}$  alkyl group and more preferably a saturated  $C_{10-16}$  alkyl group, for example a saturated  $C_{12-14}$  alkyl group). The acylated amino acids may also be used in the form of an alkali metal salt, an alkaline earth metal salt or alkanolammonium salt, for example mono-, di- or triethanolamine. Examples of acylated amino acids are the acyl derivatives known collectively by the INCI name of Amino Acids, for example Sodium Cocoyl Glutamate, Lauroyl Glutamic Acid, Capryloyl Glycine oder Myristoyl Methylalanine.

#### *Nonionic Surfactants*

**[0061]** Nonionic surfactants in the context of the invention are, in addition to the above-described the amine oxides, alkoxyates, such as polyglycol ethers, fatty alcohol polyglycol ethers, alkyl phenol polyglycol ethers, end-capped polyglycol ethers, mixed ethers and hydroxy mixed ethers and fatty acid polyglycol esters. Block polymers of ethylene oxide and propylene oxide and fatty acid alkanolamides and fatty acid polyglycol ethers are also suitable. Important classes of nonionic surfactants according to the invention are also the sugar surfactants, more particularly the alkyl polyglucosides.

#### *Fatty Alcohol Polyglycol Ethers*

**[0062]** In the context of the invention, fatty alcohol polyglycol ethers are unbranched or branched, saturated or unsaturated  $C_{10-22}$  alcohols alkoxyated with ethylene oxide (EO) and/or propylene oxide (PO) with a degree of alkoxylation of up to 30, preferably ethoxylated  $C_{10-18}$  fatty alcohols with a degree of ethoxylation of less than 30, preferably with a degree of ethoxylation of 1 to 20, more preferably 1 to 12, most preferably 1 to 8 and, in one most particularly preferred embodiment, 2 to 5, for example  $C_{12-14}$  fatty alcohol ethoxylates with 2, 3 or 4 EO or a mixture of the  $C_{12-14}$  fatty alcohol ethoxylates with 3 and 4 EO in a ratio by weight of 1 to 1 or isotridecyl alcohol ethoxylate with 5, 8 or 12 EO.

#### *Sugar Surfactants*

**[0063]** Sugar surfactants are known surface-active compounds which include, for example, the sugar surfactant classes of alkyl glucose esters, aldobionamides, gluconamides (sugar acid amides), glycerol amides, glycerol glycolipids, polyhydroxyfatty acid amide sugar surfactants (sugar amides) and alkyl polyglucosides described, for example, in WO 97/00609 A1 (Henkel Corporation) and the publications cited therein (pages 4 to 12) to which reference is explicitly made in this regard and of which the disclosure is hereby included in the present application. According to the invention, preferred sugar surfactants are the alkyl polyglucosides and the sugar amides and their derivatives, more particularly their ethers and esters. The ethers are the products of the reaction of one or more, preferably one, sugar hydroxy group with a compound containing one or more hydroxy groups, for example  $C_{1-22}$  alcohols or glycols, such as ethylene and/or propylene glycol; the sugar hydroxy group may also carry polyethylene glycol and/or propylene glycol residues. The esters are the reaction products of one or more, preferably one, sugar hydroxy group with a carboxylic acid, more particularly a  $C_{6-22}$  fatty acid.

#### *Sugar Amides*

**[0064]** Particularly preferred sugar amides correspond to the formula  $R'C(O)N(R'')[Z]$ , where  $R'$  is a linear or branched, saturated or unsaturated acyl group, preferably a linear unsaturated acyl group, containing 5 to 21, preferably 5 to 17, more preferably 7 to 15 and most preferably 7 to 13 carbon atoms,  $R''$  is a linear or branched, saturated or unsaturated alkyl group, preferably a linear unsaturated alkyl group, containing 6 to 22, preferably 6 to 18, more preferably 8 to 16 and most preferably 8 to 14 carbon atoms, a  $C_{1-5}$  alkyl group, more particularly a methyl, ethyl, propyl, isopropyl, n-butyl, isobutyl, tert.butyl or n-pentyl group, or hydrogen and  $Z$  is a sugar unit, i.e. a monosaccharide unit. Particularly preferred sugar amides are the amides of glucose, the glucamides, for example lauroyl methyl glucamide.

