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(54) Title: PROCESS FOR PRODUCING SULFATIZED ESTERAMINES

(57) Abstract: The present invention relates to a process for producing sulfatized esteramines comprising step a), wherein at least one alcohol containing at least two hydroxy groups (compound (A)) is reacted with at least one amino acid (compound (B)) and with sulfuric acid (compound (C)). The present invention also relates to sulfatized esteramines obtained by such process, wherein the at least one amino acid is selected from α -amino acids or β -amino acids, their uses, and compositions comprising such products.

Process for producing sulfatized esteramines

Description

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The present invention relates to a process for producing sulfatized esteramines comprising step a), wherein at least one alcohol containing at least two hydroxy groups (compound (A)) is reacted with at least one amino acid (compound (B)) and with sulfuric acid (compound (C)). The present invention also relates to sulfatized esteramines obtained by such process, wherein the at least one amino acid is selected from α -amino acids or β -amino acids.

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Due to the climate change, one of the most important targets of the detergent and cleaning (D&C) industry today is to significantly lower the CO₂ emission per wash, by improving e.g. cold water conditions by improving the cleaning efficiency at low temperatures of below 40, 30 or 20 or even colder, to lower the amounts of chemicals employed per wash, increasing the weight-efficiency of the cleaning technologies, reducing the amount of water per wash, introducing bio-derived components etc. Hence, one important target of the D&C industry is the need for biodegradable ingredients, to improve the sustainability of the cleaning formulations (and especially the laundry and dish wash formulations) and to avoid the accumulation of non-degradable compounds in the ecosystem. Hence, there is a need to provide compounds being biodegradable and still having at least the same performance as already known but not biodegradable compounds, such biodegradation as measured under defined conditions within 28 days as to be required by many users especially in the field of detergents, and as being a future requirement by applicable legislation in several countries and regions of the world.

25

Such reduction in CO₂-emission or the desire to improve the "footprint" of any product is of high and even further rising interest in the industry and with the consumers, be it in terms of its origin like being from natural or renewable resources, or - all compared to previous products - its production in terms of production efficiency and thus reduced usage of energy, its efficiency in usage such as reduced amounts for the same performance or higher performance at the same amount levels used, its persistence in the natural environment upon and/or after its usage such as bio-degradation.

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As a result of these trends, there is a strong need for new biodegradable cleaning additives that provide at least comparable cleaning properties and a reduction in the CO₂-footprint by being bio-derived, bio-degradable or even both. The materials should preferably exhibit good primary cleaning activity, soil removal for oily/fatty and particulate stains and/or should lead to improved whiteness maintenance, minimizing the amount of suspended and emulsified oily/fatty and particulate soil from redepositing on the surfaces of the textiles or hard surfaces, etc.

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WO 2019/007750 relates to alkoxylated esteramines and salts thereof according to a specific formula (I), derived from mono-alkohols. In case the respective compound is a salt, the respec-

tive salt may be obtained by at least partial protonation of the amine groups contained within the compounds according to formula (I) by an acid selected from compounds such as methane sulfonic acid, hydrochloric acid, sulfuric acid, phosphoric acid or lactic acid. The alkoxylated esteramines of WO 2019/007750 may be obtained by reacting at least one alcohol according to a specific formula (III) with at least one C₂ to C₁₆ alkylene oxide followed by at least partial esterification with at least one aminoacid such as alanine, lysine or an acid according a specific formula (IV). Further alkoxylated esteramines and salts thereof are disclosed within WO 2019/007754. However, all examples use only a sulfonic acid and no other acid, and specifically do not use sulfuric acid, and thus no sulfatized esteramines are produced. Sulfatization is not mentioned at all within WO 2019/007750.

WO 2019/110371 relates to a process for the preparation of organic sulfonic salts of aminoacid esters as well as to the organic sulfonic acid salts of aminoacid esters as such. The respective organic sulfonic acid salts of aminoacid esters are obtained by a process comprising the reaction of at least one lactam having at least three carbon atoms in the lactam ring with at least one organic sulfonic acid in aqueous solution (step i)) and the esterification of the reaction product of step i) with at least one alcohol with at least 8 carbon atoms comprising at least one hydroxyl group.

WO 2022/002761 relates to sulfatized esteramines obtainable by a process comprising step a), wherein at least one alcohol containing at least two hydroxy groups (compound (A)) is reacted with at least one lactam (compound (B)) and with sulfuric acid (compound (C)). Lactams contain at least three carbon atoms, and thus are cyclic amino acids of the formal linear "gamma-aminoacids" or higher amino-acids.

WO 2020/144030 relates to comparable sulfatized esteramines by employing monoalcohols instead.

The object of the present invention is to provide a new process for producing sulfatized esteramines. The object is achieved by a process for producing a sulfatized esteramine comprising step a):

a) reacting at least one alcohol containing at least two hydroxy groups (compound (A)) with at least one amino acid (compound (B)) and with sulfuric acid (compound (C)).

The sulfatized esteramines produced by a process according to the present invention may be used in specific compositions, such as detergent, cleaning and/or fabric and home care compositions/formulations.

An advantage can be seen in the fact that the sulfatized esteramines produced by a process according to the present invention show improved clay dispersing properties and/or an improved whiteness compared to esteramines based on, for example, alkoxylated and non-

alkoxylated di- and polyols without sulfate groups. This means, expressed in other words, that the respective esteramines according to the prior art do not mandatorily contain any OSO_3 fragments.

- 5 Another advantage can be seen in that due to the employment of at least one amino acid within the inventive process, higher conversion rates and/or faster conversion are obtained compared to a process wherein at least one lactam is employed instead.

10 In a further, independent aspect, the sulfatized esteramines produced by a process according to the present invention show improved biodegradability properties when being employed, for example, within cleaning compositions.

15 In one embodiment of the present invention, a further advantage can be found in that no (additional) solvent, especially no water, needs to be added for carrying out step a) by reacting compounds (A), (B) and (C) with each other.

The invention is specified in more detail as follows:

20 The invention relates to a process for producing a sulfatized esteramine comprising step a):

- a) reacting at least one alcohol containing at least two hydroxy groups (compound (A)) with at least one amino acid (compound (B)) and with sulfuric acid (compound (C)).

25 When used herein any definition requiring a compound or a substituent of a compound to consist of "at least a number of carbon atoms", number of carbon atoms refers to the total number of carbon atoms in said compound or substituent of a compound. For example for a substituent disclosed as "alkyl ether with at least 8 carbon atoms comprising alkylene oxide groups", the total number of at least 8 carbon atoms needs to be the sum of the number of carbon atoms of the alkyl moiety and the number of carbon atoms of the alkylene oxide moieties.

30 The term "containing at least two hydroxy groups" means that two or more -OH groups are present. The term "hydroxy group" is equal to the term "hydroxyl group" or "-OH group". Alcohols/compounds having only one hydroxy group, such as methanol or ethanol, do, by consequence, not fall under the definition of an alcohol containing at least two hydroxy groups according to compound (A) of the present invention. Any functionalized group derived from a hydroxy group such as an ether group is not considered to be an -OH group.

40 Alcohols containing at least two hydroxy groups according to compound (A) are known to a person skilled in the art. As mentioned above, the respective alcohol may contain two, three, four, five or even more hydroxy groups within the respective molecule/compound. The respective alcohol may contain linear, branched and/or cyclic alkyl fragments. Beyond that, the respective alcohol may also contain aromatic fragments as well as combinations of alkyl and aromatic

fragments ("aralkyl fragments"). Furthermore, the respective alcohol may also contain alkyl ether fragments. Examples of alcohols according to compound (A) are glycerol, pentaerythrit, sorbitol, 1,1,1-trimethylolpropane (TMP), erythrit or alkoxyated alcohols, such as polyethylene glycol. Alcohols according to compound (A) of the present invention are usually commercially available, for example, under the tradename "Pluronics" (for example as polyethyleneglycol block (co)polymers) from BASF SE.

In one embodiment of the present invention, at least one linear or branched C₂- to C₃₆-alcohol containing at least two hydroxy groups is used.

In another embodiment, alkylether alcohols are used. Alkylether alcohols are for example alkyl alcohols alkoxyated with ethylene oxide, and/or propylene oxide, and/or butylene oxide. In one embodiment of the present invention, at least one linear or branched C₂- to C₃₆-alcohol containing at least two hydroxy groups alkoxyated with ethylene oxide, and/or propylene oxide, and/or butylene oxide is used. In another embodiment at least one C₈- to C₂₂-alcohol containing at least two hydroxy groups alkoxyated with ethylene oxide, and/or propylene oxide, and/or butylene oxide is used.

Alkoxylation of the alcohol is either carried out with only one alkylene oxide or with more than one alkylene oxide. If more than one alkylene oxide is used, the resulting alkylether alcohols comprises either randomly distributed alkylene oxide units or a block of one alkylene oxide followed by a block of another alkylene oxide or a block of one alkylene oxide followed by another block which comprises two or more alkylene oxides arranged in random order or a block comprising two or more alkylene oxides is followed by another block which comprises two or more alkylene oxides with each such block being different in their relative amount of alkylene oxides, their arrangement of alkylene oxides and/or the identity of the alkylene oxides such that two block linked to each other differ in their chemical composition and arrangement; any such combination of arrangements is in principle possible, and as such is encompassed by this present invention.

In one embodiment of the present invention, alkyl alcohols alkoxyated with only a single alkylene oxide are used. In a further embodiment, alkyl alcohols alkoxyated with a first alkylene oxide followed by alkoxylation with a second alkylene oxide, thereby forming a block structure of different alkylene oxide blocks, are used.

The at least one alcohol containing at least two hydroxy groups according to compound (A) is preferably at least one alcohol containing at least two hydroxy groups selected from diols, polyols, alkoxyated diols and alkoxyated polyols, more preferably, selected from sorbitol, 1,6-hexanediol, glycerol, 1,1,1-trimethylolpropan (TMP), pentaerythrit, erythrit, polyethyleneglycol, ethylene glycol, alkoxyated ethylene glycol, propylene glycol, alkoxyated propylene glycol, polypropylene glycol, polyalkylene oxide block copolymers,

alkoxylated sorbitol, alkoxylated 1,6-hexanediol, alkoxylated glycerol, alkoxylated TMP, alkoxylated erythrit and alkoxylated pentaerythrit, most preferably, selected from 1,6-hexanediol, alkoxylated sorbitol, alkoxylated glycerol, polyethylene glycol, block copolymers of ethylene oxide and propylene oxide, alkoxylated TMP, alkoxylated erythrit and alkoxylated pentaerythrit.

Within the context of the present invention, it is also preferred that in case compound (A) comprises an alkoxylated alcohol containing at least two hydroxy groups, the alkoxylated fragment of the respective alcohol is based on at least one C₂-C₂₂ alkylene oxide, more preferably on ethylene oxide and/or propylene oxide, most preferably the respective alcohol comprises at least one block based on ethylene oxide and/or propylene oxide.

Within the context of the present invention, it is also preferred that in case an alkoxylated alcohol containing at least two hydroxy groups is employed as compound (A), the respective alkylation in order to obtain the respective alkoxylated alcohol is carried out prior to step a) as a separate step b). Expressed in other words, this means that first an alkoxylated alcohol according to compound (A) is prepared and, for example, directly afterwards, the respective alkoxylated alcohol (i.e. compound (A)) is employed within step a) of the process according to the present invention in order to obtain the sulfatized ester amines according to the present invention.

It is therefore preferred that the sulfatized ester amines according to the present invention are obtainable by a process comprising steps a) and b), wherein step a) is defined as above and the process also comprises step b), which is carried out prior to step a):

b) at least one alcohol containing at least two hydroxy groups and, preferably having a weight average molecular weight M_w of less than 500 g/mol, is reacted with at least one alkylene oxide in order to obtain an alkoxylated alcohol as compound (A).

Within step b), it is preferred that the sulfatized esteramine according to the present invention is obtained, wherein

- i) ethylene oxide and/or propylene oxide is employed, and/or
- ii) at least one alcohol containing at least two hydroxy groups and having a weight average molecular weight M_w of less than 500 g/mol is reacted with at least 1 mol of propylene oxide and/or with at least 1 mol of ethylene oxide, or
- iii) at least one alcohol containing at least two hydroxy groups and having a weight average molecular weight M_w of less than 500 g/mol is reacted batchwise with ethylene oxide and/or propylene oxide in order to obtain at least one block based on ethylene oxide and/or propylene oxide on the respective alkoxylated alcohol, or

iv) at least one alcohol containing at least two hydroxy groups and having a weight average molecular weight M_w of less than 500 g/mol is reacted in at least one batch with 1 to 120 mol of propylene oxide followed by at least one batch of 1 to 150 mol ethylene oxide.

5 In a preferred embodiment of the present invention step b) is carried out as follows:

at least one alcohol containing at least two hydroxy groups is reacted with at least one alkylene oxide in order to obtain an alkoxylated alcohol as compound (A), such reaction preferably being performed as semi-batch or batch reaction, more preferably semi batch reaction, to obtain an
10 alkoxylated alcohol, preferably – in case of more than one alkylene oxide is employed –, a polyalkylene oxide block copolymer in the polyalkoxyl-portion of the alkoxylated alcohol is obtained.

Within this preferred embodiment it is even more preferred that the at least one alkylene oxide
15 is selected from ethylene oxide (EO) and propylene oxide (PO), preferably in an amount of from 1 to 150 mol EO and/or from 1 to 120 mol PO, and the at least alcohol having a weight average molecular weight M_w of at most 500, preferably at most 300, more preferably at most 200, and most preferably at most 150 g/mol.

20 The at least one amino acid according to compound (B) is known to a person skilled in the art. In principle, any amino acid which is stable and known to a person skilled in the art can be employed as compound (B) within the context of the present invention.

Within the present invention, it is preferred that component (B) is at least one amino acid selected from the group of α -amino acids, β -amino acids, 6-amino hexanoic acid, 5-amino pentanoic acid, 4-amino butanoic acid, 3-amino propanoic acid, 12-amino dodecanoic acid and 11-aminoundecanoic acid,

preferably compound (B) is at least one amino acid selected from alanine, glycine, leucine, isoleucine, valine, proline, phenylalanine, arginine, asparagine, aspartic acid, glutamine, histidine, lysine, threonine, tryptophan, tyrosine, cysteine, methionine, serine, aminoisobutyric acid, 2-aminopentanoic acid, sarcosine, N,N-dimethylglycine, β -alanine, 6-amino hexanoic acid, N,N-dimethyl-6-aminohexanoic acid, 5-amino pentanoic acid, 4-amino butanoic acid, 3-amino propanoic acid, 12-amino dodecanoic acid and 11-aminoundecanoic acid,

more preferably compound (B) is at least one amino acid selected from alanine, glycine, leucine, isoleucine, valine, proline, phenylalanine, arginine, asparagine, aspartic acid, glutamine, histidine, lysine, threonine, tryptophan, tyrosine, cysteine, methionine, serine, aminoisobutyric acid, 2-aminopentanoic acid, β -alanine, 6-amino hexanoic acid, 5-amino pentanoic acid, 4-amino butanoic acid, 3-amino propanoic acid, 12-amino dodecanoic acid and 11-aminoundecanoic acid,

40 most preferably compound (B) is 6-aminohexanoic acid, alanine or β -alanine.

Reaction of the amino acid may take place by reacting the at least one amino acid with sulfuric acid. Reaction of the amino acid with the sulfuric acid is preferably carried out in the absence of water.

5 The term "absence of water" means that the composition contains no more than 5 wt.-% of water based on the total amount of solvent, in another embodiment no more than 1 wt.-% of water based on the total amount of solvent, in a further embodiment the solvent contains essentially no water such as no water at all.

10 In an alternative embodiment of the present application the reaction of the amino acid takes place by reacting the at least one amino acid with sulfuric acid in an aqueous solution, preferably in an aqueous solution containing only water.

The term "aqueous solution" means that the solvent contains more than 50 wt.-% of water
15 based on the total amount of solvent. In a further embodiment the term means that the solvent contains more than 80 wt.-% of water based on the total amount of solvent. In another embodiment the term means that the solvent contains more than 95 wt.-% of water based on the total amount of solvent. In a further embodiment the term means that the solvent contains more than 99 wt.-% of water based on the total amount of solvent. In an even further embodiment, the
20 term means that the solvent contains only water.

In one preferred embodiment of the present invention, no (additional) solvent, especially no water, is added for carrying out step a) by reacting compounds (A), (B) and (C) with each other. In this embodiment, the amount of solvent, in particular of water, is less than 5 wt.-%, preferably
25 less than 1 wt.-%, based on the total amount of compounds (A), (B) and (C) as employed within step a).

Sulfuric acid as such, which is employed as compound (C) within the present invention, is known to a person skilled in the art.

30 In one embodiment the amino acid is either dissolved in water or is dispersed in an aqueous phase. Typical concentration of amino acid in water is in the range of from 50 % by weight to 99 % by weight based on the total weight of amino acid and water. In one embodiment of the present invention the concentration of amino acid in water is in the range of from 55 to 90 % by
35 weight based on the total weight of the amino acid and water. In a further embodiment the concentration of amino acid in water is in the range of from 65 to 80 % by weight based on the total weight of the amino acid and water.

In one embodiment, sulfuric acid is used as concentrated sulfuric acid.

40 In another embodiment, sulfuric acid is used as 96 to 98 wt.-% sulfuric acid solution in water. In a further embodiment sulfuric acid is used as 80 wt.-% sulfuric acid solution in water.

In one embodiment of the present invention the total amount of sulfuric acid is added at the beginning of the reaction to the at least one amino acid.

In another embodiment the sulfuric acid is added dropwise for a duration of from 0.1 to 10 h to the at least one amino acid.

5

The process as such comprising step a) in order to obtain the sulfatized esteramines according to the present invention can be carried out by any method known to a person skilled in the art. Specific ways/embodiments for carrying out step a) according to the present invention, are described in further detail below within the experimental section.

10

Step a) according to the present invention may be carried out by mixing the respective compounds (A) to (C) in any order and/or sequence. For example, it is possible to mix all three components together before starting the reaction as such. However, it is also possible to mix only parts of these components in advance and the remaining parts of the respective components or even the complete part of a single component afterwards. For example, step a) can also be carried out batchwise and/or continuously.

15

Within the context of the present invention, step a) may be carried out as follows:

20

i) at least a fraction of compound (A) is first mixed with at least a fraction of compound (B) followed by continuously adding at least a fraction of compound (C) over a specific period of time, preferably the entire amount of compound (A) is first mixed with the entire amount of compound (B) followed by continuously adding the entire amount of compound (C), and/or

25

ii) at least a fraction of compound (A) is first mixed with at least a fraction of compound (B) and compound (C) is added continuously for a specific period of time which is preferably in the range of less than one hour, more preferably less than 30 minutes, most preferably between 5 and 15 minutes, and/or

iii) the reaction is carried out after all compounds (A) to (C) are admixed with each other

30

the reactions being performed at a temperature of 80 to 200 °C and – optionally - water is removed from the reaction mixture.