*Alkyl Polyglycosides*

**[0065]** The alkyl polyglycosides (APGs) are particularly preferred sugar surfactants for the purposes of the present invention and preferably correspond to the general formula  $R^1O(AO)_a[G]_x$ , where  $R^1$  is a linear or branched, saturated or unsaturated alkyl group containing 6 to 22, preferably 6 to 18 and more preferably 8 to 14 carbon atoms, [G] is a glycosidic sugar unit and x is a number of 1 to 10 and AO stands for an alkyleneoxy group, for example an ethyleneoxy or propyleneoxy group, and a stands for the mean degree of alkoxylation of 0 to 20. The group  $(AO)_a$  may also contain various alkyleneoxy units, for example ethyleneoxy or propyleneoxy units, in which case a stands for the mean total degree of alkoxylation, i.e. the sum of the degree of ethoxylation and the degree of propoxylation. Unless indicated in detail or indicated otherwise in the following, the alkyl groups  $R^1$  of the APGs are linear unsaturated groups with the indicated number of carbon atoms.

**[0066]** APGs are nonionic surfactants and represent known substances which may be obtained by the relevant methods of preparative organic chemistry. The index x indicates the degree of oligomerization (DP degree), i.e. distribution of mono- and oligoglycosides, and is a number of 1 to 10. Whereas x in a given compound must always be an integer and, above all, may assume a value of 1 to 6, the value x for a certain alkyl oligoglycoside is an analytically determined calculated quantity which is generally a broken number. Alkyl glycosides having an average degree of oligomerization x of 1.1 to 3.0 are preferably used. Alkyl glycosides having a degree of oligomerization of less than 1.7 and, more particularly, between 1.2 and 1.6 are preferred from the applicational point of view. The glycosidic sugar used is preferably xylose but especially glucose.

**[0067]** The alkyl or alkenyl radical  $R^1$  may be derived from primary alcohols containing 8 to 18 and preferably 8 to 14 carbon atoms. Typical examples are caproic alcohol, caprylic alcohol, capric alcohol and undecyl alcohol and the technical mixtures thereof obtained, for example, in the hydrogenation of technical fatty acid methyl esters or in the hydrogenation of aldehydes from Roelen's oxosynthesis.

**[0068]** However, the alkyl or alkenyl radical  $R^1$  is preferably derived from lauryl alcohol, myristyl alcohol, cetyl alcohol, palmitoleyl alcohol, stearyl alcohol, isostearyl alcohol or oleyl alcohol and may also be derived from elaidyl alcohol, petroselinyl alcohol, arachyl alcohol, gadoleyl alcohol, behenyl alcohol, erucyl alcohol and technical mixtures thereof.

**[0069]** Particularly preferred APGs are not alkoxyated ( $a=0$ ) and correspond to the formula  $RO[G]_x$ , in which R again stands for a linear or branched, saturated or unsaturated alkyl group containing 4 to 22 carbon atoms, [G] is a glycosidic sugar, preferably glucose, and x is a number of 1 to 10, preferably 1.1 to 3 and more preferably 1.2 to 1.6. Accordingly, preferred alkyl polyglycosides are, for example,  $C_{8-10}$  and a  $C_{12-14}$  alkyl polyglucoside with a DP degree of 1.4 or 1.5, more particularly  $C_{8-10}$  alkyl-1,5-glucoside and  $C_{12-14}$  alkyl-1,4-glucoside.

*Cationic Surfactants*

**[0070]** The composition according to the invention may additionally contain one or more cationic surfactants (cationic surfactants; INCI Quaternary Ammonium Compounds).

**[0071]** Preferred cationic surfactants are the quaternary surface-active compounds, more particularly containing an ammonium, sulfonium, phosphonium, iodonium or arsonium group, which are described as antimicrobial agents, for example, in K. H. Wallhäußer's "Praxis der Sterilisation, Desinfektion-Konservierung: Keimidentifizierung-Betriebshygiene" (5th Edition, Stuttgart/New York: Thieme, 1995). By using antimicrobial quaternary ammonium compounds, the composition can be given an antimicrobial effect or any antimicrobial activity already present through other ingredients can be improved.

**[0072]** Particularly preferred cationic surfactants are quaternary ammonium compounds (QUATS; INCI Quaternary Ammonium Compounds) corresponding to the general formula  $(R^I)(R^{II})(R^{III})(R^{IV})N^+X^-$ , in which  $R^I$  to  $R^{IV}$  may be the same or different and represent  $C_{1-22}$  alkyl groups,  $C_{7-28}$  aralkyl groups or heterocyclic groups, two or - in the case of an aromatic compound, such as pyridine - even three groups together with the nitrogen atom forming the heterocycle, for example a pyridinium or imidazolium compound, and  $X^-$  represents halide ions, sulfate ions, hydroxide ions or similar anions. In the interests of optimal antimicrobial activity, at least one of the substituents preferably has a chain length of 8 to 18 and, more preferably, 12 to 16 carbon atoms.

**[0073]** QUATS can be obtained by reaction of tertiary amines with alkylating agents such as, for example, methyl chloride, benzyl chloride, dimethyl sulfate, dodecyl bromide and also ethylene oxide. The alkylation of tertiary amines with one long alkyl chain and two methyl groups is particularly simple. The quaternization of tertiary amines containing two long chains and one methyl group can also be carried out under mild conditions using methyl chloride. Amines containing three long alkyl chains or hydroxysubstituted alkyl chains lack reactivity and are preferably quaternized with dimethyl sulfate.

**[0074]** Suitable QUATS are, for example, benzalkonium chloride (N-alkyl-N,N-dimethylbenzyl ammonium chloride, CAS No. 8001-54-5), benzalkon B (m,p-dichlorobenzyl dimethyl- $C_{12}$ -alkyl ammonium chloride, CAS No. 58390-78-6), benzoxonium chloride (benzyl dodecyl-bis-(2-hydroxyethyl)-ammonium chloride), cetrimonium bromide (N-hexadecyl-

N,N-trimethyl ammonium bromide, CAS No. 57-09-0), benzetonium chloride (N,N-di-methyl-N-[2-[2-[p-(1,1,3,3-tetramethylbutyl)-phenoxy]-ethoxy]-ethyl]-benzyl ammonium chloride, CAS No. 121-54-0), dialkyl dimethyl ammonium chlorides, such as di-n-decyldimethyl ammonium chloride (CAS No. 7173-51-5-5), didecyldimethyl ammonium bromide (CAS No. 2390-68-3), dioctyl dimethyl ammonium chloride, 1-cetylpyridinium chloride (CAS No. 123-03-5) and thiazoline iodide (CAS No. 15764-48-1) and mixtures thereof. Particularly preferred QUATS are the benzalkonium chlorides containing C<sub>8-18</sub> alkyl groups, more particularly C<sub>12-14</sub> alkyl benzyl dimethyl ammonium chloride. A particularly preferred QUAT is cocopentaethoxy methyl ammonium methosulfate (INCI PEG-5 Cocomonium Methosulfate; Rewoquat® CPEM).

**[0075]** To avoid possible incompatibilities of the cationic surfactants with the anionic surfactants, the cationic surfactant used should be compatible with anionic surfactants or should only be used in very small amounts. In one particular embodiment of the invention, no cationic surfactants are used at all.

### Solvents

**[0076]** The water content of the liquid composition according to the invention may be in the range of about 20 to 90 wt.-%, preferably 30 to 80 wt.-%, more preferably 35 to 70 wt.-% and most preferably 35 to 60 wt.-%, based on the total weight of the liquid composition. The composition according to the invention may advantageously contain one or more water-soluble organic solvents in a quantity of typically 0.1 to 30% by weight, preferably 1 to 20% by weight, more preferably 2 to 15% by weight, most preferably 4 to 12% by weight and, in one most particularly preferred embodiment, 6 to 10% by weight.