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In case within option i) compounds (A) and (B) are added as fractions, it is preferred that over a specific period of time the remaining rest of the compound (A) is added in portions or continuously during a period of from 1 minute to 5 hours, and/or the remaining rest of the compound (B) is added in portions or continuously during a period of from 1 minute to 5 hours, the remaining rest of (C) is added in portions or continuously during a period of from 1 minute to 6 hours.

40

However, it is preferred within option i) that the entire amount of compound (A) is first mixed with the entire amount of compound (B) followed by continuously adding the entire amount of

compound (C), and compound (C) is added over a period of time of 5 minutes to 2 hours, preferably of 5 to 15 minutes.

The specific ratio of the individual compounds (A) to (C) can, in principle, be freely chosen.

- 5 However, it is preferred that at least one of the following conditions, preferably all of the following conditions, is/are fulfilled when carrying out step a) according to the present invention.

10 In a preferred embodiment of the present invention, the process is carried out such that within step a) at least a fraction of compound (A) is first mixed with at least a fraction of compound (B), preferably the entire amount of compound (A) is first mixed with the entire amount of compound (B),

- 15 i) followed by adding at least a fraction of compound (C) over a specific period of time and thereafter adding the remaining part of the total amount of compound (C) over a further period of time, the total period of time is preferably in the range of less than two hours, more preferably less than 30 minutes, most preferably between 5 and 15 minutes, preferably followed by continuously adding the entire amount of compound (C) within an as short period of time as possible, and
- 20 ii) the reaction is carried out at a temperature of 80 to 200 °C for a period of time of from 1 to 30 hours, preferably 1 to 25 hours, more preferably 1 to 20 hours, at a pressure from 1.0 up to 10 bar, preferably 1.0 to 5 bar, most preferably 1.0 to 4 bar, the reaction is optionally carried out in the presence of water, preferably by employing an aqueous solution of compound (B),

- 25 and optional step c) is performed after step a) is finished or at least partially in parallel to step a), preferably after step a) is finished, with step c) being the removal of water and/or alcohols from the reaction mixture.

30 In case the entire amount of component (C) is added within an as short period of time as possible, the skilled person knows that the exact amount of time is determined by parameters such as the overall size/volume of the vessels/pipes employed and/or the total amount of the respective batch; a "period as short as possible" hence is the shortest possible time achievable with the specific amounts and equipment and their scale etc. being employed in a specific actual reaction being performed.

35 It is preferred within the context of the present invention that in step a) the molar ratio of compound (C) to compound (B) is at least 100 mol-%, preferably in the range of 100 mol-% to 125 mol-%.

40 It is preferred within the context of the present invention that in step a) the molar ratio of compound (B) to the hydroxy groups of compound (A) is in the range of 10 mol-% to 50 mol-%.

It is preferred within the context of the present invention that in step a) the molar ratio of compound (C) to the hydroxy groups of compound (A) is in the range of 10 mol-% to 62,5 mol-%.

Within the context of the present invention, it is even more preferred that in step a) at least 10 % of all hydroxy groups of compound (A) are reacted with compound (B) in order to form ester groups within the respective sulfatized esteramine and/or at least 10 % of all hydroxy groups of compound (A) are sulfatized in order to form OSO_3 fragments within the respective sulfatized esteramine.

It is even more preferred that in step a) 20 to 50, preferably 30 to 50, more preferably 40 to 50 % of all hydroxy groups of compound (A) are reacted with compound (B) in order to form ester groups within the respective sulfatized esteramine, 20 to 50, preferably 30 to 50, more preferably 40 to 50 % of all hydroxy groups of compound (A) are sulfatized in order to form OSO_3 fragments within the respective sulfatized esteramine, and 0 to 60, preferably up to 40, more preferably up to 20 % of all hydroxy groups of compound (A) remain in unreacted form within the respective sulfatized esteramine.

As already mentioned above, it is also possible that besides compounds (A) to (C), further compounds such as solvent and/or water are present when carrying out step a). In addition, it is also possible that prior to and/or after step a), further steps may be carried out in order to obtain the sulfatized esteramines according to the present invention.

In one embodiment of the present invention, it is preferred that step a) is carried out in the absence of water.

In another embodiment of the present invention, step a) is carried out in the presence of at least one solvent and/or in the presence of water. Here, it is preferred that step a) is carried out in the presence of water, preferably by employing an aqueous solution of compound (B).

It is also preferred that in case a solvent and/or water is employed and/or in order to remove an excess of unreacted educts that an additional step c) is carried out after step a) is finished. However, it is also possible that step c) is already started in parallel to performing step a) or at the end of performing step a).

In one embodiment of the present invention, it is preferred that an optional step c) is carried out by removing water and - optionally - also compound (A); preferably step c) is carried out after step a) is finished.

By consequence, within step c) of the present invention, water and/or excess alcohol can be removed. Removal of water and alcohol can be carried out by all techniques known in the art, for example by application of a reduced pressure. In one embodiment of the present invention,

step c) (i.e. the optional removal of water and/or excess of alcohol) is carried out by applying reduced pressure in the range of from 0.1 mbar to 800 mbar. In another embodiment, reduced pressure in the range of from 1 mbar to 500 mbar is applied. In a further embodiment, reduced pressure in the range of from 10 mbar to 100 mbar is applied.

5

Within the context of the present invention, it is preferred that the reaction of step a) is carried out

- 10 i) after all compounds (A) to (C) are admixed with each other at a temperature of 80 to 200 °C for a period of time of 1 to 30 hours, and/or
- ii) under pressure from 1.0 up to 10 bar, preferably 1.0 to 5 bar, most preferably 1.0 to 4 bar, preferably in a vessel closed off from the surrounding atmosphere.

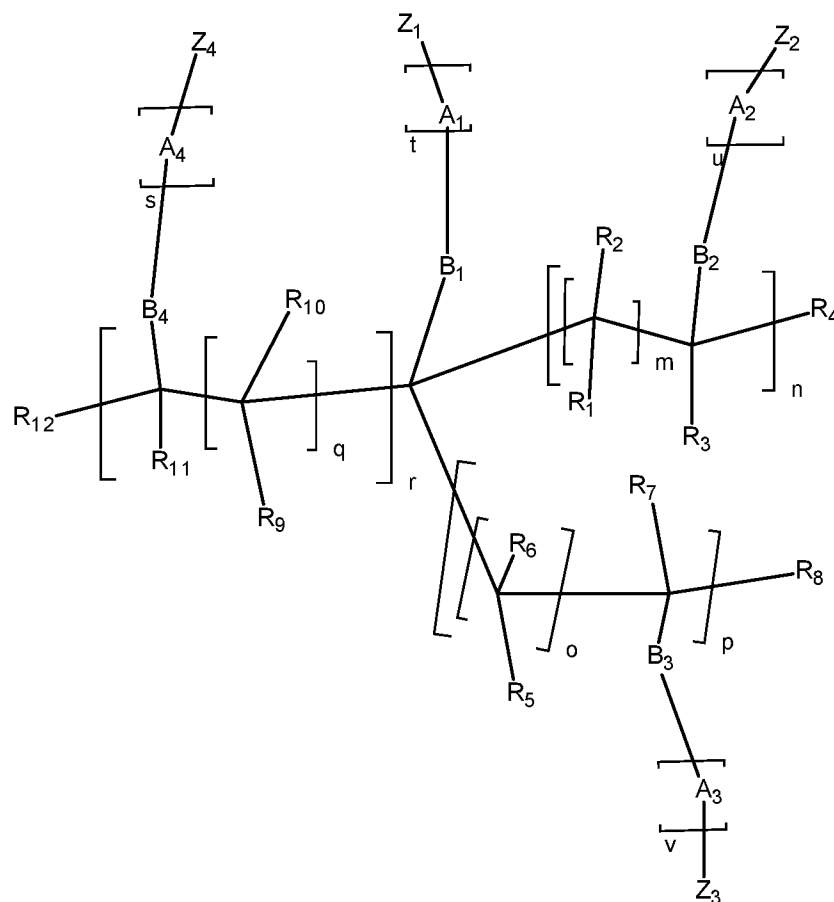
15 In another embodiment of the present invention, step a) is carried out by a process comprising steps i) to iii):

- (i) reacting at least one amino acid with sulfuric acid;
- (ii) esterification of the reaction product of step (i) with 10 - 50 mol-% of the hydroxy groups of an alcohol containing at least two hydroxy groups;
- 20 (iii) optionally removal of water and/or removal of excess alcohol during and/or after, preferably after, step (ii).

Within this embodiment of the present invention, step a) is carried out in accordance with the specific sequence of steps as disclosed within WO 2022/002761 (in respect of steps i) to iii)).
25 However, at least one amino acid is employed within the process of the present invention in contrast to that of WO 2022/002761, wherein the at least one lactam is employed instead. Moreover, this embodiment of the present invention differs from the respective disclosure of WO 2022/002761 in the definition of the alcohol, which is within the context of the present invention an alcohol according to component (A) as defined above, whereas in WO 2022/002761
30 an alcohol mandatorily containing only one hydroxyl group is employed in the respective process.

In another embodiment, the sulfatized esteramine obtained by the inventive process is defined according to Formula (I),

35



(Formula I)

wherein independently from each other

5 n being an integer from 1 to 12,
m being an integer for each repetition unit n independently selected from 0 to 12;
p being an integer from 0 to 12,
o being an integer for each repetition unit p independently selected from 0 to 12;
10 r being an integer from 0 to 12,
q being an integer for each repetition unit r independently selected from 0 to 12;
s, t, u and v being an integer from 0 to 100;
A₁, A₂, A₃, and A₄ are independently from each other and independently for each repetition unit
s, t, u, or v, selected from the list consisting of alkyleneoxy group, such A-units stem from the
15 reaction of one alcohol with at least two hydroxy groups with C2 - C22 alkylene oxides, e.g. in
case of ethoxylated alcohols with at least two hydroxy groups A is “-O-CH₂-CH₂-”;

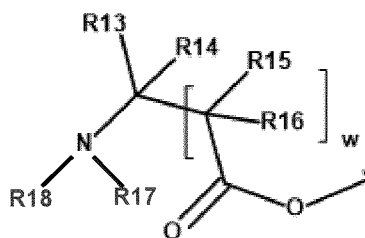
wherein for s, t, u, and/or v equal to 1 the oxygen atom of the A₁, A₂, A₃, and A₄ group is bound to the B group and the following A₁, A₂, A₃, and A₄ groups are always bound via the oxygen atom to the previous A₁, A₂, A₃, and A₄ group;

B₁, B₂, B₃, and B₄ are independently from each other selected from the group consisting of a bond, linear C₁ to C₁₂ alkanediyl groups, and branched C₁ to C₁₂ alkanediyl groups;

such B-units are given by the molecular structure of one alcohol with at least two hydroxy groups, e.g. in case of R₁, R₂, R₃, R₄, R₅, R₆, R₇, R₈, R₉, R₁₀, R₁₁ and R₁₂ being independently for each repetition unit selected from the group consisting of H, linear alkyl, branched alkyl, and cycloalkyl; such R-units are given by the molecular structure of one alcohol with at least two hydroxy groups;

Z₁, and/or Z₂, and/or Z₃, and/or Z₄, independently for each repetition unit n, p, and r, are selected from the group consisting of OH, and OSO₃⁻, and -OSO₃H and a compound according to Formula (II), wherein said compound according to Formula (II) connects to the compound according to Formula (I) via the bond labeled with *, such Z-units stem from the reaction of one alcohol with at least two hydroxy groups with at least one amino acid and with sulfuric acid;

with the proviso that at least 10 mol % to 50 mol% of the substituents Z₁, and/or Z₂, and/or Z₃, and/or Z₄, are a compound according to Formula (II), and at least 10 mol % to 50 mol% of the substituents Z₁, and/or Z₂, and/or Z₃, and/or Z₄, are a group consisting OSO₃⁻, or -OSO₃H, and 0 mol % to 60 mol% of the substituents Z₁, and/or Z₂, and/or Z₃, and/or Z₄, are OH,



(Formula II)

with independently from each other

w being an integer from 0 to 12;

R₁₃, R₁₄, R₁₅, R₁₆, R₁₇ and R₁₈ independently being selected from the group consisting of H, linear alkyl, branched alkyl, and cycloalkyl; such R-units stem from the amino acid; R₁₇ and R₁₈ preferably selected from H or methyl, most preferably R₁₇ and R₁₈ are H.

The sulfatized esteramines according to the above defined formula (I) or the respective salts thereof are obtained by the process as described above.

It is to be noted that the structure shown in formula (I) and defined herein before is present in the "inventive compound" in an amount of at least 80, preferably at least 85, more preferably at

least 90, even more preferably at least 95, even more preferably at least 98 mole percent, such as at least 99 or even close to 100 percent.

Thus, it is clear to a person of skill in the art, that the definition of the sulfatized esteramines according to formula (I) is a result of an optimized way for carrying out the respective process, wherein all functional groups (of the respective monomers or any intermediate) have undergone a complete reaction. It is also clear, however, that a complete reaction (the conversion degree of 100%) is an idealized assumption. In reality, the degree of conversion is usually below 100%. Unreacted hydroxy groups may be present. This fact is known to a person skilled in the art due to the complexity of the reaction as well as the structure according to formula (I). Irrespective of that, the reaction for obtaining said structure is disclosed in the description above. By following the general reaction conditions as well as knowing specific reaction conditions, the real structure for each individual case/reaction condition is obvious for a person skilled in the art.

For the sake of completeness it is mentioned in connection with the present invention, but especially in connection with the sulfatized esteramines according to formula (I) that the reactions employed in the process according to the present invention are known by a person of skill to be leading to statistical distributions. This means that when for example "20 ethylene oxide ("EO") units per functional group of the molecule (i.e the "core") to be reacted" are employed, that does not necessarily mean that each such functional group of the core actually will bear exactly 20 EO-units; to the contrary, the resulting product obtained from such reaction is a mixture of various slightly differing products, with the main product contained in the product of the process being the product having a core being modified on each functional group with exactly 20 EO-units per functional group; however, due to the statistical reasons, this "main product" (which is the targeted product of the reaction process and which is defined by the structure of Formula (I) contemplated herein) is accompanied by many products having slight variations to this main product, where e.g. the same core-molecule is modified with EO but the lengths of the EO-chains per functional group slightly differing from 20: some chains are slightly longer and some slightly shorter, a typically even smaller amount bearing even more EO and some even less EO, an even smaller amount differs to a larger extent etc.

The more functional groups the core bears, and the more e.g. alkylene oxide-units per functional group are employed, the larger is the overall deviation from the targeted molecule: this means, that the content of the targeted molecule (which is depicted in the Formula (I)) decreases within the product mixture obtained, and more different, slight variations of the targeted molecule are present.

This however does not cause any problem, as the above explanation for such reactions is the identical "problem" observed for each and every polymerization reaction: Every polymer being prepared is defined by a chemical structure. Depicting such polymer structure, however, is as difficult as for the structures contemplated in this present invention: the more precise the structure of a polymer is defined, the more this depicted structure is wrong. Hence, polymers are

being described by the monomers they are created from, the reaction employed (e.g. “by radical polymerization” which then implies how the monomeric units are linked), and certain other typical values such as the molecular weight M_w , M_n , the polydispersity index (i.e. the broadness of the molecular weight distribution) etc. – which in fact is nothing else than saying that the polymer product obtained from the polymer reaction is a mixture of various polymer molecules which have different chain lengths, slightly differing orders of monomeric units within a chain (if more than one monomer is employed), slightly differing amounts of each monomeric unit within a chain (if more than one monomeric unit is employed) and so on.

For the present structure contemplated in this present invention, the same difficulty arises as explained for a polymer molecule description but complicated with the fact, that a defined organic core molecule is also employed: the core of the molecule is a clearly chemically defined “organic structure”, which can be pinned down exactly. However, the side chain modifications are introduced by polymer addition reactions, thus introducing the concept of polymer description (and its “relative description”) into a clearly defined organic molecule.

This means for the presently contemplated structure that although it seems like a clearly defined structure of a “typical organic molecule”, this is in fact not the case: the present structure is a combination of clearly defined organic chemical structure (i.e. the core) fused together with polymer descriptions of the side chains (which are oligomers or polymers – depending on the amount of monomeric units employed).

This has to be taken in mind when the present structure is defined: the “organic structural parts” (i.e. the “core”) can be easily and clearly defined in terms of organic chemistry, whereas the “polymer structural parts” (i.e. the “side chains”) seem to be also following the “organic chemicals structure description”, but in fact should be viewed with the eye of a polymer chemist.

With this in mind, it is clear that the “structure of Formula (I)” is a combination of organic chemistry description for the core and a polymer chemistry-description for the side chains and thus the “target molecule” of the reaction but not a “100%-structure” as in other organic molecules: it is the “main component” of the process described, the product containing smaller amounts of many slight variations of this main component side-by-side.

Another subject of the present invention is a sulfatized esteramine as such, obtained by the above described process for producing these sulfatized esteramines, wherein the at least one amino acid (compound (B)) is selected from α -amino acids or β -amino acids, preferably selected from alanine, glycine, leucine, isoleucine, valine, proline, phenylalanine, arginine, asparagine, aspartic acid, glutamine, histidine, lysine, threonine, tryptophan, tyrosine, cysteine, methionine, serine, aminoisobutyric acid, 2-aminopentanoic acid, sarcosine, N,N-dimethylglycine, β -alanine, more preferably selected from alanine, β -alanine, glycine, valine, leucine, isoleucine, most preferably selected from alanine and β -alanine.

It is obvious for a person skilled in the art that the process for obtaining the sulfatized esteramines as such can be carried out analogously as described above for the first subject matter of the present invention, process for producing a sulfatized esteramine comprising step a) including all variations and/or embodiments and/or preferred definitions.

Another subject matter of the present invention is the use of the above-mentioned sulfatized esteramines cleaning compositions.

The inventive sulfatized esteramines can be added to cleaning compositions.

The inventive sulfatized esteramines are present in said formulations at a concentration of 0.1 to 5 weight%, preferably at a concentration of 0.5 to 2 weight%.

The inventive sulfatized esteramines can also be added to a cleaning composition comprising from about 1% to about 70% by weight of a surfactant system. The inventive sulfatized esteramines may be present in a cleaning composition at a concentration of from about 0.1% to about 5% by weight of the composition, or at a concentration of from about 0.5% to about 2% by weight of the composition.

Cleaning Compositions, Uses

The "inventive sulfatized esteramine(s)" are hereinafter termed "inventive compound(s)" and "compound(s) of the invention".

The terms "at least one inventive compound" and "inventive compound(s)" encompasses one, two, three, four or more inventive compound(s) as a mixture.

The inventive compound(s) as directly obtained from the inventive process can be used advantageously in cleaning compositions.

They may be used as at least one inventive compound, or mixtures of more than one inventive compound.

Hence, another subject matter of the present invention is the use of the above-mentioned inventive compound(s) in cleaning compositions, specifically as prepared by the process defined herein.

The inventive compound(s) can be added to cleaning compositions.