**[0077]** In the context of the teaching according to the invention, the solvent is used in particular as a hydrotropic agent, a viscosity adjuster and/or low-temperature stabilizer according to requirements. It has a solubilizing effect, particularly on surfactants and electrolytes, perfumes and dyes, and thus contributes to their incorporation, prevents the formation of liquid crystalline phases and contributes to the formation of clear products. The viscosity of the composition according to the invention decreases with increasing solvent content. However, too much solvent can produce a fall in viscosity. Finally, the cold cloud and clear point of the composition according to the invention decreases with increasing solvent content. Suitable solvents are, for example, saturated or unsaturated, preferably saturated, branched or unbranched C<sub>1-20</sub> hydrocarbons, preferably C<sub>2-15</sub> hydrocarbons, containing at least one hydroxy group and optionally one or more ether functions C-O-C, i.e. oxygen atoms interrupting the carbon atom chain.

**[0078]** Preferred solvents are the C<sub>2-6</sub> alkylene glycols and poly-C<sub>2-3</sub>-alkylene glycol ethers, optionally etherified on one side with a C<sub>1-6</sub> alkanol, containing on average 1 to 9 identical or different, preferably identical, alkylene glycol groups per molecule and the C<sub>1-6</sub> alcohols, preferably ethanol, n-propanol or isopropanol, more particularly ethanol.

**[0079]** Examples of solvents are the following compounds identified by their INCI names: Alcohol (Ethanol), Buteth-3, Butoxydiglycol, Butoxyethanol, Butoxyisopropanol, Butoxypropanol, n-Butyl Alcohol, t-Butyl Alcohol, Butylene Glycol, Butyloctanol, Diethylene Glycol, Dimethoxydiglycol, Dimethyl Ether, Dipropylene Glycol, Ethoxydiglycol, Ethoxyethanol, Ethyl Hexanediol, Glycol, Hexanediol, 1,2,6-Hexanetriol, Hexyl Alcohol, Hexylene Glycol, Isobutoxypropanol, Isopentyl-diol, Isopropyl Alcohol (isoPropanol), 3-Methoxybutanol, Methoxydiglycol, Methoxyethanol, Methoxyisopropanol, Methoxymethylbutanol, Methoxy PEG-10, Methylal, Methyl Alcohol, Methyl Hexyl Ether, Methylpropanediol, Neopentyl Glycol, PEG-4, PEG-6, PEG-7, PEG-8, PEG-9, PEG-6 Methyl Ether, Pentylene Glycol, PPG-7, PPG-2-Buteth-3, PPG-2 Butyl Ether, PPG-3 Butyl Ether, PPG-2 Methyl Ether, PPG-3 Methyl Ether, PPG-2 Propyl Ether, Propanediol, Propyl Alcohol (n-Propanol), Propylene Glycol, Propylene Glycol Butyl Ether, Propylene Glycol Propyl Ether, Tetrahydrofurfuryl Alcohol, Trimethylhexanol.

**[0080]** Particularly preferred solvents are the poly-C<sub>2-3</sub>-alkylene glycol ethers etherified on one side with a C<sub>1-6</sub> alkanol and containing on average 1 to 9 and preferably 2 to 3 ethylene or propylene glycol groups, for example PPG-2 Methyl Ether (dipropylene glycol monomethyl ether). Most particularly preferred solvents are the C<sub>2-3</sub> alcohols ethanol, n-propanol and/or isopropanol, more particularly ethanol.

**[0081]** Besides the solvents described above, suitable solubilizers, particularly for perfume and dyes, are, for example, alkanolamines and alkyl benzene sulfonates containing 1 to 3 carbon atoms in the alkyl chain.