The inventive compound(s) are present in general in said formulations at a concentration of from about 0.1% to about 50%, preferably from about 0.25% to 15%, more preferably from about 0.5% to about 10%, and even more preferably from about 0.5% to about 5%, and most preferably in amounts of up to 3%, each in weight % in relation to the total weight of such com-

position/product, optionally further comprising from about 1% to about 70% by weight of a surfactant system, wherein – specifically - for a liquid hand dishwashing or spray detergent cleaning composition such composition comprising from 0.1% to 50%, preferably from 1% to 35%, more preferably from 3% to 30%, by weight of the total composition, of a surfactant system, and such surfactant system preferably comprising from 60% to 90%, more preferably from 70% to 80% by weight of the surfactant system of an anionic surfactant.

Hence, another subject matter of the present invention is the use of the inventive compound(s) obtained by a process of the invention as detailed before, in fabric and home care products, in particular cleaning compositions for improved oily and fatty stain removal, removal of solid dirt such as clay, prevention of greying of fabric surfaces, and/or anti-scale agents, wherein the cleaning composition is preferably a laundry detergent formulation and/or a dish wash detergent formulation, more preferably a liquid laundry detergent formulation and/or a liquid manual dish wash detergent formulation.

Another subject-matter of the present invention is, therefore, also a cleaning composition, fabric and home care product, industrial and institutional cleaning product, preferably in laundry detergents, in cleaning compositions and/or in fabric and home care products, each comprising at least one inventive compound(s) obtained by a process of the invention.

A further subject-matter of the present invention is a fabric and home care product, cleaning composition, industrial and institutional cleaning product, preferably a laundry detergent, a cleaning composition and/or a fabric and home care product, each containing at least one inventive compound obtained by a process of the invention.

In a preferred embodiment, it is a cleaning composition and/or fabric and home care product and/or industrial and institutional cleaning product, comprising at least one inventive compound obtained by a process of the invention. In particular, it is a cleaning composition for improved cleaning performance, especially improved primary washing, preferably a laundry detergent formulation and/or a manual dish wash detergent formulation, more preferably a liquid laundry detergent formulation and/or a liquid manual dish wash detergent formulation.

In a preferred embodiment, the cleaning composition of the present invention is a liquid or solid laundry detergent composition, preferably a liquid laundry detergent composition.

In another preferred embodiment, the cleaning composition of the present invention is a liquid or solid (e.g. powder or tab/unit dose) detergent composition for manual or automatic dish wash, preferably a liquid manual dish wash detergent composition. Such compositions are known to a person of skill in the art.

In another embodiment, the cleaning composition of the present invention is a hard surface cleaning composition that may be used for cleaning various surfaces such as hard wood, tile, ceramic, plastic, leather, metal, glass.

- 5 In one embodiment of the present invention, the inventive compound(s) obtained by a process of the invention is a component of a cleaning compositions or fabric and home care product, preferably a laundry cleaning composition, a laundry care product or laundry treatment product or laundry washing product, preferably a liquid laundry detergent formulation or liquid laundry detergent product, that each additionally comprise at least one surfactant, preferably at least
10 one anionic surfactant.

- In one embodiment it is also preferred in the present invention that the cleaning composition comprises (besides at least one inventive compound obtained by a process of the invention) additionally at least one enzyme, preferably selected from one or more optionally further comprising at least one enzyme, preferably selected from one or more lipases, hydrolases, amy-
15 lases, proteases, cellulases, hemicellulases, phospholipases, esterases, pectinases, lactases, pectate lyases, cutinases, DNases, xylanases, oxico-reductases, dispersins, mannanases and peroxidases, and combinations of at least two of the foregoing types, preferably at least one enzyme being selected from lipases.

- 20 Even more preferably, the cleaning compositions of the present invention comprising at least one inventive compound obtained by a process of the invention and optionally further comprising at least one surfactant or a surfactant system - as detailed before - are those for improved cleaning performance within laundry and manual dish wash applications, even more specifically,
25 for improved cleaning performance (such actions as detailed before) such as those on fabrics and dishware, and may additionally comprise at least one enzyme selected from the list consisting of optionally further comprising at least one enzyme, preferably selected from one or more optionally further comprising at least one enzyme, preferably selected from one or more lipases, hydrolases, amylases, proteases, cellulases, hemicellulases, phospholipases, esterases, pecti-
30 nases, lactases, pectate lyases, cutinases, DNases, xylanases, oxico-reductases, dispersins, mannanases and peroxidases, and combinations of at least two of the foregoing types, preferably selected from one or more lipases, hydrolases, amylases, proteases, cellulases, and combinations of at least two of the foregoing types, more preferably at least one enzyme being selected from lipases.

- 35 In one embodiment, the inventive compound(s) obtained by a process of the invention may be utilized in cleaning compositions comprising a surfactant system comprising C10-C15 alkyl benzene sulfonates (LAS) as the primary surfactant and one or more additional surfactants selected from non-ionic, cationic, amphoteric, zwitterionic or other anionic surfactants, or mixtures thereof.

- 40 In a further embodiment the inventive compound(s) obtained by a process of the invention may be utilized in cleaning compositions or fabric and home care product, preferably a laundry

cleaning composition, a laundry care product or laundry washing product, preferably a liquid laundry detergent formulation or liquid laundry detergent product, comprising C12-C18 alkyl ethoxylate surfactants with 5-10 ethoxy-units as the primary surfactant and one or more additional surfactants selected from anionic, cationic, amphoteric, zwitterionic or other non-ionic surfactants, or mixtures thereof.

In a further embodiment, the inventive compound(s) obtained by a process of the invention may be utilized in the cleaning compositions or fabric and home care product, preferably a laundry cleaning composition, a laundry care product or laundry treatment product or laundry washing product, preferably a liquid laundry detergent formulation or liquid laundry detergent product, comprising C8-C18 linear or branched alkyl ethersulfates with 1-5 ethoxy-units as the primary surfactant and one or more additional surfactants selected from non-ionic, cationic, amphoteric, zwitterionic or other anionic surfactants, or mixtures thereof.

In one embodiment of the present invention, the inventive compound(s) obtained by a process of the invention is a component of a cleaning composition, such as preferably a laundry or a dish wash formulation, more preferably a liquid laundry or manual dish wash formulation, that each additionally comprise at least one surfactant, preferably at least one anionic surfactant.

In a further embodiment, this invention also encompasses a composition comprising at least one inventive compound obtained by a process of the invention, further comprises an antimicrobial agent as disclosed hereinafter, preferably selected from the group consisting of 2-phenoxyethanol, more preferably comprising said antimicrobial agent in an amount ranging from 2ppm to 5% by weight of the composition; even more preferably comprising 0.1 to 2% of phenoxyethanol.

In a further embodiment, this invention also encompasses a composition, preferably a cleaning composition, more preferably a liquid laundry detergent composition or a liquid hand dish composition, even more preferably a liquid laundry detergent composition, or a liquid softener composition for use in laundry, such composition comprising inventive compound(s) obtained by a process of the invention in the amounts detailed before as described herein before, such composition further comprising 4,4'-dichloro 2-hydroxydiphenylether in a concentration from 0.001 to 3%, preferably 0.002 to 1%, more preferably 0.01 to 0.6%, each by weight of the composition.

In a further embodiment, this invention also encompasses a composition, specifically a cleaning composition, more preferably a cleaning composition in liquid, solid or semi-solid form, preferably being a concentrated liquid detergent formulation, single mono doses laundry detergent formulation, liquid hand dish washing detergent formulation or solid automatic dish washing formulation, more preferably a laundry detergent formulation, comprising inventive compound(s) obtained by a process of the invention and in the amounts as detailed before, such composition being preferably a detergent composition, such composition further comprising an antimicrobial agent as disclosed hereinafter, preferably selected from the group consisting of 2-phenoxyethanol, more preferably comprising said antimicrobial agent in an amount ranging from

2ppm to 5% by weight of the composition; even more preferably comprising 0.1 to 2% of phenoxyethanol.

In a further embodiment, this invention also encompasses a method of preserving an aqueous composition against microbial contamination or growth, such composition, specifically a cleaning composition, more preferably a cleaning composition in liquid, solid or semi-solid form, preferably being a concentrated liquid detergent formulation, single mono doses laundry detergent formulation, liquid hand dish washing detergent formulation or solid automatic dish washing formulation, more preferably a laundry detergent formulation, comprising inventive compound(s) obtained by a process of the invention and in the amounts detailed before, such composition being preferably a detergent composition, such method comprising adding at least one antimicrobial agent selected from the disclosed antimicrobial agents as disclosed hereinafter, such antimicrobial agent preferably being 2-phenoxyethanol.

In a further embodiment, this invention also encompasses a method of laundering fabric or of cleaning hard surfaces, which method comprises treating a fabric or a hard surface with a cleaning composition, more preferably a liquid laundry detergent composition or a liquid hand dish composition, even more preferably a liquid laundry detergent composition, or a liquid softener composition for use in laundry, such composition comprising inventive compound(s) obtained by a process of the invention in the amounts detailed before, such composition further comprising 4,4'-dichloro 2-hydroxydiphenylether.

As used herein, the phrase "cleaning composition" as used for the inventive compositions and products includes compositions and formulations designed for cleaning soiled material. Such compositions include but are not limited to, laundry cleaning compositions and detergents, fabric softening compositions, fabric enhancing compositions, fabric freshening compositions, laundry prewash, laundry pretreat, laundry additives, spray products, dry cleaning agent or composition, laundry rinse additive, wash additive, post-rinse fabric treatment, ironing aid, dish washing compositions, hard surface cleaning compositions, unit dose formulation, delayed delivery formulation, detergent contained on or in a porous substrate or nonwoven sheet, and other suitable forms that may be apparent to one skilled in the art in view of the teachings herein. Such compositions may be used as a pre-laundering treatment, a post-laundering treatment, or may be added during the rinse or wash cycle of the laundering operation.

The cleaning compositions of the invention comprise a surfactant system in an amount sufficient to provide desired cleaning properties. In some embodiments, the cleaning composition comprises, by weight of the composition, from about 1% to about 70% of a surfactant system. In other embodiments, the liquid cleaning composition comprises, by weight of the composition, from about 2% to about 60% of the surfactant system. In further embodiments, the cleaning composition comprises, by weight of the composition, from about 5% to about 30% of the surfactant system. In embodiments for a liquid hand dishwashing or spray detergent cleaning composition such composition comprises preferably from 60% to 90%, more preferably from 70% to

80% by weight of the surfactant system, more preferably of an anionic surfactant. The surfactant system may comprise a deterative surfactant selected from anionic surfactants, nonionic surfactants, cationic surfactants, zwitterionic surfactants, amphoteric surfactants, ampholytic surfactants, and mixtures thereof. Those of ordinary skill in the art will understand that a deterative surfactant encompasses any surfactant or mixture of surfactants that provide cleaning, stain removing, or laundering benefit to soiled material.

Even more preferably, the compositions or products of the present invention as detailed herein before comprising at least one inventive compound(s) obtained by a process of the invention and in the amounts as specified in the previous paragraph, optionally further comprising at least one surfactant or a surfactant system in amounts from about 1% to about 70% by weight of the composition or product, are preferably those for primary cleaning (i.e. removal of stains) and more preferably within laundry applications, and may additionally comprise at least one enzyme selected from lipases, hydrolases, amylases, proteases, cellulases, mannanases, hemicellulases, phospholipases, esterases, xylanases, DNases, dispersins, pectinases, oxidoreductases, cutinases, lactases and peroxidases, more preferably at least two of the aforementioned types.

The phrase "cleaning composition" as used herein includes compositions and formulations and products designed for cleaning soiled material. Such compositions, formulations and products include those designed for cleaning soiled material or soiled surfaces of any kind.

"Compositions for industrial and institutional cleaning" includes such cleaning compositions being designed for use in industrial and institutional cleaning, meaning the cleaning in an industrial environment such as office buildings, factories etc., and institutional environments such as schools, public buildings such as courts, public administration, hospitals etc., such as those for use of cleaning soiled material or surfaces of any kind, such as hard surface cleaners for surfaces of any kind, including tiles, carpets, PVC-surfaces, wooden surfaces, metal surfaces, lacquered surfaces.

"Compositions for Fabric and Home Care" include cleaning compositions including but not limited to laundry cleaning compositions and detergents, fabric softening compositions, fabric enhancing compositions, fabric freshening compositions, laundry prewash, laundry pretreat, laundry additives, spray products, dry cleaning agent or composition, laundry rinse additive, wash additive, post-rinse fabric treatment, ironing aid, dish washing compositions, hard surface cleaning compositions, unit dose formulation, delayed delivery formulation, detergent contained on or in a porous substrate or nonwoven sheet, and other suitable forms that may be apparent to one skilled in the art in view of the teachings herein. Such compositions may be used as a pre-laundering treatment, a post-laundering treatment, or may be added during the rinse or wash cycle of the laundering operation, preferably during the wash cycle of the laundering or dish washing operation.

The cleaning compositions of the invention may be in any form, namely, in the form of a liquid; a solid such as a powder, granules, agglomerate, paste, tablet, pouches, bar, gel; an emulsion; types delivered in dual- or multi-compartment containers; single-phase or multi-phase unit dose; a spray or foam detergent; premoistened wipes (i.e., the cleaning composition in combination with a nonwoven material such as that discussed in US 6,121,165, Mackey, et al.); dry wipes (i.e., the cleaning composition in combination with a nonwoven materials, such as that discussed in US 5,980,931, Fowler, et al.) activated with water by a user or consumer; and other homogeneous, non-homogeneous or single-phase or multiphase cleaning product forms.

The liquid cleaning compositions of the present invention preferably have a viscosity of from 50 to 10000 mPa*s; liquid manual dish wash cleaning compositions (also liquid manual "dish wash compositions") have a viscosity of preferably from 100 to 10000 mPa*s, more preferably from 200 to 5000 mPa*s and most preferably from 500 to 3000 mPa*s at 20 1/s and 20°C; liquid laundry cleaning compositions have a viscosity of preferably from 50 to 3000 mPa*s, more preferably from 100 to 1500 mPa*s and most preferably from 200 to 1000 mPa*s at 20 1/s and 20°C.

The cleaning compositions and formulations of the invention may – and preferably do - contain adjunct cleaning additives (also abbreviated herein as "adjuncts"), such adjuncts being preferably in addition to a surfactant system as defined before.

Suitable adjunct cleaning additives include builders, cobuilders, structurants or thickeners, clay soil removal/anti-redeposition agents, polymeric soil release agents, dispersants such as polymeric dispersing agents, polymeric grease cleaning agents, solubilizing agents, chelating agents, enzymes, enzyme stabilizing systems, bleaching compounds, bleaching agents, bleach activators, bleach catalysts, brighteners, malodor control agents, pigments, dyes, opacifiers, hueing agents, dye transfer inhibiting agents, chelating agents, suds boosters, suds suppressors (antifoams), color speckles, silver care, anti-tarnish and/or anti-corrosion agents, alkalinity sources, pH adjusters, pH-buffer agents, hydrotropes, scrubbing particles, antibacterial agents, anti-oxidants, softeners, carriers, processing aids, pro-perfumes, and perfumes.

Liquid cleaning compositions additionally may comprise – and preferably do comprise at least one of – rheology control/modifying agents, emollients, humectants, skin rejuvenating actives, and solvents.

Solid compositions additionally may comprise - and preferably do comprise at least one of - fillers, bleaches, bleach activators and catalytic materials.

Suitable examples of such cleaning adjuncts and levels of use are found in WO 99/05242, U.S. Patent Nos. 5,576,282, 6,306,812 B1 and 6,326,348 B1.

Those of ordinary skill in the art will understand that a deterative surfactant encompasses any surfactant or mixture of surfactants that provide cleaning, stain removing, or laundering benefit to soiled material.

5 Hence, the cleaning compositions of the invention such as fabric and home care products, and formulations for industrial and institutional cleaning, more specifically such as laundry and manual dish wash detergents, preferably additionally comprise a surfactant system and, more preferably, also further adjuncts, as the one described above.

10 The surfactant system may be composed from one surfactant or from a combination of surfactants selected from anionic surfactants, non-ionic surfactants, cationic surfactants, zwitterionic surfactants, amphoteric surfactants, and mixtures thereof. Those of ordinary skill in the art will understand that a surfactant system for detergents encompasses any surfactant or mixture of surfactants that provide cleaning, stain removing, or laundering benefit to soiled material.

15 The cleaning compositions of the invention typically comprise a surfactant system in an amount sufficient to provide desired cleaning properties.

The liquid cleaning compositions of the present invention may have any suitable pH-value.
20 Preferably the pH of the composition is adjusted to between 4 and 14. More preferably the composition has a pH of from 6 to 13, even more preferably from 6 to 10, most preferably from 7 to 9. The pH of the composition can be adjusted using pH modifying ingredients known in the art and is measured as a 10% product concentration in demineralized water at 25°C. For example, NaOH may be used and the actual weight% of NaOH may be varied and trimmed up to the
25 desired pH such as pH 8.0. In one embodiment of the present invention, a pH >7 is adjusted by using amines, preferably alkanolamines, more preferably triethanolamine.

The selection of the additional surfactants and further ingredients in these embodiments may be dependent upon the application and the desired benefit.

30 All such cleaning compositions, their ingredients including (adjunct) cleaning additives, their general compositions and more specific compositions are known, as for example illustrated in the publications 800542 and 800500 as published by Protegas, Liechtenstein, and also from WO 2022/136409 and WO 2022/136408, wherein in any of the before prior art documents the
35 sulfatized esteramines within the general compositions and also each individualized specific cleaning composition disclosed in the beforementioned publications but also in any other publication disclosing cleaning formulations and products as contemplated herein may be replaced partially or completely by the inventive compound(s). Especially in those documents mentioned before in this paragraph, also various types of formulations for cleaning compositions are dis-
40 closed; all such composition types – the general compositions and also each individualized specific cleaning composition - can be equally applied also to those cleaning compositions contemplated herein.

Hence, the present invention also encompasses any and all of such disclosed compositions of the before-mentioned prior art-disclosures but further comprising at least one of the inventive compound in addition to or as a replacement for any already ins such prior art-composition contained sulfatized esteramine or any such compound, which can be replaced by such inventive compound(s) – such replacements in principle known to a person of skill in the art or readily obvious in view of the present invention - , with the content of the inventive compound(s) being present in said formulations at a concentration as given in this chapter at the beginning, i.e. typically at a concentration of from about 0.1% to about 50%, preferably from about 0,25% to 15%, more preferably from about 0.5% to about 10%, and even more preferably from about 0.5% to about 5%, and most preferably in amounts of up to 3%, each in weight % in relation to the total weight of such composition/product.

General description of cleaning compositions, formulations and their ingredients

Cleaning compositions such as fabric and home care products and formulations for industrial and institutional cleaning, more specifically such as laundry and manual dish wash detergents, are known to a person skilled in the art. Any composition etc. known to a person skilled in the art, in connection with the respective use, can be employed within the context of the present invention by including at least one inventive compound, preferably at least one such inventive compound in amounts suitable for expressing a certain property within such a composition, especially when such a composition is used in its area of use.