### Viscosity

**[0082]** The viscosity favorable for the composition according to the invention (at 20° C and at a shear rate of 30 s<sup>-1</sup>, as measured with a Brookfield LV DV 11 viscosimeter, spindle 25) is in the range from about 10 to about 10,000 mPa·s, preferably about 50 to about 8,000 mPa·s, in particular about 200 to about 6,500 mPa·s, more preferably about 500 to about 6,000 mPa·s.

**[0083]** After dilution of the liquid composition with, based on the volume of the liquid composition, about 0.5 to about 5 parts, in particular about 0.7 to about 4 parts, more preferably about 0.8 to about 3 parts of water, the diluted composition preferably has a viscosity (at 20° C and at a shear rate of 30 s<sup>-1</sup>, as measured with a Brookfield LV DV 11 viscosimeter, spindle 25) of about 500 to about 8,000 mPa·s, preferably about 800 to about 7,000 mPa·s, in particular about 1,000 to

about 6,500 mPa·s, most preferably about 1,500 to about 6,000 mPa·s.

#### *Polymeric Thickeners*

5 **[0084]** Polymeric thickeners in the context of the present invention are the polycarboxylates with a thickening effect as polyelectrolytes, preferably homopolymers and copolymers of acrylic acid, more particularly acrylic acid copolymers, such as acrylic acid/methacrylic acid copolymers, and the polysaccharides, more particularly heteropolysaccharides, and other typical thickening polymers.

10 **[0085]** Suitable polysaccharides or heteropolysaccharides are the polysaccharide gums, for example gum arabic, agar, alginates, carrageenans and their salts, guar, guaran, tragacanth, geilan, ramsan, dextran or xanthan and their derivatives, e.g. propoxylated guar, as well as their mixtures. Other polysaccharide thickeners, such as starches or cellulose derivatives, can be used alternatively, but preferably in addition to a polysaccharide gum, for example starches of various origins and starch derivatives, e.g. hydroxyethyl starch, starch phosphate esters or starch acetates, or carboxymethyl cellulose or its sodium salt, methyl, ethyl, hydroxyethyl, hydroxypropyl, hydroxypropyl methyl or hydroxyethyl

15 methyl cellulose or cellulose acetate.

**[0086]** A particularly preferred polymeric thickener is the microbial anionic heteropolysaccharide xanthan gum which is produced by *Xanthomonas campestris* and a few other species under aerobic conditions and which has a molecular weight of 2 to  $15 \times 10^6$ . This polymer is obtainable from Kelco, for example, under the name of Keltrol<sup>®</sup>, for example as the cream-colored powder Keltrol<sup>®</sup> T (transparent) or the white granules Keltrol<sup>®</sup> RD (readily dispersible).

20 **[0087]** Acrylic acid polymers suitable as polymeric thickeners are, for example, the high molecular weight homopolymers of acrylic acid crosslinked with a polyalkenyl polyether, more particularly an allyl ether of sucrose, pentaerythritol or propylene (INCI Carbomer), which are also known as carboxyvinyl polymers. Polyacrylic acids such as these are obtainable inter alia from B.F. Goodrich under the name of Carbopol<sup>®</sup>, for example Carbopol<sup>®</sup> 940 (molecular weight ca. 4,000,000 g/mol), Carbopol<sup>®</sup> 941 (molecular weight ca. 1,250,000 g/mol) or Carbopol<sup>®</sup> 934 (molecular weight ca.

25 3,000,000 g/mol).

**[0088]** However, particularly suitable polymeric thickeners are the following acrylic acid copolymers: (i) copolymers of two or more monomers from the group of acrylic acid, methacrylic acid and their simple esters preferably formed with C<sub>1-4</sub> alkanols (INCI Acrylates Copolymer), which include for example the copolymers of methacrylic acid, butyl acrylate and methyl methacrylate (CAS 250235-69-2) or of butyl acrylate and methyl methacrylate (CAS 25852-37-3) and which are obtainable, for example, from Rohm & Haas under the names of Aculyn<sup>®</sup> and Acusol<sup>®</sup>, for example the anionic non-associative polymers Aculyn<sup>®</sup> 33 (crosslinked), Acusol<sup>®</sup> 810 and Acusol<sup>®</sup> 830 (CAS 25852-37-3); (ii) crosslinked high molecular weight acrylic acid copolymers which include, for example, the copolymers of C<sub>10-30</sub> alkyl acrylates-crosslinked with an allyl ether of sucrose or pentaerythritol-with one or more monomers from the group of acrylic acid, methacrylic acid and their simple esters preferably formed with C<sub>1-4</sub> alkanols (INCI Acrylates/C<sub>10-30</sub> Alkyl Acrylate Crosspolymer) and which are obtainable, for example, from B.F. Goodrich under the name of Carbopol<sup>®</sup>, for example the hydrophobicized Carbopol<sup>®</sup> ETD 2623 and Carbopol<sup>®</sup> 1382 (INCI Acrylates/C<sub>10-30</sub> Alkyl Acrylate Crosspolymer) and Carbopol<sup>®</sup> AQUA 30 (formerly Carbopol<sup>®</sup> EX 473).

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**[0089]** The polymeric thickener content is normally not more than 8% by weight, preferably between 0.1 and 7% by weight, more preferably between 0.5 and 6% by weight, most preferably between 1 and 5% by weight and, in one most particularly preferred embodiment, between 1.5 and 4% by weight, for example between 2 and 2.5% by weight.

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**[0090]** According to preferred embodiments of the invention, however, the composition is free from polymeric thickeners.

#### *Dicarboxylic Acid (Salts)*

45 **[0091]** In order to stabilize the liquid composition according to the invention, particularly where it has a high surfactant content, one or more dicarboxylic acids and/or salts thereof, more particularly a composition of Na salts of adipic acid, succinic acid and glutaric acid commercially obtainable, for example, as Sokalan<sup>®</sup> DSC, may be added, advantageously in quantities of 0.1 to 8% by weight, preferably in quantities of 0.5 to 7% by weight, more preferably in quantities of 1.3 to 6% by weight and most preferably in quantities of 2 to 4% by weight.

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**[0092]** A change in the content of dicarboxylic acid (salt), more particularly in quantities above 2% by weight, can contribute to a clear solution of the ingredients. The viscosity of the mixture can also be influenced within certain limits by this component. In addition, this component influences the solubility of the mixture. In a particularly preferred embodiment, the component in question is used where the surfactant content is high, more particularly above 30% by weight. However, if their presence is not essential, the composition according to the invention is preferably free from dicarboxylic acids (salts).

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Auxiliaries and Additives

**[0093]** In addition, one or more other typical auxiliaries and additives, particularly in manual dishwashing detergents and cleaners for hard surfaces, more particularly builders, UV stabilizers, perfume, pearlizers (INCI Opacifying Agents; for example glycol distearate, for example Cutina® AGS of Henkel AG & Co. KGaA or mixtures containing it, for example the Euperlans® of Henkel KGaA), dyes, corrosion inhibitors, preservatives (for example the technical 2-bromo-2-nitropropane-1,3-diol also known as Bronopol (CAS 52-51-7) which is commercially obtainable from Boots as Boots Bronopol BT) and skin-feel-improving or skin-care additives (for example dermatologically active substances, such as vitamin A, vitamin B2, vitamin B12, vitamin C, vitamin E, D-panthenol, sericerin, collagen partial hydrolyzate, various vegetable protein partial hydrolyzates, protein hydrolyzate/fatty acid condensates, liposomes, cholesterol, vegetable and animal oils such as, for example, lecithin, soybean oil, etc., plant extracts such as, for example, aloe vera, azulene, hamamelis extracts, algal extracts, etc., allantoin, AHA complexes), may be present in the compositions according to the invention in quantities of normally not more than 5% by weight, preferably 0.1 to 3 wt.-%.

pH-value

**[0094]** The pH-value of the of the compositions according to the invention may be adjusted with typical pH adjusters, for example acids, such as mineral acids or citric acid, and/or alkalis, such as sodium or potassium hydroxide, a pH in the range from 7.1 to 13, preferably in the range from 8 to 12 and more particularly in the range from 9 to 11 being preferred.