Cleaning additives

The cleaning compositions and formulations of the invention may – and preferably do - contain adjunct cleaning additives (also abbreviated herein as “adjuncts”), such adjuncts being preferably in addition to a surfactant system as defined before.

Suitable adjunct cleaning additives include builders, cobuilders, structurants or thickeners, clay soil removal/anti-redeposition agents, polymeric soil release agents, dispersants such as polymeric dispersing agents, polymeric grease cleaning agents, solubilizing agents, chelating agents, enzymes, enzyme stabilizing systems, bleaching compounds, bleaching agents, bleach activators, bleach catalysts, brighteners, malodor control agents, pigments, dyes, opacifiers, hueing agents, dye transfer inhibiting agents, chelating agents, suds boosters, suds suppressors (antifoams), color speckles, silver care, anti-tarnish and/or anti-corrosion agents, alkalinity sources, pH adjusters, pH-buffer agents, hydrotropes, scrubbing particles, antibacterial agents, anti-oxidants, softeners, carriers, processing aids, pro-perfumes, and perfumes. Alls such adjuncts are detailed and exemplified further below in the following chapters.

Liquid cleaning compositions additionally may comprise – and preferably do comprise at least one of – rheology control/modifying agents, emollients, humectants, skin rejuvenating actives, and solvents.

- 5 Solid compositions additionally may comprise - and preferably do comprise at least one of - fillers, bleaches, bleach activators and catalytic materials.

Suitable examples of such cleaning adjuncts and levels of use are found in WO 99/05242, U.S. Patent Nos. 5,576,282, 6,306,812 B1 and 6,326,348 B1.

- 10 Those of ordinary skill in the art will understand that a deterative surfactant encompasses any surfactant or mixture of surfactants that provide cleaning, stain removing, or laundering benefit to soiled material.

- 15 Hence, the cleaning compositions of the invention such as fabric and home care products, and formulations for industrial and institutional cleaning, more specifically such as laundry and manual dish wash detergents, preferably additionally comprise a surfactant system and, more preferably, also further adjuncts, as the one described above and below in more detail.

- 20 The surfactant system may be composed from one surfactant or from a combination of surfactants selected from anionic surfactants, non-ionic surfactants, cationic surfactants, zwitterionic surfactants, amphoteric surfactants, and mixtures thereof. Those of ordinary skill in the art will understand that a surfactant system for detergents encompasses any surfactant or mixture of surfactants that provide cleaning, stain removing, or laundering benefit to soiled material.

- 25 The cleaning compositions of the invention preferably comprise a surfactant system in an amount sufficient to provide desired cleaning properties. The surfactant system may comprise a deterative surfactant selected from anionic surfactants, non-ionic surfactants, cationic surfactants, zwitterionic surfactants, amphoteric surfactants, and mixtures thereof.

- 30 Laundry compositions

- 35 “Laundry composition” may be any composition, formulation or product which is intended for use in laundry including laundry care, laundry cleaning etc.; hence this term will be used in the following denoting any composition, formulation or product.

- In laundry compositions, anionic surfactants contribute usually by far the largest share of surfactants within such formulation. Hence, preferably, the inventive cleaning compositions for use in laundry comprise at least one anionic surfactant and optionally further surfactants selected from any of the surfactant classes described herein, preferably from non-ionic surfactants and/or amphoteric surfactants and/or zwitterionic surfactants and/or cationic surfactants.
- 40

Cleaning compositions may – and preferably do - also contain anionic surfactants - which may be employed also in combinations of more than one other surfactant.

Nonlimiting examples of anionic surfactants – which may be employed also in combinations of more than one surfactant - useful herein include C9-C20 linear alkylbenzenesulfonates (LAS), C10-C20 primary, branched chain and random alkyl sulfates (AS); C10-C18 secondary (2,3) alkyl sulfates; C10-C18 alkyl alkoxy sulfates (AExS) wherein x is from 1 to 30; C10-C18 alkyl alkoxy carboxylates comprising 1 to 5 ethoxy units; mid-chain branched alkyl sulfates as discussed in US 6,020,303 and US 6,060,443; mid-chain branched alkyl alkoxy sulfates as discussed in US 6,008,181 and US 6,020,303; modified alkylbenzene sulfonate (MLAS) as discussed in WO 99/05243, WO 99/05242 and WO 99/05244; methyl ester sulfonate (MES); and alpha-olefin sulfonate (AOS).

Preferred examples of suitable anionic surfactants are alkali metal and ammonium salts of C8-C12-alkyl sulfates, of C12-C18-fatty alcohol ether sulfates, of C12-C18-fatty alcohol polyether sulfates, of sulfuric acid half-esters of ethoxylated C4-C12-alkylphenols (ethoxylation: 3 to 50 mol of ethylene oxide/mol), of C12-C18-alkylsulfonic acids, of C12-C18 sulfo fatty acid alkyl esters, for example of C12-C18 sulfo fatty acid methyl esters, of C10-C18-alkylarylsulfonic acids, preferably of n-C10-C18-alkylbenzene sulfonic acids, of C10-C18 alkyl alkoxy carboxylates and of soaps such as for example C8-C24-carboxylic acids. Preference is given to the alkali metal salts of the aforementioned compounds, particularly preferably the sodium salts.

In one embodiment of the present invention, anionic surfactants are selected from n-C10-C18-alkylbenzene sulfonic acids and from fatty alcohol polyether sulfates, which, within the context of the present invention, are in particular sulfuric acid half-esters of ethoxylated C12-C18-alkanols (ethoxylation: 1 to 50 mol of ethylene oxide/mol), preferably of n-C12-C18-alkanols.

In one embodiment of the present invention, also alcohol polyether sulfates derived from branched (i.e., synthetic) C11-C18-alkanols (ethoxylation: 1 to 50 mol of ethylene oxide/mol) may be employed.

Preferably, the alkoxylation group of both types of alkoxyated alkyl sulfates, based on C12-C18-fatty alcohols or based on branched (i.e., synthetic) C11-C18-alcohols, is an ethoxylation group and an average ethoxylation degree of any of the alkoxyated alkyl sulfates is 1 to 5, preferably 1 to 3.

Preferably, the laundry detergent formulation of the present invention comprises from at least 1 wt. % to 50 wt. %, preferably in the range from greater than or equal to about 2 wt. % to equal to or less than about 30 wt. %, more preferably in the range from greater than or equal to 3 wt. % to less than or equal to 25 wt. %, and most preferably in the range from greater than or equal to 5 wt. % to less than or equal to 25 wt. % of one or more anionic surfactants as described above,

based on the particular overall composition, including other components and water and/or solvents.

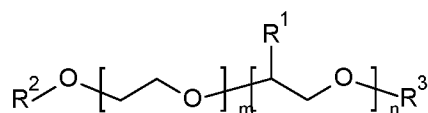
In a preferred embodiment of the present invention, anionic surfactants are selected from C10-C15 linear alkylbenzenesulfonates, C10-C18 alkylethersulfates with 1-5 ethoxy units and C10-C18 alkylsulfates.

Cleaning compositions may also contain non-ionic surfactants - which may be employed also in combinations of more than one other surfactant.

Non-limiting examples of non-ionic surfactants – which may be employed also in combinations of more than one other surfactant - include: C8-C18 alkyl ethoxylates, such as, NEODOL® non-ionic surfactants from Shell; ethylenoxide/propylenoxide block alkoxylates as PLURONIC® from BASF; C14-C22 mid-chain branched alkyl alkoxylates, BAEx, wherein x is from 1 to 30, as discussed in US 6,153,577, US 6,020,303 and US 6,093,856; alkylpolysaccharides as discussed in U.S. 4,565,647 Llenado, issued January 26, 1986; specifically alkylpolyglycosides as discussed in US 4,483,780 and US 4,483,779; polyhydroxy fatty acid amides as discussed in US 5,332,528; and ether capped poly(oxyalkylated) alcohol surfactants as discussed in US 6,482,994 and WO 01/42408.

Preferred examples of non-ionic surfactants are in particular alkoxyated alcohols and alkoxyated fatty alcohols, di- and multiblock copolymers of ethylene oxide and propylene oxide and reaction products of sorbitan with ethylene oxide or propylene oxide, furthermore alkylphenol ethoxylates, alkyl glycosides, polyhydroxy fatty acid amides (glucamides). Examples of (additional) amphoteric surfactants are so-called amine oxides.

Preferred examples of alkoxyated alcohols and alkoxyated fatty alcohols are, for example, compounds of the general formula (A)



[formula (A)]

in which the variables are defined as follows:

R1 is selected from linear C1-C10-alkyl, preferably ethyl and particularly preferably methyl,

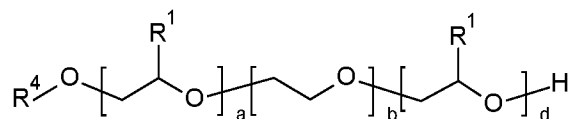
R2 is selected from C8-C22-alkyl, for example n-C8H17, n-C10H21, n-C12H25, n-C14H29, n-C16H33 or n-C18H37,

R3 is selected from C1-C10-alkyl, methyl, ethyl, n-propyl, isopropyl, n-butyl, isobutyl, sec-butyl, tert-butyl, n-pentyl, isopentyl, sec-pentyl, neopentyl, 1,2-dimethylpropyl, isoamyl, n-hexyl, isoheptyl, sec-hexyl, n-heptyl, n-octyl, 2-ethylhexyl, n-nonyl, n-decyl or isodecyl,

m and n are in the range from zero to 300, where the sum of n and m is at least one. Preferably, m is in the range from 1 to 100 and n is in the range from 0 to 30.

Here, compounds of the general formula (A) may be block copolymers or random copolymers, preference being given to block copolymers.

Other preferred examples of alkoxyated alcohols and alkoxyated fatty alcohols are, for example, compounds of the general formula (B)



[formula (B)]

in which the variables are defined as follows:

R¹ is identical or different and selected from linear C1-C4-alkyl, preferably identical in each case and ethyl and particularly preferably methyl,

R⁴ is selected from C6-C20-alkyl, in particular n-C8H₁₇, n-C10H₂₁, n-C12H₂₅, n-C14H₂₉, n-C16H₃₃, n-C18H₃₇,

a is a number in the range from zero to 6, preferably 1 to 6,

b is a number in the range from zero to 20, preferably 4 to 20,

d is a number in the range from 4 to 25.

Preferably, at least one of a and b is greater than zero.

Here, compounds of the general formula (B) may be block copolymers or random copolymers, preference being given to block copolymers.

Further suitable non-ionic surfactants are selected from di- and multiblock copolymers, composed of ethylene oxide and propylene oxide. Further suitable non-ionic surfactants are selected from ethoxylated or propoxylated sorbitan esters. Alkylphenol ethoxylates or alkyl polyglycosides or polyhydroxy fatty acid amides (glucamides) are likewise suitable. An overview of suitable further non-ionic surfactants can be found in EP A 0 851 023 and in DE-A 198 19 187.

Mixtures of two or more different non-ionic surfactants may of course also be present.

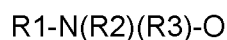
In a preferred embodiment of the present invention, non-ionic surfactants are selected from C12/14 and C16/18 fatty alcoholalkoxylates, C13/15 oxoalkoholalkoxylates, C13-alkoholalkoxylates, and 2-propylheptylalkoholalkoxylates, each of them with 3 – 15 ethoxy units, preferably 5-10 ethoxy units, or with 1-3 propoxy- and 2-15 ethoxy units.

Cleaning compositions may also contain amphoteric surfactants - which may be employed also in combinations of more than one other surfactant.

Non-limiting examples of amphoteric surfactants - which may be employed also in combinations of more than one other surfactant - include: water-soluble amine oxides containing one alkyl

moiety of from about 8 to about 18 carbon atoms and 2 moieties selected from the group consisting of alkyl moieties and hydroxyalkyl moieties containing from about 1 to about 3 carbon atoms; and water-soluble sulfoxides containing one alkyl moiety of from about 10 to about 18 carbon atoms and a moiety selected from the group consisting of alkyl moieties and hydroxyalkyl moieties of from about 1 to about 3 carbon atoms. See WO 01/32816, US 4,681,704, and US 4,133,779. Suitable surfactants include thus so-called amine oxides, such as lauryl dimethyl amine oxide ("lauramine oxide").

Preferred examples of amphoteric surfactants are amine oxides. Preferred amine oxides are alkyl dimethyl amine oxides or alkyl amido propyl dimethyl amine oxides, more preferably alkyl dimethyl amine oxides and especially coco dimethyl amino oxides. Amine oxides may have a linear or mid-branched alkyl moiety. Typical linear amine oxides include water-soluble amine oxides containing one R1 = C8-18 alkyl moiety and two R2 and R3 moieties selected from the group consisting of C1-C3 alkyl groups and C1-C3 hydroxyalkyl groups. Preferably, the amine oxide is characterized by the formula



wherein R1 is a C8-18 alkyl and R2 and R3 are selected from the group consisting of methyl, ethyl, propyl, isopropyl, 2-hydroxyethyl, 2-hydroxypropyl and 3-hydroxypropyl. The linear amine oxide surfactants in particular may include linear C10-C18 alkyl dimethyl amine oxides and linear C8-C12 alkoxy ethyl dihydroxy ethyl amine oxides. Preferred amine oxides include linear C10, linear C10-C12, and linear C12-C14 alkyl dimethyl amine oxides. As used herein "mid-branched" means that the amine oxide has one alkyl moiety having n1 carbon atoms with one alkyl branch on the alkyl moiety having n2 carbon atoms. The alkyl branch is located on the alpha carbon from the nitrogen on the alkyl moiety. This type of branching for the amine oxide is also known in the art as an internal amine oxide. The total sum of n1 and n2 is from 10 to 24 carbon atoms, preferably from 12 to 20, and more preferably from 10 to 16. The number of carbon atoms for the one alkyl moiety (n1) should be approximately the same number of carbon atoms as the one alkyl branch (n2) such that the one alkyl moiety and the one alkyl branch are symmetric. As used herein "symmetric" means that (n1-n2) is less than or equal to 5, preferably 4, most preferably from 0 to 4 carbon atoms in at least 50 wt. %, more preferably at least 75 wt. % to 100 wt. % of the mid-branched amine oxides for use herein. The amine oxide further comprises two moieties, independently selected from a C1-C3 alkyl, a C1-C3 hydroxyalkyl group, or a polyethylene oxide group containing an average of from about 1 to about 3 ethylene oxide groups. Preferably the two moieties are selected from a C1-C3 alkyl, more preferably both are selected as a C1 alkyl.

In a preferred embodiment of the present invention, amphoteric surfactants are selected from C8-C18 alkyl-dimethyl aminoxides and C8-C18 alkyl-di(hydroxyethyl)aminoxide.

Certain amphoteric surfactants can – besides their typical action as surfactant - promote corrosion inhibition, such as compounds having one or two carboxylic groups and one or more amine groups, and optionally further containing also amide-groups and/or hydroxy-groups; such compounds for example being N-(2-carboxyethyl)-N-dodecyl-beta-alaninate (also named N-lauryl-beta-iminodipropionate metal salt, cocoamphodiacetate di-metal salt, cocoamphoacetate metal salt (the metal typically being sodium)). Hence, such amphoteric surfactants are preferred when corrosion inhibition is of importance, such as in cleaning applications which typically have a high pH, e.g. automatic dish washing.

Cleaning compositions may also contain zwitterionic surfactants - which may be employed also in combinations of more than one other surfactant.

Suitable zwitterionic surfactants include betaines, such as alkyl betaines, alkylamidobetaine, amidazoliniumbetaine, sulfobetaine (INCI Sultaines) as well as the phosphobetaines. Examples of suitable betaines and sulfobetaines are the following (designated in accordance with INCI): Almond amidopropyl of betaines, Apricotamidopropyl betaines, Avocadamidopropyl of betaines, Babassuamidopropyl of betaines, Behenamidopropyl betaines, Behenyl of betaines, Canol amidopropyl betaines, Capryl/Capramidopropyl betaines, Carnitine, Cetyl of betaines, Cocamidodethyl of betaines, Cocamidopropyl betaines, Cocamidopropyl Hydroxysultaine, Coco betaines, Coco Hydroxysultaine, Coco/Oleamidopropyl betaines, Coco Sultaine, Decyl of betaines, Dihydroxyethyl Oleyl Glycinate, Dihydroxyethyl Soy Glycinate, Dihydroxyethyl Stearyl Glycinate, Dihydroxyethyl Tallow Glycinate, Dimethicone Propyl of PG-betaines, Erucamidopropyl Hydroxysultaine, Hydrogenated Tallow of betaines, Isostearamidopropyl betaines, Lauramidopropyl betaines, Lauryl of betaines, Lauryl Hydroxysultaine, Lauryl Sultaine, Milkamidopropyl betaines, Minkamidopropyl of betaines, Myristamidopropyl betaines, Myristyl of betaines, Oleamidopropyl betaines, Oleamidopropyl Hydroxysultaine, Oleyl of betaines, Olivamidopropyl of betaines, Palmamidopropyl betaines, Palmitamidopropyl betaines, Palmitoyl Carnitine, Palm Kernelamidopropyl betaines, Polytetrafluoroethylene Acetoxypentyl of betaines, Ricinoleamidopropyl betaines, Sesamidopropyl betaines, Soyamidopropyl betaines, Stearamidopropyl betaines, Stearyl of betaines, Tallowamidopropyl betaines, Tallowamidopropyl Hydroxysultaine, Tallow of betaines, Tallow Dihydroxyethyl of betaines, Undecylenamidopropyl betaines and Wheat Germamidopropyl betaines.

Preferred betaines are, for example, C12-C18-alkylbetaines and sulfobetaines. The zwitterionic surfactant preferably is a betaine surfactant, more preferable a Cocoamidopropylbetaine surfactant.

Non-limiting examples of cationic surfactants - which may be employed also in combinations of more than one other surfactant - include: the quaternary ammonium surfactants, which can have up to 26 carbon atoms include: alkoxylated quaternary ammonium (AQA) surfactants as discussed in US 6,136,769; dimethyl hydroxyethyl quaternary ammonium as discussed in US 6,004,922; dimethyl hydroxyethyl lauryl ammonium chloride; polyamine cationic surfactants as

discussed in WO 98/35002, WO 98/35003, WO 98/35004, WO 98/35005, and WO 98/35006; cationic ester surfactants as discussed in US patents Nos. 4,228,042, 4,239,660 4,260,529 and US 6,022,844; and amino surfactants as discussed in US 6,221,825 and WO 00/47708, specifically amido propyldimethyl amine (APA).

Compositions according to the invention may comprise at least one builder. In the context of the present invention, no distinction will be made between builders and such components elsewhere called "co-builders". Examples of builders are complexing agents, hereinafter also referred to as complexing agents, ion exchange compounds, and precipitating agents. Builders are selected from citrate, phosphates, silicates, carbonates, phosphonates, amino carboxylates and polycarboxylates.

In the context of the present invention, the term citrate includes the mono- and the dialkali metal salts and in particular the mono- and preferably the trisodium salt of citric acid, ammonium or substituted ammonium salts of citric acid as well as citric acid. Citrate can be used as the anhydrous compound or as the hydrate, for example as sodium citrate dihydrate. Quantities of citrate are calculated referring to anhydrous trisodium citrate.

The term phosphate includes sodium metaphosphate, sodium orthophosphate, sodium hydrogenphosphate, sodium pyrophosphate and polyphosphates such as sodium tripolyphosphate. Preferably, however, the composition according to the invention is free from phosphates and polyphosphates, with hydrogenphosphates being subsumed, for example free from trisodium phosphate, pentasodium tripolyphosphate and hexasodium metaphosphate ("phosphate-free"). In connection with phosphates and polyphosphates, "free from" should be understood within the context of the present invention as meaning that the content of phosphate and polyphosphate is in total in the range from 10 ppm to 0.2% by weight of the respective composition, determined by gravimetry.

The term carbonates includes alkali metal carbonates and alkali metal hydrogen carbonates, preferred are the sodium salts. Particularly preferred is Na_2CO_3 .

Examples of phosphonates are hydroxyalkanephosphonates and aminoalkane γ -phosphonates. Among the hydroxyalkanephosphonates, the 1-hydroxyethane-1,1-diphosphonate (HEDP) is of particular importance as builder. It is preferably used as sodium salt, the disodium salt being neutral and the tetrasodium salt being alkaline (pH 9). Suitable aminoalkanephosphonates are preferably ethylene diamine γ -tetra γ -methylene γ -phosphonate (EDTMP), diethylenetriaminepenta γ -methylene γ -phosphonate (DTPMP), and also their higher homologues. They are preferably used in the form of the neutrally reacting sodium salts, e.g. as hexasodium salt of EDTMP or as hepta- and octa-sodium salts of DTPMP.

Examples of amino carboxylates and polycarboxylates are nitrilotriacetates, ethylene diamine tetraacetate, diethylene triamine pentaacetate, triethylene tetraamine hexaacetate, propylene

diamines tetraacetic acid, ethanol-diglycines, methylglycine diacetate, and glutamine diacetate. The term amino carboxylates and polycarboxylates also include their respective non-substituted or substituted ammonium salts and the alkali metal salts such as the sodium salts, in particular of the respective fully neutralized compound.

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Silicates in the context of the present invention include in particular sodium disilicate and sodium metasilicate, aluminosilicates such as for example zeolites and sheet silicates, in particular those of the formula α -Na₂Si₂O₅, β -Na₂Si₂O₅, and δ -Na₂Si₂O₅.

10 Compositions according to the invention may contain one or more builder selected from materials not being

mentioned above. Examples of builders are α -hydroxypropionic acid and oxidized starch.

In one embodiment of the present invention, builder is selected from polycarboxylates. The term "polycarboxylates" includes non-polymeric polycarboxylates such as succinic acid, C₂-C₁₆-alkyl disuccinates, C₂-C₁₆-alkenyl disuccinates, ethylene diamine N,N'-disuccinic acid, tartaric acid diacetate, alkali metal malonates, tartaric acid monoacetate, propanetricarboxylic acid, butanetetracarboxylic acid and cyclopentanetetracarboxylic acid.

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Oligomeric or polymeric polycarboxylates are for example polyaspartic acid or in particular alkali metal salts of (meth)acrylic acid homopolymers or (meth)acrylic acid copolymers.

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Suitable co-monomers are monoethylenically unsaturated dicarboxylic acids such as maleic acid, fumaric acid, maleic anhydride, itaconic acid and citraconic acid. A suitable polymer is in particular polyacrylic acid, which preferably has a weight-average molecular weight M_w in the range from 2000 to 40 000 g/mol, preferably 2000 to 10 000 g/mol, in particular 3000 to 8000 g/mol. Further suitable copolymeric polycarboxylates are in particular those of acrylic acid with methacrylic acid and of acrylic acid or methacrylic acid with maleic acid and/or fumaric acid.

25

It is also possible to use copolymers of at least one monomer from the group consisting of monoethylenically unsaturated C₃-C₁₀-mono- or C₄-C₁₀-dicarboxylic acids or anhydrides thereof, such as maleic acid, maleic anhydride, acrylic acid, methacrylic acid, fumaric acid, itaconic acid and citraconic acid, with at least one hydrophilically or hydrophobically modified co-monomer as listed below.

30

Suitable hydrophobic co-monomers are, for example, isobutene, diisobutene, butene, pentene, hexene and styrene, olefins with ten or more carbon atoms or mixtures thereof, such as, for example, 1-decene, 1-dodecene, 1-tetradecene, 1-hexadecene, 1-octadecene, 1-eicosene, 1-docosene, 1-tetracosene and 1-hexacosene, C₂₂- α -olefin, a mixture of C₂₀-C₂₄- α -olefins and polyisobutene having on average 12 to 100 carbon atoms per molecule.

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Suitable hydrophilic co-monomers are monomers with sulfonate or phosphonate groups, and also non-ionic monomers with hydroxyl function or alkylene oxide groups. By way of example,

mention may be made of: allyl alcohol, isoprenol, methoxypolyethylene glycol (meth)acrylate, methoxypolypropylene glycol (meth)acrylate, methoxypolybutylene glycol (meth)acrylate, methoxypoly(propylene oxide-co-ethylene oxide) (meth)acrylate, ethoxypolyethylene glycol (meth)acrylate, ethoxypolypropylene glycol (meth)acrylate, ethoxypolybutylene glycol (meth)acrylate and ethoxypoly(propylene oxide-co-ethylene oxide) (meth)acrylate. Polyalkylene glycols here can comprise 3 to 50, in particular 5 to 40 and especially 10 to 30 alkylene oxide units per molecule.

Particularly preferred sulfonic-acid-group-containing monomers here are 1-acrylamido-1-propanesulfonic acid, 2-acrylamido-2-propanesulfonic acid, 2-acrylamido-2-methylpropanesulfonic acid, 2-methacrylamido-2-methylpropanesulfonic acid, 3-methacrylamido-2-hydroxypropanesulfonic acid, allylsulfonic acid, methallylsulfonic acid, allyloxybenzenesulfonic acid, methallyloxybenzenesulfonic acid, 2-hydroxy-3-(2-propenyloxy)propanesulfonic acid, 2-methyl-2-propene-1-sulfonic acid, styrenesulfonic acid, vinylsulfonic acid, 3-sulfopropyl acrylate, 2-sulfoethyl methacrylate, 3-sulfopropyl methacrylate, sulfomethacrylamide, sulfomethylmethacrylamide, and salts of said acids, such as sodium, potassium or ammonium salts thereof.

Particularly preferred phosphonate-group-containing monomers are vinylphosphonic acid and its salts.

Moreover, amphoteric polymers can also be used as builders.

Compositions according to the invention can comprise, for example, in the range from in total 0.1 to 70% by weight, preferably 10 to 50% by weight, preferably up to 20% by weight, of builder(s), especially in the case of solid formulations. Liquid formulations according to the invention preferably comprise in the range of from 0.1 to 8% by weight of builder.

Formulations according to the invention can comprise one or more alkali carriers. Alkali carriers ensure, for example, a pH of at least 9 if an alkaline pH is desired. Of suitability are, for example, the alkali metal carbonates, the alkali metal hydrogen carbonates, and alkali metal metasilicates mentioned above, and, additionally, alkali metal hydroxides. A preferred alkali metal is in each case potassium, particular preference being given to sodium. In one embodiment of the present invention, a pH >7 is adjusted by using amines, preferably alkanolamines, more preferably triethanolamine.

In one embodiment of the present invention, the laundry formulation or composition according to the invention comprises additionally at least one enzyme.

Useful enzymes are, for example, one or more hydrolases selected from lipases, amylases, proteases, cellulases, hemicellulases, phospholipases, esterases, pectinases, lactases and peroxidases, and combinations of at least two of the foregoing types.

In one embodiment, the composition according to the present invention comprises additionally at least one enzyme.

5 Preferably, the at least one enzyme is a detergent enzyme.

In one embodiment, the enzyme is classified as an oxidoreductase (EC 1), a transferase (EC 2), a hydrolase (EC 3), a lyase (EC 4), an isomerase (EC 5), or a ligase (EC 6) (the EC-numbering is according to Enzyme Nomenclature, Recommendations (1992) of the Nomenclature Committee of the International Union of Biochemistry and Molecular Biology including its supplements published 1993-1999). Preferably, the enzyme is a hydrolase (EC 3).

In a preferred embodiment, the enzyme is selected from the group consisting of proteases, amylases, lipases, cellulases, mannanases, hemicellulases, phospholipases, esterases, pectinases, lactases, peroxidases, xylanases, cutinases, pectate lyases, keratinases, reductases, oxidases, phenoloxidases, lipoxygenases, ligninases, pullulanases, tannases, pentosanases, malanases, beta-glucanases, arabinosidases, hyaluronidases, chondroitinases, laccases, nucleases, DNase, phosphodiesterases, phytases, carbohydrases, galactanases, xanthanases, xyloglucanases, oxidoreductase, perhydrolases, aminopeptidase, asparaginase, carbohydrase, carboxypeptidase, catalase, chitinase, cyclodextrin glycosyltransferase, alpha-galactosidase, beta-galactosidase, glucoamylase, alpha-glucosidase, beta-glucosidase, invertase, ribonuclease, transglutaminase, and dispersins, and combinations of at least two of the foregoing types. More preferably, the enzyme is selected from the group consisting of proteases, amylases, lipases, cellulases, mannanases, xylanases, DNases, dispersins, pectinases, oxidoreductases, and cutinases, and combinations of at least two of the foregoing types. Most preferably, the enzyme is a protease, preferably, a serine protease, more preferably, a subtilisin protease.

Such enzyme(s) can be incorporated into the composition at levels sufficient to provide an effective amount for achieving a beneficial effect, preferably for primary washing effects and/or secondary washing effects, like antigreying or antipilling effects (e.g., in case of cellulases). Preferably, the enzyme is present in the composition at levels from about 0.00001% to about 5%, preferably from about 0.00001% to about 2%, more preferably from about 0.0001% to about 1%, or even more preferably from about 0.001% to about 0.5% enzyme protein by weight of the composition.

35 Preferably, the enzyme-containing composition further comprises an enzyme stabilizing system. Preferably, the enzyme-containing composition described herein comprises from about 0.001% to about 10%, from about 0.005% to about 8%, or from about 0.01% to about 6%, by weight of the composition, of an enzyme stabilizing system. The enzyme stabilizing system can be any stabilizing system which is compatible with the enzyme.

40 Preferably, the enzyme stabilizing system comprises at least one compound selected from the group consisting of polyols (preferably, 1,3-propanediol, ethylene glycol, glycerol, 1,2-

propanediol, or sorbitol), salts (preferably, CaCl_2 , MgCl_2 , or NaCl), short chain (preferably, C1-C6) carboxylic acids (preferably, formic acid, formate (preferably, sodium formate), acetic acid, acetate, or lactate), borate, boric acid, boronic acids (preferably, 4-formyl phenylboronic acid (4-FPBA)), peptide aldehydes, peptide acetals, and peptide aldehyde hydrosulfite adducts. Preferably, the enzyme stabilizing system comprises a combination of at least two of the compounds selected from the group consisting of salts, polyols, and short chain carboxylic acids and preferably one or more of the compounds selected from the group consisting of borate, boric acid, boronic acids (preferably, 4-formyl phenylboronic acid (4-FPBA)), peptide aldehydes, peptide acetals, and peptide aldehyde hydrosulfite adducts. In particular, if proteases are present in the composition, protease inhibitors may be added, preferably selected from borate, boric acid, boronic acids (preferably, 4-FPBA), peptide aldehydes (preferably, peptide aldehydes like Z-VAL-H or Z-GAY-H), peptide acetals, and peptide aldehyde hydrosulfite adducts. Compositions according to the invention may comprise one or more bleaching agent (bleaches).

Preferred bleaches are selected from sodium perborate, anhydrous or, for example, as the monohydrate or as the tetrahydrate or so-called dihydrate, sodium percarbonate, anhydrous or, for example, as the monohydrate, and sodium persulfate, where the term "persulfate" in each case includes the salt of the peracid H_2SO_5 and also the peroxodisulfate.

In this connection, the alkali metal salts can in each case also be alkali metal hydrogen carbonate, alkali metal hydrogen perborate and alkali metal hydrogen persulfate. However, the dialkali metal salts are preferred in each case.

Formulations according to the invention can comprise one or more bleach catalysts. Bleach catalysts can be selected from oxaziridinium-based bleach catalysts, bleach-boosting transition metal salts or transition metal complexes such as, for example, manganese-, iron-, cobalt-, ruthenium- or molybdenum-salen complexes or carbonyl complexes. Manganese, iron, cobalt, ruthenium, molybdenum, titanium, vanadium and copper complexes with nitrogen-containing tripod ligands and also cobalt-, iron-, copper- and ruthenium-amine complexes can also be used as bleach catalysts.

Formulations according to the invention can comprise one or more bleach activators, for example tetraacetyl ethylene diamine, tetraacetylmethylene diamine, tetraacetyl glycoluril, tetraacetylhexylene diamine, acylated phenolsulfonates such as for example n-nonanoyl- or isononanoyloxybenzene sulfonates, N-methylmorpholinium-acetonitrile salts ("MMA salts"), trimethylammonium acetonitrile salts, N-acylimides such as, for example, N-nonanoylsuccinimide, 1,5-diacetyl-2,2-dioxohexahydro-1,3,5-triazine ("DADHT") or nitrile quats (trimethylammonium acetonitrile salts).

Formulations according to the invention can comprise one or more corrosion inhibitors. In the present case, this is to be understood as including those compounds which inhibit the corrosion of metal. Examples of suitable corrosion inhibitors are triazoles, in particular benzotriazoles,

bisbenzotriazoles, aminotriazoles, alkylaminotriazoles, also phenol derivatives such as, for example, hydroquinone, pyrocatechol, hydroxy- γ -hydroquinone, gallic acid, phloroglucinol or pyrogallol.

- 5 In one embodiment of the present invention, formulations according to the invention comprise in total in the range from 0.1 to 1.5% by weight of corrosion inhibitor.

Besides such “typical” corrosion inhibitors, also amphoteric surfactants can promote corrosion inhibition, such as compounds having one or two carboxylic groups and one or more amine
10 groups, and optionally further containing also amide-groups and/or hydroxy-groups; such compounds for example being N-(2-carboxyethyl)-N-dodecyl-beta-alaninate (also named N-lauryl-beta-iminodipropionate metal salt, cocoamphodiacetate di-metal salt, cocoamphoacetate metal salt (the metal typically being sodium).

- 15 Formulations according to the invention may also comprise further cleaning polymers and/or soil release polymers.

The additional cleaning polymers may include, without limitation, “multifunctional polyethylene imines” (for example BASF’s Sokalan® HP20) and/or “multifunctional diamines” (for example
20 BASF’s Sokalan® HP96). Such multifunctional polyethylene imines are typically ethoxylated polyethylene imines with a weight-average molecular weight Mw in the range from 3000 to 250000, preferably 5000 to 200000, more preferably 8000 to 100000, more preferably 8000 to 50000, more preferably 10000 to 30000, and most preferably 10000 to 20000 g/mol. Suitable multifunctional polyethylene imines have 80 wt. % to 99 wt. %, preferably 85 wt. % to 99 wt. %,
25 more preferably 90 wt. % to 98 wt. %, most preferably 93 wt. % to 97 wt. % or 94 wt. % to 96 wt. % ethylene oxide side chains, based on the total weight of the materials. Ethoxylated polyethylene imines are typically based on a polyethylene imine core and a polyethylene oxide shell. Suitable polyethylene imine core molecules are polyethylene imines with a weight-average molecular weight Mw in the range of 500 to 5000 g/mol. Preferably employed is a molecular
30 weight from 500 to 1000 g/mol, even more preferred is a Mw of 600 to 800 g/mol. The ethoxylated polymer then has on average 5 to 50, preferably 10 to 35 and even more preferably 20 to 35 ethylene oxide (EO) units per NH-functional group.

Suitable multifunctional diamines are typically ethoxylated C2 to C12 alkylene diamines, preferably
35 hexamethylene diamine, which are further quaternized and optionally sulfated. Typical multifunctional diamines have a weight-average molecular weight Mw in the range from 2000 to 10000, more preferably 3000 to 8000, and most preferably 4000 to 6000 g/mol. In a preferred embodiment of the invention, ethoxylated hexamethylene diamine, furthermore quaternized and sulfated, may be employed, which contains on average 10 to 50, preferably 15 to 40 and even
40 more preferably 20 to 30 ethylene oxide (EO) groups per NH-functional group, and which preferably bears two cationic ammonium groups and two anionic sulfate groups.

In a preferred embodiment of the present invention, the cleaning compositions may contain at least one multifunctional polyethylene imine and/or at least one multifunctional diamine to improve the cleaning performance, such as preferably improve the stain removal ability, especially the primary detergency of particulate stains on polyester fabrics of laundry detergents. The multifunctional polyethylene imines or multifunctional diamines or mixtures thereof according to the descriptions above may be added to the laundry detergents and cleaning compositions in amounts of generally from 0.05 to 15 wt. %, preferably from 0.1 to 10 wt. % and more preferably from 0.25 to 5 wt. % and even as low as up to 2 wt.%, based on the particular overall composition, including other components and water and/or solvents.

Thus, one aspect of the present invention is a laundry detergent composition, in particular a liquid laundry detergent, comprising (i) at least one inventive compound and (ii) at least one compound selected from multifunctional polyethylene imines and multifunctional diamines and mixtures thereof.

In one embodiment of the present invention, the ratio of the at least one inventive compound and (ii) the at least one compound selected from multifunctional polyethylene imines and multifunctional diamines and mixtures thereof, is from 10:1 to 1:10, preferably from 5:1 to 1:5 and more preferably from 3:1 to 1:3.

Cleaning compositions, fabric and home care products and specifically the laundry formulations comprising the inventive compound may also comprise at least one antimicrobial agent (named also "preservative").

An antimicrobial agent is a chemical compound that kills microorganisms or inhibits their growth or reproduction. Microorganisms can be bacteria, yeasts or molds. A preservative is an antimicrobial agent which may be added to aqueous products and compositions to maintain the original performance, characteristics and integrity of the products and compositions by killing contaminating microorganisms or inhibiting their growth.

The composition/formulation may contain one or more antimicrobial agents and/or preservatives as listed in patent WO2021/115912 A1 ("Formulations comprising a hydrophobically modified polyethyleneimine and one or more enzymes") on pages 35 to 39.