**[0095]** In order to adjust and/or stabilize the pH-value, the composition according to the invention may contain one or more buffers (INCI Buffering Agents) in quantities of typically 0.001 to 5% by weight, preferably 0.005 to 3% by weight, more preferably 0.01 to 2% by weight, most preferably 0.05 to 1% by weight and, in one most particularly preferred embodiment, 0.1 to 0.5% by weight, for example 0.2% by weight. Buffers which are also complexing agents or even chelators (INCI Chelating Agents) are preferred. Particularly preferred buffers are citric acid or the citrates, more particularly the sodium and potassium citrates, for example trisodium citrate \*2 H<sub>2</sub>O and tripotassium citrate \*H<sub>2</sub>O.

Production

**[0096]** The composition according to the invention may be prepared by stirring the individual constituents together in any order. The addition sequence is not crucial to the production of the composition. Water, surfactants and optionally others of the ingredients mentioned above are preferably stirred together. If perfume and/or dye is/are used, they are subsequently added to the solution obtained. The pH value is then adjusted as described above.

**[0097]** In a further aspect, the present invention relates to the use of a liquid composition, as herein described above, for the cleaning of hard surfaces, as herein defined.

**[0098]** In a still further aspect, the present invention also relates to the use of a liquid composition, as herein described above, for the preparation of a dilute aqueous hard surface cleaning composition.

**[0099]** Consequently, in yet another aspect, the present invention furthermore relates to a method for the preparation of a dilute aqueous hard surface cleaning composition, characterized in that a liquid composition as herein disclosed and described is diluted with about 0.5 to about 5 parts, preferably about 0.7 to about 4 parts, more preferably about 0.8 to about 3 parts of water, for instance, but without limitation, about 0.8, 0.9, 1.0, 1.5, 2.0, 2.5 or 3.0 parts of water, based on the volume of the liquid composition.

**[0100]** All embodiments disclosed herein in relation to the liquid compositions apply similarly to the methods and uses of the invention and *vice versa*.

**[0101]** The following examples are given to illustrate the present invention. Because these examples are given for illustrative purposes only, the invention should not be deemed limited thereto.

Examples

Example 1: Composition formulations

**[0102]**

Table 1

Ingredients	Liquid Composition Example 1	Liquid Composition Example 2
SLES	2.1	2.1
Amine Oxide		1.4

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(continued)

Ingredients	Liquid Composition Example 1	Liquid Composition Example 2
Cocoamidopropyl betaine	1.4	
Sodium chloride	1.5	1.5
Perfume	0.05	0.05
Dyes	0.05	0.05
Water	ad 100	ad 100

**[0103]** Amounts of ingredients given in wt.-%, based on the total weight of the liquid composition.

**[0104]** The viscosity of both Liquid Composition Example 1 and Liquid Composition Example 2 is 5,500 mPa·s (measured at 20 °C, 3 rpm, Spindle 31, Brookfield DV2T).

**Example 2:** Dilution ratios and viscosity of diluted products

**[0105]**

**Table 2**

Ingredients	Amount [wt.-%]	Amount [wt.-%]
Liquid Composition Example 1	25	0
Liquid Composition Example 2	0	25
Water	75	75
<b>Viscosity</b> [mPa·s] (measured at 20 °C, 3 rpm, Spindle 31, Brookfield DV2T)	5,000-6,000	5,000-6,000