Especially of interest for the cleaning compositions and fabric and home care products and specifically in the laundry formulations are any of the following antimicrobial agents and/or preservatives:

4,4'-dichloro 2-hydroxydiphenyl ether (further names: 5-chloro-2-(4-chlorophenoxy) phenol, Diclolan, DCP), Tinosan® HP 100 (commercial product of BASF SE containing 30% of the antimicrobial active 4,4'-dichloro 2-hydroxydiphenylether); 2-Phenoxyethanol (further names: Phenoxyethanol, Methylphenylglycol, Phenoxetyethanol, ethylene glycol phenyl ether, Ethylene glycol monophenyl ether, 2-(phenoxy) ethanol, 2-phenoxy-1-ethanol); 2-bromo-2-nitropropane-

1,3-diol (further names: 2-bromo-2-nitro-1,3-propanediol, Bronopol); Glutaraldehyde (further names: 1-5-pentandial, pentane-1,5-dial, glutaral, glutar-dialdehyde); Glyoxal (further names: ethandial, oxylaldehyde, 1,2-ethandial); 2-butyl-benzo[d]isothiazol-3-one ("BBIT"); 2-methyl-2H-isothiazol-3-one ("MIT"); 2-octyl-2H-isothiazol-3-one ("OIT"); 5-Chloro-2-methyl-2H-isothiazol-3-one ("CIT" or "CMIT"); Mixture of 5-chloro-2-methyl-2H-isothiazol-3-one ("CMIT") and 2-methyl-2H-isothiazol-3-one ("MIT") (Mixture of CMIT/MIT); 1,2-benzisothiazol-3(2H)-one ("BIT"); Hexa-2,4-dienoic acid (trivial name "sorbic acid") and its salts, e.g., calcium sorb-ate, sodium sorbate; potassium (E,E)-hexa-2,4-dienoate (Potassium Sorbate); Lactic acid and its salts; L-(+)-lactic acid; especially sodium lactate; Benzoic acid and salts of benzoic acid, e.g., sodium benzoate, ammonium benzo-ate, calcium benzoate, magnesium benzoate, MEA-benzoate, potassium benzoate; Salicylic acid and its salts, e.g., calcium salicylate, magnesium salicylate, MEA salicylate, sodium salicylate, potassium salicylate, TEA salicylate; Benzalkonium chloride, benzalkonium bromide, benzalkonium saccharinate; Didecyldimethylammonium chloride ("DDAC"); N-(3-aminopropyl)-N-dodecylpropane-1,3-diamine ("Diamine"); Peracetic acid; Hydrogen peroxide.

At least one antimicrobial agent or preservative may be added to the inventive composition in a concentration of 0.001 to 10% relative to the total weight of the composition.

Preferably, the composition contains 2-phenoxyethanol in a concentration of 0.1 to 2% or 4,4'-dichloro 2-hydroxydiphenyl ether (DCPP) in a concentration of 0.005 to 0.6%.

The invention also encompasses a method of preserving an aqueous composition according to the invention against microbial contamination or growth, which method comprises addition of at least one antimicrobial agent or preservative, preferably 2-phenoxyethanol.

The invention also encompasses a method of providing an antimicrobial effect on textiles after treatment with a solid laundry detergent (e.g. powders, granulates, capsules, tablets, bars etc.), a liquid laundry detergent, a softener or an after-rinse containing 4,4'-dichloro 2-hydroxydiphenyl ether (DCPP).

Formulations according to the invention may also comprise water and/or additional organic solvents, e.g., ethanol or propylene glycol.

Further optional ingredients may be but are not limited to viscosity modifiers, cationic surfactants, foam boosting or foam reducing agents, perfumes, dyes, optical brighteners, and dye transfer inhibiting agents.

Dish wash compositions

Another aspect of the present invention is also a dish wash composition, comprising at least one inventive compound(s) as described above.

Thus, an aspect of the present invention is also the use of the inventive compound(s) as described above, in dish wash applications, such as manual or automated dish wash applications.

Dish wash compositions according to the invention can be in the form of a liquid, semi-liquid, cream, lotion, gel, or solid composition, solid embodiments encompassing, for example, powders and tablets. Liquid compositions are typically preferred for manual dish wash applications, whereas solid formulations and pouch formulations (where the pouches may contain also solids in addition to liquid ingredients) are typically preferred for automated dish washing compositions; however, in some areas of the world also liquid automated dish wash compositions are used and are thus of course also encompassed by the term "dish wash composition".

The dish wash compositions are intended for direct or indirect application onto dishware and metal and glass surfaces, such as drinking and other glasses, beakers, dish and cooking ware like pots and pans, and cutlery such as forks, spoons, knives and the like.

The inventive method of cleaning dishware, metal and/or glass surfaces comprises the step of applying the dish wash cleaning composition, preferably in liquid form, onto the surface, either directly or by means of a cleaning implement, i.e., in neat form. The composition is applied directly onto the surface to be treated and/or onto a cleaning device or implement such as a dish cloth, a sponge or a dish brush and the like without undergoing major dilution (immediately) prior to the application. The cleaning device or implement is preferably wet before or after the composition is delivered to it. In the method of the invention, the composition can also be applied in diluted form.

Both neat and dilute application give rise to superior cleaning performance, i.e. the formulations of the invention containing at least one inventive compound(s) exhibit excellent degreasing properties. The effort of removing fat and/or oily soils from the dishware, metal and/or glass surfaces is decreased due to the presence of the inventive compound(s), even when the level of surfactant used is lower than in conventional compositions.

Preferably the composition is formulated to provide superior grease cleaning (degreasing) properties, long-lasting suds and/or improved viscosity control at decreased temperature exposures; preferably at least two, more preferably all three properties are present in the inventive dish wash composition. Optional – preferably present - further benefits of the inventive manual dish wash composition include soil removal, shine, and/or hand care; more preferably at least two and most preferably all three further benefits are present in the inventive dish wash composition.

In one embodiment of the present invention, the inventive compound(s) is one component of a manual dish wash formulation that additionally comprises at least one surfactant, preferably at least one anionic surfactant.

In another embodiment of the present invention, the inventive compound(s) is one component of a manual dish wash formulation that additionally comprises at least one anionic surfactant and at least one other surfactant, preferably selected from amphoteric surfactants and/or zwitterionic surfactants. In a preferred embodiment of the present invention, the manual dish wash formulations contain at least one amphoteric surfactant, preferably an amine oxide, or at least one zwitterionic surfactant, preferably a betaine, or mixtures thereof, to aid in the foaming, detergency, and/or mildness of the detergent composition.

Examples of suitable **anionic surfactants** are already mentioned above for laundry compositions.

Preferred anionic surfactants for dish wash compositions are selected from C10-C15 linear alkylbenzenesulfonates, C10-C18 alkylethersulfates with 1-5 ethoxy units and C10-C18 alkylsulfates.

Preferably, the manual dish wash detergent formulation of the present invention comprises from at least 1 wt% to 50 wt%, preferably in the range from greater than or equal to about 3 wt% to equal to or less than about 35 wt%, more preferably in the range from greater than or equal to 5 wt% to less than or equal to 30 wt%, and most preferably in the range from greater than or equal to 5 wt% to less than or equal to 20 wt% of one or more anionic surfactants as described above, based on the particular overall composition, including other components and water and/or solvents.

Dish wash compositions according to the invention may comprise at least one **amphoteric surfactant**.

Examples of suitable amphoteric surfactants for dish wash compositions are already mentioned above for laundry compositions.

Preferred amphoteric surfactants for dish wash compositions are selected from C8-C18 alkyl-dimethyl aminoxides and C8-C18 alkyl-di(hydroxyethyl)aminoxide.

The manual dish wash detergent composition of the invention preferably comprises from 1 wt% to 15 wt%, preferably from 2 wt% to 12 wt%, more preferably from 3 wt% to 10 wt% of the composition of an amphoteric surfactant, preferably an amine oxide surfactant. Preferably the composition of the invention comprises a mixture of the anionic surfactants and alkyl dimethyl amine oxides in a weight ratio of less than about 10:1, more preferably less than about 8:1, more preferably from about 5:1 to about 2:1.

Addition of the amphoteric surfactant provides good foaming properties in the dish wash composition.

In this chapter on Dish Wash it needs to be emphasized again that certain amphoteric surfactants can – besides their typical action as surfactant - promote corrosion inhibition, such as compounds having one or two carboxylic groups and one or more amine groups, and optionally further containing also amide-groups and/or hydroxy-groups; such compounds for example being N-(2-carboxyethyl)-N-dodecyl-beta-alaninate (also named N-lauryl-beta-iminodipropionate metal salt, cocoamphodiacetate di-metal salt, cocoamphoacetate metal salt (the metal typically being sodium). Hence, such amphoteric surfactants are preferred when corrosion inhibition is of importance, such as in cleaning applications which typically have a high pH, e.g. automatic dish washing.

Dish wash compositions according to the invention may comprise at least one **zwitterionic surfactant**.

Examples of suitable zwitterionic surfactants for dish wash compositions are already mentioned above for laundry compositions.

Preferred zwitterionic surfactants for dish wash compositions are selected from betaine surfactants, more preferable from Cocoamidopropylbetaine surfactants.

In a preferred embodiment of the present invention, the zwitterionic surfactant is Cocamidopropylbetaine.

The manual dish wash detergent composition of the invention optionally comprises from 1 wt% to 15 wt%, preferably from 2 wt% to 12 wt%, more preferably from 3 wt% to 10 wt% of the composition of a zwitterionic surfactant, preferably a betaine surfactant.

Dish wash compositions according to the invention may comprise at least one **cationic surfactant**.

Examples of suitable cationic surfactants for dish wash compositions are already mentioned above for laundry compositions.

Cationic surfactants, when present in the composition, are present in an effective amount, more preferably from 0.1 wt% to 5 wt%, preferably 0.2 wt% to 2 wt% of the composition.

Dish wash compositions according to the invention may comprise at least one **non-ionic surfactant**.

Examples of suitable non-ionic surfactants for dish wash compositions are already mentioned above for laundry compositions.

Preferred non-ionic surfactants are the condensation products of Guerbet alcohols with from 2 to 18 moles, preferably 2 to 15, more preferably 5-12 of ethylene oxide per mole of alcohol. Other preferred non-ionic surfactants for use herein include fatty alcohol polyglycol ethers, alkylpolyglucosides and fatty acid glucamides.

5 The manual hand dish detergent composition of the present invention may comprise from 0.1 wt% to 10 wt%, preferably from 0.3 wt% to 5 wt%, more preferably from 0.4 wt% to 2 wt% of the composition, of a linear or branched C10 alkoxyated non-ionic surfactant having an average degree of alkoxylation of from 2 to 6, preferably from 3 to 5. Preferably, the linear or branched
10 C10 alkoxyated non-ionic surfactant is a branched C10 ethoxylated non-ionic surfactant having an average degree of ethoxylation of from 2 to 6, preferably of from 3 to 5. Preferably, the composition comprises from 60 wt% to 100 wt%, preferably from 80 wt% to 100 wt%, more preferably 100 wt% of the total linear or branched C10 alkoxyated non-ionic surfactant of the branched C10 ethoxylated non-ionic surfactant. The linear or branched C10 alkoxyated non-
15 ionic surfactant preferably is a 2-propylheptyl ethoxylated non-ionic surfactant having an average degree of ethoxylation of from 3 to 5. A suitable 2-propylheptyl ethoxylated non-ionic surfactant having an average degree of ethoxylation of 4 is Lutensol® XP40, commercially available from BASF SE, Ludwigshafen, Germany. The use of a 2-propylheptyl ethoxylated non-ionic surfactant having an average degree of ethoxylation of from 3 to 5 leads to improved foam levels and long-lasting suds.
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Thus, one aspect of the present invention is a manual dish wash detergent composition, in particular a liquid manual dish wash detergent composition, comprising (i) at least one inventive compound, and (ii) at least one further 2-propylheptyl ethoxylated non-ionic surfactant having an
25 average degree of ethoxylation of from 3 to 5.

Dish wash compositions according to the invention may comprise at least one **hydrotrope** in an effective amount, to ensure the compatibility of the liquid manual dish wash detergent compositions with water.
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Suitable hydrotropes for use herein include anionic hydrotropes, particularly sodium, potassium, and ammonium xylene sulfonate, sodium, potassium and ammonium toluene sulfonate, sodium, potassium, and ammonium cumene sulfonate, and mixtures thereof, and related compounds, as disclosed in U.S. Patent 3,915,903.

35 The liquid manual dish wash detergent compositions of the present invention typically comprise from 0.1 wt% to 15 wt% of the total liquid detergent composition of a hydrotrope, or mixtures thereof, preferably from 1 wt% to 10 wt%, most preferably from 2 wt% to 5 wt% of the total liquid manual dish wash composition.

40 Dish wash compositions according to the invention may comprise at least one **organic solvent**. Examples of organic solvents are C4-C14 ethers and diethers, glycols, alkoxyated glycols, C6-C16 glycol ethers, alkoxyated aromatic alcohols, aromatic alcohols, aliphatic branched alco-

hols, alkoxyated aliphatic branched alcohols, alkoxyated linear C1-C5 alcohols, linear C1-C5 alcohols, amines, C8-C14 alkyl and cycloalkyl hydrocarbons and halohydrocarbons, and mixtures thereof.

- 5 When present, the liquid dish wash compositions will contain from 0.01 wt% to 20 wt%, preferably from 0.5 wt% to 15 wt%, more preferably from 1 wt% to 10 wt%, most preferably from 1 wt% to 5 wt% of the liquid detergent composition of a solvent. These solvents may be used in conjunction with an aqueous liquid carrier, such as water, or they may be used without any aqueous liquid carrier being present. At higher solvent systems, the absolute values of the viscosity may drop but there is a local maximum point in the viscosity profile.

- The dish wash compositions herein may further comprise from 30 wt% to 90 wt% of an **aqueous liquid carrier**, comprising water, in which the other essential and optional ingredients are dissolved, dispersed or suspended. More preferably the compositions of the present invention
- 15 comprise from 45 wt% to 85 wt%, even more preferably from 60 wt% to 80 wt% of the aqueous liquid carrier. The aqueous liquid carrier, however, may contain other materials which are liquid, or which dissolve in the liquid carrier, at room temperature (25 °C) and which may also serve some other function besides that of an inert filler.

- 20 Dish wash compositions according to the invention may comprise at least one **electrolyte**. Suitable electrolytes are preferably selected from inorganic salts, even more preferably selected from monovalent salts, most preferably sodium chloride.

- The liquid manual dish wash compositions according to the invention may comprise from 0.1
- 25 wt% to 5 wt%, preferably from 0.2 wt% to 2 wt% of the composition of an electrolyte.

Manual dish wash formulations comprising the inventive compound(s) may also comprise at least one **antimicrobial agent**.

- 30 Examples of suitable antimicrobial agents for dish wash compositions are already mentioned above for laundry compositions.

- The antimicrobial agent may be added to the inventive hand dish wash composition in a concentration of 0.0001 wt% to 10 wt% relative to the total weight of composition. Preferably, the
- 35 formulation contains 2-phenoxyethanol in a concentration of 0.01 wt% to 5 wt%, more preferably 0.1 wt% to 2 wt% and/or 4,4'-dichloro 2-hydroxydiphenyl ether in a concentration of 0.001 wt% to 1 wt%, more preferably 0.002 wt% to 0.6 wt% (in all cases relative to the total weight of the composition).

- 40 Further **additional ingredients** are such as but not limited to conditioning polymers, cleaning polymers, surface modifying polymers, soil flocculating polymers, rheology modifying polymers, enzymes, structurants, builders, chelating agents, cyclic diamines, emollients, humectants, skin

rejuvenating actives, carboxylic acids, scrubbing particles, bleach and bleach activators, perfumes, malodor control agents, pigments, dyes, opacifiers, beads, pearlescent particles, microcapsules, antibacterial agents, pH adjusters including NaOH and alkanolamines such as monoethanolamines and buffering means.

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Hand dishwashing liquid composition

The liquid detergent composition comprising at least one inventive compound as described herein throughout the disclosure including the examples may be a hand dishwashing or spray
10 detergent composition. Preferably the liquid hand dishwashing or spray detergent composition comprises from between 0.1 and 50%, preferably between 1% and 30% by weight of the detergent composition comprising inventive compound(s). Preferably the pH of the detergent composition of the invention, measured as a 10% product concentration in demineralized water at 20°C, is adjusted to between 3 and 14, more preferably between 4 and 13, more preferably between 6 and 12 and most preferably between 8 and 10. The composition of the present invention can be Newtonian or non-Newtonian, preferably Newtonian. Preferably, the composition has a viscosity of from 10 mPa·s to 10,000 mPa·s, preferably from 100 mPa·s to 5,000 mPa·s, more preferably from 300 mPa·s to 2,000 mPa·s, or most preferably from 500 mPa·s to 1,500 mPa·s, alternatively combinations thereof. The viscosity is measured at 20°C with a Brookfield
15 RT Viscometer using spindle 31 with the RPM of the viscometer adjusted to achieve a torque of between 40% and 60%. The viscosity of the Spray detergent is preferably ranging 0.5-100mPa.s.

The liquid hand dishwashing or spray detergent cleaning composition comprises from 0.1% to
25 50%, preferably from 1% to 35%, more preferably from 3% to 30%, by weight of the total composition of a surfactant system. The surfactant system preferably comprises from 60% to 90%, more preferably from 70% to 80% by weight of the surfactant system of an anionic surfactant. Alkyl sulphated anionic surfactants are preferred, particularly those selected from the group consisting of: alkyl sulphate, alkyl alkoxy sulphate preferably alkyl ethoxy sulphate, and mixtures thereof. The alkyl sulphated anionic surfactant preferably has an average alkyl chain length of
30 from 8 to 18, preferably from 10 to 14, more preferably from 12 to 14, most preferably from 12 to 13 carbon atoms. The alkyl sulphated anionic surfactant preferably has an average degree of alkoxylation preferably ethoxylation, of less than 5, preferably less than 3, more preferably from 0.5 to 2.0, most preferably from 0.5 to 0.9. The alkyl sulphate anionic surfactant preferably has
35 a weight average degree of branching of more than 10%, preferably more than 20%, more preferably more than 30%, even more preferably between 30% and 60%, most preferably between 30% and 50%. Suitable counterions include alkali metal cation earth alkali metal cation, alkanol ammonium or ammonium or substituted ammonium, but preferably sodium. Suitable examples of commercially available alkyl sulphate anionic surfactants include, those derived
40 from alcohols sold under the Neodol® brand-name by Shell, or the Lial®, Isalchem®, and Safol® brand-names by Sasol, or some of the natural alcohols produced by The Procter & Gamble Chemicals company.

The surfactant system preferably comprises from 0.1% to 20%, more preferably from 0.5% to 15% and especially from 2% to 10% by weight of the liquid hand dishwashing detergent composition of a co-surfactant. Preferred co-surfactants are selected from the group consisting of an amphoteric surfactant, a zwitterionic surfactant, and mixtures thereof. The anionic surfactant to the co-surfactant weight ratio can be from 1:1 to 8:1, preferably from 2:1 to 5:1, more preferably from 2.5:1 to 4:1. The co-surfactant is preferably an amphoteric surfactant, more preferably an amine oxide surfactant. Preferably, the amine oxide surfactant is selected from the group consisting of: alkyl dimethyl amine oxide, alkyl amido propyl dimethyl amine oxide, and mixtures thereof, most preferably C12-C14 alkyl dimethyl amine oxide. Suitable zwitterionic surfactants include betaine surfactants, preferably cocamidopropyl betaine.

The surfactant system of the composition of the present invention may comprises from 0.1% to 25%, preferably from 0.5% to 20%, more preferably from 1% to 10%, most preferably from 1.5% to 5%, by weight of the surfactant system, of a non-ionic surfactant. Suitable nonionic surfactants can be selected from the group consisting of: alkoxylated non-ionic surfactant, alkyl polyglucoside ("APG") surfactant, and mixtures thereof. Suitable alkoxylated non-ionic surfactants can be linear or branched, primary or secondary alkyl alkoxylated preferably alkyl ethoxylated non-ionic surfactants comprising on average from 9 to 15, preferably from 10 to 14 carbon atoms in its alkyl chain and on average from 5 to 12, preferably from 6 to 10, most preferably from 7 to 8, units of ethylene oxide per mole of alcohol. Most preferably, the alkyl polyglucoside surfactant has an average alkyl carbon chain length between 10 and 16, preferably between 10 and 14, most preferably between 12 and 14, with an average degree of polymerization of between 0.5 and 2.5 preferably between 1 and 2, most preferably between 1.2 and 1.6. C8-C16 alkyl polyglucosides are commercially available from several suppliers (e.g., Simusol® surfactants from Seppic Corporation; and Glucopon® 600 CSUP, Glucopon® 650 EC, Glucopon® 600 CSUP/MB, and Glucopon® 650 EC/MB, from BASF Corporation).

The detergent composition herein may optionally comprise a number of other adjunct ingredients such as builders (e.g., preferably citrate), chelants (e.g., preferably GLDA), conditioning polymers, cleaning polymers including polyalkoxylated polyalkylene imines, surface modifying polymers, soil flocculating polymers, sudsing polymers including EO-PO-EO triblock copolymers, grease cleaning amines including cyclic polyamines, structurants, emollients, humectants, skin rejuvenating actives, enzymes, carboxylic acids, scrubbing particles, bleach and bleach activators, perfumes, malodor control agents, pigments, dyes, opacifiers, beads, pearlescent particles, microcapsules, organic solvents, inorganic cations such as alkaline earth metals such as Ca/Mg-ions, antibacterial agents, preservatives, viscosity adjusters (e.g., salt such as NaCl, and other mono-, di- and trivalent salts) and pH adjusters and buffering means (e.g. carboxylic acids such as citric acid, HCl, NaOH, KOH, alkanolamines, phosphoric and sulfonic acids, carbonates such as sodium carbonates, bicarbonates, sesquicarbonates, borates, silicates, phosphates, imidazole and alike).

General cleaning compositions and formulations for Laundry and Dish Wash

The disclosed liquid formulations in this chapter may and preferably do comprise 0 to 2 % 2-phenoxyethanol, preferably about 1 %, in addition to all other mentioned ingredients.

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The disclosed liquid formulations in this chapter may and preferably do comprise 0-0,2% 4,4'-dichoro 2-hydroxydiphenylether, preferably about 0,15 %, in addition to all other mentioned ingredients.

10 The bleach-free solid laundry compositions may comprise 0-0,2% 4,4'-dichoro 2-hydroxydiphenylethe, preferably about 0,15 %, in addition to all other mentioned ingredients.

The disclosed formulations in this chapter may and preferably do comprise one or more enzymes selected from those disclosed herein above, more preferably a protease and/or an amylase, wherein even more preferably the protease is a protease with at least 90% sequence identity to SEQ ID NO: 22 of EP1921147B1 and having the amino acid substitution R101E (according to BPN' numbering) and wherein the amylase is an amylase with at least 90% sequence identity to SEQ ID NO: 54 of WO2021032881A1, such enzyme(s) preferably being present in the formulations at levels from about 0.00001% to about 5%, preferably from about 0.00001% to about 2%, more preferably from about 0.0001% to about 1%, or even more preferably from about 0.001% to about 0.5% enzyme protein by weight of the composition.

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The tables in this chapter show general cleaning compositions of certain types, which correspond to typical compositions correlating with typical washing conditions as typically employed in various regions and countries of the world. The at least one inventive compound may be added to such formulation(s) in suitable amounts as outlined herein.

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When no inventive compound is added, a shown formulation is a "comparative formulation"; when the amount chosen is in the general range as disclosed herein and specifically within ranges disclosed herein as preferred amounts for the various ingredients and the inventive compound, the formulation is a formulation according to the invention. Ingredients (other than the inventive compound) listed with amounts including "zero%" in the mentioned range may be present but not necessarily have to be present, in both the inventive and the comparative formulations. Hence, each number encompassed by a given range is meant to be included in the formulations shown in this chapter, and all variations and permutations possible are likewise meant to be included.

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In a preferred embodiment the inventive compound is used in a laundry detergent.

40 Liquid laundry detergents according to the present invention are preferably composed of:

- 0,1 – 5 % of at least one inventive compound
 1 – 50% of surfactants
 0,1 – 40 % of builders, cobuilders and/or chelating agents
 0,1 – 50 % other adjuncts
 5 water to add up 100 %.

Preferred liquid laundry detergents according to the present invention are composed of:

- 0,5 – 2 % of at least one inventive compound
 10 5 – 40 % of anionic surfactants selected from C10-C15- LAS and C10-C18 alkyl ethersulfates containing 1-5 ethoxy-units
 1,5 – 10 % of nonionic surfactants selected from C10-C18-alkyl ethoxylates containing 3 – 10 ethoxy-units
 2 – 20 % of soluble organic builders/ cobuilders selected from C10-C18 fatty acids, di- and
 15 tricarboxylic acids, hydroxy-di- and hydroxytricarboxylic acids, aminopolycarboxylates and polycarboxylic acids
 0,05 – 5 % of an enzyme system containing at least one enzyme suitable for detergent use and preferably also an enzyme stabilizing system
 0,5 – 20 % of mono- or diols selected from ethanol, isopropanol, ethylenglycol, or propylenglycol
 20 0,1 – 20 % other adjuncts
 water to add up to 100%.

- 25 Solid laundry detergents (like e.g. powders, granules or tablets) according to the present invention are preferably composed of:

- 0,1 – 5 % of at least one inventive compound
 1 – 50% of surfactants
 0,1 – 90 % of builders, cobuilders and/or chelating agents
 30 0-50% of fillers
 0 – 40% of bleach actives
 0,1 – 30 % of other adjuncts and/or water
 wherein the sum of the ingredients adds up 100 %.

- 35 Preferred solid laundry detergents according to the present invention are composed of:

- 0,5 – 2 % of at least one inventive compound
 5 – 30 % of anionic surfactants selected from C10-C15- LAS, C10-C18 alkylsulfates and C10-C18 alkyl ethersulfates containing 1-5 ethoxy-units
 40 1,5 – 7,5 % of non-ionic surfactants selected from C10-C18-alkyl ethoxylates containing 3 – 10 ethoxy-units

- 20 – 80 % of inorganic builders and fillers selected from sodium carbonate, sodium bicarbonate, zeolites, soluble silicates, sodium sulfate
- 0,5 - 15 % of cobuilders selected from C10-C18 fatty acids, di- and tricarboxylic acids, hydroxydi- and hydroxytricarboxylic acids, aminopolycarboxylates and polycarboxylic acids
- 5 0,1 – 5 % of an enzyme system containing at least one enzyme suitable for detergent use and preferably also an enzyme stabilizing system
- 0,5 – 30 % of bleach actives
- 0,1 – 20 % other adjuncts
- 10 water to add up to 100%

In a preferred embodiment at least one esteramine and/or salt thereof according to the present invention is used in a manual dish wash detergent.

- 15 Liquid manual dish wash detergents according to the present invention are composed of:

- 1 – 50 % of at least one inventive esteramine and/or salt thereof
- 1 – 90% of surfactants
- 0,1 – 50 % of other adjuncts
- 20 water to add up 100 %.

Preferred liquid manual dish wash detergents according to the present invention are composed of:

- 25 3 – 30 % of at least one inventive esteramine and/or salt thereof
- 1 – 35 % of a surfactant system:
- 60% to 90%, more preferably from 70% to 80% by weight of the surfactant system of an anionic surfactant;
- 0.5% to 15% - by weight of the surfactant system - of a co-surfactant, preferably selected from the group consisting of an amphoteric surfactant, a zwitterionic surfactant, and mixtures thereof;
- 30 1% to 10% - by weight of the surfactant system - of a non-ionic surfactant;
- 0 – 5 % of an enzyme, preferably also including an enzyme stabilizing system;
- 0,5 – 20 % of mono- or diols selected from ethanol, isopropanol, ethylene glycol, or propylene glycol;
- 35 0,1 – 20 % other adjuncts;
- water to add up to 100%.

- 40 Alternative preferred liquid manual dish wash detergents according to the present invention are composed of:

- 3 – 35 % of at least one inventive esteramine and/or salt thereof

- 5 – 80 % of anionic surfactants selected from C10-C15- LAS, C10-C18 alkyl ethersulfates containing 1-5 ethoxy-units, and C10-C18 alkylsulfate
- 2 - 10 % of Cocamidopropylbetaine
- 0 – 10 % of Lauramine oxide
- 5 0 – 2 % of a non-ionic surfactant, preferably a C10-Guerbet alcohol alkoxylate
- 0 – 5 % of an enzyme, preferably Amylase, and preferably also an enzyme stabilizing system
- 0,5 – 20 % of mono- or diols selected from ethanol, isopropanol, ethylenglycol, or propylenglycol
- 10 0,1 – 20 % other adjuncts
- water to add up to 100%

It is clear that the total amount of all ingredients within the disclosed formulations have to add up to "100" percent by weight of the total formulation.

15

In the following tables:

"Inventive Compound(s)" = at least one inventive compound as described in this present invention

- 20 General formula for laundry detergent compositions according to the invention:
(numbers: wt.%)

Ingredient	Ranges of Ingredient in Liquid frame formulations
Linear alkyl benzene sulphonic acid	0 to 30
Coco fatty acid	1 to 12
Fatty alcohol ether sulphate	0 to 25
NaOH or mono or triethanol amine	Add up to pH 7,5 to pH 9,0
Alcohol ethoxylate	3 to 10
1,2-Propylene glycol	1 to 10
Ethanol	0 to 4
Sodium citrate	0 to 8
water	Up to 100

Liquid laundry frame formulations according to the invention:

active						
(numbers: wt.% active)	F1	F2	F3	F4	F5	F6
alcohol ethoxylat 7EO	5.40	10.80	12.40	7.30	1.60	7.60
Coco fatty acid K12-18	2.40	3.10	3.20	3.20	3.50	6.40
Fatty alcohol ether sulphate	5.40	8.80	7.10	7.10	5.40	14.00
Linear alkyl benzene sulphononic acid	5.50	0.00	14.50	15.50	10.70	0.00
1,2 Propandiol	6.00	3.50	8.70	8.70	1.10	7.80
Triethanolamine	0	0	0	0	0	0
Monoethanolamine	0	0	4.00	4.30	0.30	0
NaOH	2.20	1.10	0	0	0	1.00
Glycerol	0	0.80	3.00	2.80	0	0
Ethanol	2.00	0	0	0	0.38	0.39
Na citrate	3.00	2.80	3.40	2.10	7.40	5.40
Inventive Compound(s) (total)	0,1 - 5	0,1 - 5	0,1 - 5	0,1 - 5	0,1 - 5	0,1 - 5
polymers	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10
At least one enzyme (each)	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
water	to 100	to 100	to 100	to 100	to 100	to 100

Laundry powder frame formulations according to the invention:

Actives (numbers: wt.% active)	Bleach free Powder					
Alcohol ethoxylate 7EO	0.6	0	1	0	0	5.2
Coco fatty acid K12-18	1.2	0	0	0	0	0
Fatty alcohol ether sulphate	1.5	0	0	0	0	6
Linear alkyl benzene sulphonic	12.1	11.2	13.6	21.9	18.7	12.7
Bleach activator	0	0	0	0	0	0
Percarbonate	0	0	0	0	0	0
AcetateNa	0	0	0	0.1	0	0.1
CitrateNa	0	0	0	0	0	14
Na Silicate	27.9	5.8	6.6	2	15	20.3
Na Carbonate	17.2	35	37.3	30.1	37	1
Na Phosphate	0	0	0	14	0.3	0
Na Hydrogencarbonate	0.7	0.9	0.5	2.7	0.4	10.5
Zeolite4A	4.2	0.1	5.1	10.2	1.8	11.6
HEDP	0	0	0	0	0	0.13
MGDA	0	1.1	0	0	0	0
at least one enzyme (each)	0 - 1.5	0 - 1.5	0 - 1.5	0 - 1.5	0 - 1.5	0 - 1.5
Na Sulfate	30.8	1.3	33	11	22	3
Na Chloride	0.2	43	0.1	0	0.1	0.1
optical brightener	0.02	0		0.1	0.06	
Inventive Compound(s) (total)	0,2 - 5	0,2 - 5	0,2 - 5	0,2 - 5	0,2 - 5	0,2 - 5
polymers	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10

Laundry powder frame formulations according to the invention – continued:

Actives (numbers: wt.% active)	Bleach containing Powder					
Alcohol ethoxylate 7EO	1.2	5	4	0.5	0.5	0
Coco fatty acid K12-18	0	0	0	0.3	0	0.6
Fatty alcohol ether	0	3.9	4.4	1.6	0	0
Linear alkyl benzene	7.6	12.1	11.5	12.2	6.5	10.4
Bleach activator	0.2	9.5	9.5	0.5	0.8	2.2
Percarbonate	3.6	19.4	16.6	2.2	11.5	5.8
AcetateNa	0	6.7	7.1	0.3	1	0.7
CitrateNa	0	1.6	8.2	0.3	0.9	1.7
Na Silicate	3.6	11.3	16.4	10.2	9.1	16.5
Na Carbonate	21.6	8.7	1.4	8	22.9	14.8
Na Phospahte	0	0	0	0	0	0
Na Hydrogencarbonate	0.2	2.8	1.6	0.8	0.5	0.5
Zeolite4A	1.6	1.4	2.4	1.6	1.8	2.3
HEDP	0	0.27	0.16	0	0	0.17
MGDA	0	0	0	0	0	0
At least one enzyme	0 - 1.5	0 - 1.5	0 - 1.5	0 - 1.5	0 - 1.5	0 - 1.5
Na Sulfate	51	4	6	57	38	37
Na Chloride	1	1	0.5	1.2	0.2	1
optical brightener		0.29	0.1	0.23	0.13	0.19
Inventive Compound(s)	0,5 - 2	0,5 - 2	0,5 - 2	0,5 - 2	0,5 - 2	0,5 - 2
polymers	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10

Further typical liquid detergent formulations LD1, LD2 and LD3 are shown in the following three tables: (numbers: wt.% active)

Liquid detergent 1- LD1 “excellent” detergent;

Liquid Detergent Formulation	
Sodium alkylbenzene sulfonic acid (C ₁₀ -C ₁₃) LAS	9.5
C ₁₃ /C ₁₅ -Oxoalkohol reacted with 7 moles of EO	4,5
1,2 propyleneglycol	6
ethanol	2
potassium coconut soap	2.4
NaOH	2.2
lauryl ether sulphate (Texapon)	5.0
Sodium citrate	3
Sokalan HP 20	2
Inventive Compound or comparison	0,5–5
Graft polymer*	0-2
Water	to 100

Liquid detergent 2- LD2 “medium” performance detergent

Liquid Detergent Formulation	
Sodium alkylbenzene sulfonic acid (C ₁₀ -C ₁₃)	5.5
C ₁₃ /C ₁₅ -Oxoalkohol reacted with 7 moles of EO	5.4
1,2 propyleneglycol	6
ethanol	2
potassium coconut soap	2.4
Monoethanolamine	2.5
lauryl ether sulphate	5.4
Sodium citrate	3
Sokalan HP96	2
Inventive Compound or comparison	0,1-4
Graft polymer*	0-2
Water	to 100

Liquid detergent 3- LD3 "medium" performance "biobased" detergent

Liquid Detergent Formulation	
MGDA	5.5
APG, branched C13 Glucosid	3.5
1,2 propyleneglycol	6
ethanol	2
potassium coconut soap	4.4
NaOH	2.2
lauryl ether sulphate	9.5
Sodium citrate	3
Inventive Compound or comparison	0,1-4
Graft polymer*	0-2
Water	to 100

All previous three tables on LD1, LD2, LD3: *"graft polymer" = (poly ethylene glycol of Mn 6000 g/mol as graft base, grafted with 40 weigth % vinyl acetate (based on total polymer weight; produced following general disclosure of WO2007138054A1)

Liquid manual dish wash frame formulations according to the invention:

Ingredients	MDW.1	MDW.2	MDW.3	MDW.4	MDW.5	MDW.6	MDW.7	MDW.8
Linear C ₁₂ -C ₁₄ -alkyl-benzenesulfonic acid	8	0	6	0	6	0	6	0
C ₁₂ -C ₁₄ -fatty alcohol x 2 EO sulfate	8	16	6	12	6	12	6	12
Cocamidopropyl betaine	0	0	4	4	0	0	2	2
Lauramine oxide	0	0	0	0	4	4	2	2
2-Propylheptanol x 4 EO	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Inventive Compound(s) (total)	0,5 - 5	0,5 - 5	0,5 - 5	0,5 - 5	0,5 - 5	0,5 - 5	0,5 - 5	0,5 - 5
Ethanol	2	2	2	2	2	2	2	2
Polymer(s)	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
2-Phenoxyethanol (preservative)	1	1	1	1	1	1	1	1
Sodium chloride	1	1	1	1	1	1	1	1
Demin. water	add 100	add 100	add 100	add 100	add 100	add 100	add 100	add 100
Sodium hydroxide	add pH 8	add pH 8	add pH 8	add pH 8	add pH 8	add pH 8	add pH 8	add pH 8

It is preferred, that within the respective laundry detergent, cleaning composition and/or fabric and home care product, the at least one esteramine and/or salt thereof as described in this invention is present at a concentration of from about 0.1% to about 10%, preferably from about 0.2% to 5%, more preferably from about 0.5% to about 5%, all in relation to the total weight of such composition or product in relation to the total weight of such composition or product, and all numbers in between, and including all ranges resulting from selecting any of the lower limits mentioned and including further 0.2, 0.3, 0.4, 1, 1.5, 2, 2.5, 3, 3.5 and 4, and combining with any of the upper limits mentioned and including 19, 18, 17, 16, 14, 13, 12, 11, 9, 8, 7, and 6.

Specifically for a liquid hand dishwashing or spray detergent composition the at least one esteramine and/or salt thereof as described in this invention is present at a concentration of from about between 0.1 and 50%, preferably between 1% and 30%, by weight of the detergent composition.

The specific embodiments as described throughout this disclosure are encompassed by the present invention as part of this invention; the various further options being disclosed in this present specification as "optional", "preferred", "more preferred", "even more preferred" or "most preferred" options of a specific embodiment may be individually and independently (unless such independent selection is not possible by virtue of the nature of that feature or if such indepen-

dent selection is explicitly excluded) selected and then combined within any of the other embodiments (where other such options and preferences can be also selected individually and independently), with each and any and all such possible combinations being included as part of this invention as individual embodiments,

and especially with the preferred embodiments disclosed in the following section.