### Claims

1. A liquid composition for the cleaning of hard surfaces, said composition being a concentrate to be diluted with water while maintaining or increasing viscosity, **characterized in that** it comprises at least one fatty alcohol ether sulfate and at least one betaine in a weight ratio in the range of about 50:50 to about 70:30, preferably in the range of about 55:45 to about 65:35, more preferably in the range of about 57:43 to about 63:37, such as about 60:40, or at least one fatty alcohol ether sulfate and at least one amine oxide in a weight ratio in the range of about 50:50 to about 70:30, preferably in the range of about 55:45 to about 65:35, more preferably in the range of about 57:43 to about 63:37, such as about 60:40.
2. The liquid composition according to claim 1, wherein the at least one fatty alcohol ether sulfate is selected from the group consisting of Na C<sub>12-14</sub> fatty alcohol ether sulfate (1-4 EO), preferably Na C<sub>12-14</sub> fatty alcohol ether sulfate (1-2 EO).
3. The liquid composition according to claim 1 or claim 2, wherein the at least one fatty alcohol ether sulfate is present in an amount of about 0.5 to about 30 wt.-%, preferably about 0.7 to about 20 wt.-%, more preferably about 1 to about 10 wt.-%, based on the total weight of the composition.
4. The liquid composition according to any one of claims 1 to 3, wherein the at least one betaine is present in an amount of about 0.1 to about 25 wt.-%, preferably about 0.5 to about 15 wt.-%, more preferably about 1 to about 7 wt.-%, based on the total weight of the composition.
5. The liquid composition according to any one of claims 1 to 3, wherein the at least one amine oxide is present in an amount of about 0.1 to about 25 wt.-%, preferably about 0.5 to about 15 wt.-%, more preferably about 1 to about 7 wt.-%, based on the total weight of the composition.
6. The liquid composition according to any one of claims 1 to 5, further comprising at least one electrolyte salt selected

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from the group consisting of alkali metal salts and/or alkaline earth metal salts of an inorganic acid, preferably an inorganic acid selected from the group consisting of the hydrohalic acids, nitric acid and sulfuric acid, more particularly the chlorides and sulfates.

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7. The liquid composition according to claim 6, wherein the salts are selected from the group consisting of alkali metal, alkaline earth metal and/or ammonium salts, in particular alkali metal and/or ammonium salts, particularly preferably sodium salts.
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8. The liquid composition according to any one of claims 1 to 7, wherein the at least one inorganic acid or salt thereof is present in an amount of about 0.1 to about 10 wt.-%, preferably about 0.5 to about 7 wt.-%, more preferably about 1 to about 5 wt.-%, based on the total weight of the composition.
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9. The liquid composition according to any one of claims 1 to 8, further comprising at least one additive selected from the group consisting of additional surfactants, additional water-soluble salts, additional acids, perfumes, solvents, dyes, opacifiers, viscosity regulators, enzymes, corrosion inhibitors, pH-value adjuster, preservatives, UV stabilizers, skin-care substances, or mixtures thereof.
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10. The liquid composition according to any one of claims 1 to 9, wherein a total of about 1 to about 70 wt.-%, preferably about 1.5 to about 60 wt.-%, more preferably about 1.5 to about 50 wt.-% of surfactants are present, based on the total weight of the composition.
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11. The liquid composition according to any one of claims 1 to 10, wherein, at 20 °C and a shear rate of 30 s<sup>-1</sup>, it has a viscosity of about 10 to about 10,000 mPa·s, preferably about 50 to about 8,000 mPa·s, in particular about 200 to about 6,500 mPa·s, more preferably about 500 to about 6,000 mPa·s, and after dilution with, based on the volume of the liquid composition, about 0.5 to about 5 parts, in particular about 0.7 to about 4 parts, more preferably about 0.8 to about 3 parts of water, a viscosity of about 500 to about 8,000 mPa·s, preferably about 800 to about 7,000 mPa·s, in particular about 1,000 to about 6,500 mPa·s, most preferably about 1,500 to about 6,000 mPa·s.
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12. Use of a liquid composition according to any one of claims 1 to 11 for cleaning hard surfaces.
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13. Use of a liquid composition according to any one of claims 1 to 11 for the preparation of a dilute aqueous hard surface cleaning composition.
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14. Method for the preparation of a dilute aqueous hard surface cleaning composition, **characterized in that** a liquid composition according to any one of claims 1 to 11 is diluted with about 0.5 to about 5 parts, preferably about 0.7 to about 4 parts, more preferably about 0.8 to about 3 parts of water, based on the volume of the liquid composition.



EUROPEAN SEARCH REPORT

Application Number  
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