Examples

The following examples shall further illustrate the present invention without restricting the scope of the present invention.

Example 1: Glycerol, propoxylated with 36 mole propylene oxide and ethoxylated with 15 mole ethylene oxide, esterified with 1.5 mole 6-aminohexane acid and sulfatized with 1.5 mole sulfuric acid

1a Glycerol, propoxylated with 12 mole propylene oxide

In a 2 l autoclave 92.1 g glycerol and 1.6 g potassium tert. butoxide were placed and the mixture was heated to 80°C. The vessel was purged three times with nitrogen and the mixture was heated to 140°C. 697.0 g propylene oxide was added within 13 hours. To complete the reaction, the mixture was allowed to post-react for additional 10 hours at 140°C. The reaction mixture was stripped with nitrogen and volatile compounds were removed in vacuo at 80°C. After filtration 790.0 g of a light brown oil was obtained.

1b Glycerol, propoxylated with 36 mole propylene oxide and ethoxylated with 15 mole ethylene oxide

In a 2 l autoclave 236.7 g glycerol, propoxylated with 12 mole propylene oxide (example 1 a) and 1.2 g potassium tert. butoxide were placed and the mixture was heated to 80°C. The vessel was purged three times with nitrogen and the mixture was heated to 140°C. 418.2 g propylene oxide was added within 7 hours. To complete the reaction, the mixture was allowed to post-react for additional 2 hours at 140°C. Then, 198.2 g ethylene oxide was added within 4 hours. To complete the reaction, the mixture was stirred for additional 10 hours. The reaction mixture was stripped with nitrogen and volatile compounds were removed in vacuo at 80°C. After filtration 850.0 g of a light brown oil obtained (hydroxy value: 62.3 mgKOH/g).

1c Glycerol, propoxylated with 36 mole propylene oxide and ethoxylated with 15 mole ethylene oxide, esterified with 1.5 mole 6-aminohexane acid and sulfatized with 1.5 mole sulfuric acid

In a 4-neck vessel with thermometer, nitrogen inlet, dropping funnel, reflux condenser and stirrer 269.9 g glycerol, propoxylated with 36 mole propylene oxide and ethoxylated with 15 mole ethylene oxide (example 1 b) and 19.7g 6-aminohexane acid were placed and heated to 80°C. To the mixture 14.9 g sulfuric acid (96 %) was added within 10 minutes. The reaction mixture was heated to 120°C inner temperature and was stirred for 4 hours at this temperature. The

reflux condenser was removed and replaced by a distillation head. Water was distilled off for 44 hours under vacuum up to 5 mbar. 305.0 g of a brown solid was obtained. ¹H-NMR in MeOD indicated 43 % conversion of hydroxyl groups into 6-aminohexane acid ester and 41 % conversion of hydroxyl groups into sulfuric acid ester.

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Example 2: Glycerol, ethoxylated with 60 mole ethylene oxide, esterified with 1.5 mole 6-aminohexane acid and sulfatized with 1.5 mole sulfuric acid

2a Glycerol, ethoxylated with 12 mole ethylene oxide

10 In a 2 l autoclave 110.5 g glycerol and 1.5 g potassium tert. butoxide were placed and the mixture was heated to 80°C. The vessel was purged three times with nitrogen and the mixture was heated to 140°C. 634.3 g ethylene oxide was added in portions within 11 hours. To complete the reaction, the mixture was allowed to post-react for additional 5 hours at 140°C. The reaction mixture was stripped with nitrogen and volatile compounds were removed in vacuo at 80°C.
15 After filtration 745.0 g of a brown oil was obtained (hydroxy value: 85.0 mgKOH/g).

2b Glycerol, ethoxylated with 60 mole ethylene oxide

In a 2 l autoclave 186.2 g glycerol, ethoxylated with 12 mole ethylene oxide (example 2 a) and 1.3 g potassium tert. butoxide were placed and the mixture was heated to 80°C. The vessel was
20 purged three times with nitrogen and the mixture was heated to 140°C. 634.3 g ethylene oxide was added within 11 hours. To complete the reaction, the mixture was allowed to post-react for additional 5 hours at 140°C. The reaction mixture was stripped with nitrogen and volatile compounds were removed in vacuo at 80°C. After filtration 820.0 g of a light brown solid was obtained (hydroxy value: 62.4 mgKOH/g).

25

2c Glycerol, ethoxylated with 60 mole ethylene oxide, esterified with 1.5 mole 6-aminohexane acid and sulfatized with 1.5 mole sulfuric acid

In a 4-neck vessel with thermometer, nitrogen inlet, dropping funnel, reflux condenser and stirrer 102.8 g glycerol, ethoxylated with 60 mole ethylene oxide (example 2 b), 7.9 g 6-aminohexane acid were placed and heated to 80°C. To the mixture 6.2 g sulfuric acid (96 %) was added within 10 minutes. The reaction mixture was heated to 130°C inner temperature and was stirred for 3 hours at this temperature. The reflux condenser was removed and replaced by a distillation head. Water was distilled off for 22 hours under vacuum up to 5 mbar. 110.0 g of a brown solid was obtained. ¹H-NMR in MeOD indicated 49 % conversion of hydroxyl groups into
30 6-aminohexane acid ester and 48 % conversion of hydroxyl groups into sulfuric acid ester.
35

Example 3: Isosorbide, ethoxylated with 6 mole ethylene oxide, esterified with 1 mole 6-aminohexane acid and sulfatized with 1 mole sulfuric acid

40 3a isosorbide, ethoxylated with 6 mole ethylene oxide

In a 2 l autoclave 200.0 g isosorbide and 1.1 g potassium tert. butoxide were placed and the mixture was heated to 80°C. The vessel was purged three times with nitrogen and the mixture was

heated to 140°C. 362.0 g ethylene oxide was added within 5 hours. To complete the reaction, the mixture was allowed to post-react for additional 10 hours at 140°C. The reaction mixture was stripped with nitrogen and volatile compounds were removed in vacuo at 80°C. After filtration 563.0 g of a light brown oil was obtained (hydroxy value: 275.3 mgKOH/g).

5 3b Isosorbide, ethoxylated with 6 mole ethylene oxide, esterified with 1 mole 6-aminohexanoic acid and sulfated with 1 mole sulfuric acid

In a 4-neck vessel with thermometer, nitrogen inlet, dropping funnel, reflux condenser and stirrer 204.0 g isosorbide, ethoxylated with 6 mole ethylene oxide (example 3 a), 65.6 g 6-aminohexanoic acid were placed and heated to 80°C. To the mixture 51.5 g sulfuric acid (96 %) was added within 10 minutes. The reaction mixture was heated to 130°C inner temperature and was stirred for 4 hours at this temperature. The reflux condenser was removed and replaced by a distillation head. Water was distilled off for 24 hours under vacuum up to 5 mbar. 210.0 g of a brown solid was obtained. ¹H-NMR in MeOD indicated 47 % conversion of hydroxyl groups into 6-aminohexanoic acid ester and 47 % conversion of hydroxyl groups into sulfuric acid ester.

Example 4: Trimethylolpropane, ethoxylated with 15 mole ethylene oxide, esterified with 1 mole 6-aminohexanoic acid and sulfated with 1 mole sulfuric acid

20 4a Trimethylolpropane, ethoxylated with 15 mole ethylene oxide

In a 2 l autoclave 335.4 g trimethylolpropane and 4.0 g potassium tert. butoxide were placed and the mixture was heated to 80°C. The vessel was purged three times with nitrogen and the mixture was heated to 140°C. 1592.0 g ethylene oxide was added within 13 hours. To complete the reaction, the mixture was allowed to post-react for additional 5 hours at 140°C. The reaction mixture was stripped with nitrogen and volatile compounds were removed in vacuo at 80°C. After filtration 1965.0 g of a light yellow oil was obtained (hydroxy value: 212.0 mgKOH/g).

4b Trimethylolpropane, ethoxylated with 15 mole ethylene oxide, esterified with 1 mole 6-aminohexanoic acid and sulfated with 1 mole sulfuric acid

30 In a 4-neck vessel with thermometer, nitrogen inlet, dropping funnel, reflux condenser and stirrer 230.2 g trimethylolpropane, ethoxylated with 15 mole ethylene oxide (example 4 a), 36.3 g 6-aminohexanoic acid were placed and heated to 80°C. To the mixture 28.4 g sulfuric acid (96 %) was added within 10 minutes. The reaction mixture was heated to 130°C inner temperature and was stirred for 4.5 hours at this temperature. The reflux condenser was removed and replaced by a distillation head. Water was distilled off for 28 hours under vacuum up to 5 mbar. 285.0 g of a brown solid was obtained. ¹H-NMR in MeOD indicated 22 % conversion of hydroxyl groups into 6-aminohexanoic acid ester and 26 % conversion of hydroxyl groups into sulfuric acid ester.

Example 5: polyethylene glycol, molecular weight 600 g/mol (commercially available as Plurion E 600), esterified with 1 mole 6-amino hexanoic acid and esterified with 1 mole sulfuric acid

In a 250 ml 4-neck vessel with thermometer, nitrogen inlet, dropping funnel, reflux condenser and stirrer, 158.7 g molten polyethylene glycol with molecular weight 600 g/mol, 36.5 g 6-aminohexane acid, and 0.13 g phosphinic acid (50 % in water) were placed. To the mixture 26.1 g sulfuric acid (96 %) was added within 10 minutes. Temperature rose up to 60°C during sulfuric acid addition. Reflux condenser and dropping funnel were replaced by a distillation head. The vessel was heated to 148°C bath temperature and the reaction mixture was stirred for 22 hours at this temperature, under a constant N₂ stream. Water was continuously distilled off at 148°C bath temperature. 205.0 g of a brown solid was obtained. ¹H-NMR in MeOD indicated 50 % conversion of hydroxyl groups into 6-aminohexane acid ester and 50 % conversion of hydroxyl groups into sulfuric acid ester.

Example 6: Polyethyleneglycol polypropyleneglycol block copolymer (commercially available as Pluronic PE 4300), esterified with 1 mole 6-aminohexane acid and esterified with 1 mole sulfuric acid

In a 4-neck vessel with thermometer, nitrogen inlet, dropping funnel, reflux condenser and stirrer 269.9 g polyethyleneglycol polypropyleneglycol block copolymer (Pluronic PE 4300) was heated to 90°C. 22.2 g 6-Aminohexane acid was added. To the mixture 17.1 g sulfuric acid (96 %) was added within 10 minutes. Temperature rose up to 100°C during sulfuric acid addition. The reaction mixture was heated to 135°C bath temperature and stirred for 10 hours at this temperature. The reflux condenser was replaced by a distillation head, and water is distilled off for 22 hours. Vacuum was applied and under a vacuum up to 25 mbar the reaction mixture was stirred for additional 16 hours. 262.0 g of a brown highly viscous oil was obtained. ¹H-NMR in MeOD indicated 40 % conversion of hydroxyl groups into 6-aminohexane acid ester and 35 % conversion of hydroxyl groups into sulfuric acid ester.

Example 7: 1,6-hexane diol, esterified with 1 mole L-alanine and esterified with 1 mole sulfuric acid

In a 4-neck vessel with thermometer, nitrogen inlet, dropping funnel, reflux condenser and stirrer 88.6 g 1,6-hexane diol was heated to 40°C. 66.8 g L-alanine and 0.5 g phosphinic acid (50% in water) was added. To the mixture 78.2 g sulfuric acid (96 %) was added within 10 minutes. Temperature rose up to 75°C during sulfuric acid addition. The reaction mixture was heated to 135°C bath temperature and stirred for 10 hours at this temperature under a constant stream of nitrogen. The reflux condenser was replaced by a distillation head. Vacuum was applied and under a vacuum up to 10 mbar the reaction mixture was stirred for additional 8 hours. 174.8 g of a brown highly viscous oil was obtained. ¹H-NMR in MeOD indicated 44 % conversion of hydroxyl groups into L-alanine ester and >40 % conversion of hydroxyl groups into sulfuric acid ester.

Example 8: polyethylene glycol, molecular weight 600 g/mol, esterified with 1 mole L-alanine and esterified with 1 mole sulfuric acid

In a 4-neck vessel with thermometer, nitrogen inlet, dropping funnel, reflux condenser and stirrer 174.5 g polyethylene glycol with molecular weight of 600g/mole was heated to 40°C. 26.7 g L-alanine and 0.5 g phosphinic acid (50% in water) was added. To the mixture 31.3 g sulfuric acid (96 %) was added within 10 minutes. Temperature rose up to 60°C during sulfuric acid addition. The reaction mixture was heated to 135°C bath temperature and stirred for 4 hours at this temperature under a constant stream of nitrogen. The reflux condenser was replaced by a distillation head. Vacuum was applied and under a vacuum up to 9 mbar the reaction mixture was stirred for additional 5 hours. 220.0 g of a brown oil was obtained. ¹H-NMR in MeOD indicated 45 % conversion of hydroxyl groups into L-alanine ester and 47 % conversion of hydroxyl groups into sulfuric acid ester.

Example 9: 2-butyl-2-ethyl-1,3-propane diol, esterified with 1 mole L-valine and esterified with 1 mole sulfuric acid

In a 4-neck vessel with thermometer, nitrogen inlet, dropping funnel, reflux condenser and stirrer 96.1 g 2-butyl-2-ethyl-1,3-propane diol was heated to 70°C. 70.3 g L-Valine and 0.5 g phosphinic acid (50% in water) was added. To the mixture 60.5 g sulfuric acid (96 %) was added within 10 minutes. Temperature rose up to 75°C during sulfuric acid addition. The reaction mixture was heated to 135°C bath temperature and stirred for 4 hours at this temperature under a constant stream of nitrogen. The reflux condenser was replaced by a distillation head. Vacuum was applied and under a vacuum up to 200 mbar the reaction mixture was stirred for additional 5 hours. 195.0 g of a brown oil was obtained. ¹H-NMR in MeOD indicated 77 % conversion of hydroxyl groups into L-valine ester and conversion into sulfuric acid ester.

Example 10: Glycerol, ethoxylated with 12 mole ethylene oxide, esterified with 1 mole 6-amino hexane acid and sulfatized with 1 mole sulfuric acid

10a Glycerol, ethoxylated with 12 mole ethylene oxide

In a 2 l autoclave 110.5 g glycerol and 1.5 g potassium tert. butoxide were placed and the mixture is heated to 80°C. The vessel was purged three times with nitrogen and the mixture was heated to 140°C. 634.3 g ethylene oxide was added in portions within 11 hours. To complete the reaction, the mixture was allowed to post-react for additional 5 hours at 140°C. The reaction mixture was stripped with nitrogen and volatile compounds were removed in vacuo at 80°C. After filtration 745.0 g of a brown oil was obtained (hydroxy value: 85.0 mgKOH/g).

10 b Glycerol, ethoxylated with 12 mole ethylene oxide, esterified with 1 mole 6-amino hexane acid and sulfatized with 1 mole sulfuric acid

In a 4-neck vessel with thermometer, nitrogen inlet, dropping funnel, reflux condenser and stirrer 152.6 g glycerol, ethoxylated with 12 mole ethylene oxide (example 10 a) was heated to

40°C. 32.8 g 6-aminohexane acid and 0.5 g phosphinic acid (50% in water) was added. To the mixture 26.0 g sulfuric acid (96 %) was added within 10 minutes. Temperature rose up to 75°C during sulfuric acid addition. The reaction mixture was heated to 135°C bath temperature and stirred for 6 hours at this temperature under a constant stream of nitrogen. A sample was taken and analyzed by ¹H-NMR in MeOD. After 12 hours another sample was taken for analysis. Results are shown in Table below.

Comparative example 1: Sorbitol, propoxylated with 96 mole propylene oxide and ethoxylated with 144 mole ethylene oxide, esterified with 2 mole caprolactam as methane sulfonic acid salt.

In a 4-neck vessel with thermometer, nitrogen inlet, dropping funnel, reflux condenser and stirrer 121.1 g sorbitol, propoxylated with 96 mole propylene oxide and ethoxylated with 144 mole ethylene oxide (1 c), 2.8 g caprolactam (80% in water), and 1.2 g water are placed. To the mixture 2.05 g methane sulfonic acid (99%) is added within 10 minutes under a constant stream of nitrogen. Temperature rises up to 40°C during sulfuric acid addition. The reaction mixture is heated to 135°C bath temperature and is stirred for 25 hours at 135°C under reflux. The reflux condenser is removed and under a constant stream of nitrogen, water is distilled off for 7 hours. 120.0 g of a brown solid is obtained. ¹H-NMR in MeOD indicates 30% conversion of hydroxyl groups into 6-aminohexane acid ester as methane sulfonic acid salt.

Comparative Example 2 (prepared analogously to Example 6 of WO 2022/002761)

Glycerol, ethoxylated with 12 mole ethylene oxide, esterified with 1 mole caprolactam and sulfatized with 1 mole sulfuric acid

In a 4-neck vessel with thermometer, nitrogen inlet, dropping funnel, reflux condenser and stirrer 62.2 g glycerol, ethoxylated with 12 mole ethylene oxide (example 10 a), 14.1 g caprolactam (80% in water), and 9.0 g water were placed. To the mixture 10.3 g sulfuric acid (96 %) was added within 10 minutes. Temperature rose to 60°C during sulfuric acid addition. The reaction mixture was heated to 135°C bath temperature and stirred for 6 hours at this temperature under a constant stream of nitrogen. A sample was taken and analyzed by ¹H-NMR in MeOD. After 12 hours another sample was taken for analysis. Results are shown in Table below.

Table 1a

	Polyol	Amino acid or Lactam	Acid	solvent	Molar ratio (Polyol : Aminoacid or Lactam : Acid : Solvent)
CE2	Glycerin + 4 EO/OH	caprolactam	H ₂ SO ₄	water	1 : 1 : 1.02 : 6.5
Example 10	Glycerin + 4 EO/OH	6-amino- hexane acid	H ₂ SO ₄	-	1 : 1 : 1.02 : 0

Table 1b

	Reaction time	Conversion to ester* %	Conversion to sulfate** %
CE2	6 h	34	19
	12 h	95.5	91.5
Example 10	6 h	70	55
	12 h	100	93

* indicated by ¹H-NMR in MeOD, 100 % conversion is an integral of 2 at 4.2 ppm

5 ** indicated by ¹H-NMR in MeOD, 100 % conversion is an integral of 2 at 4.1 ppm

As it can be seen from table 1b, the inventive process is of advantage over a process such as disclosed in WO 2022/002761, because higher conversion rates and faster conversion are obtained when amino acids instead of lactams are used.

Performance in Cleaning compositions

For the whiteness benefit test, the following laundry detergent composition is provided in table 2:

5 Table 2 - laundry detergent composition

Ingredient	%
LAS	6.9
AE3S	11.3
Fatty Acid C1218	1
1, 2 Propylene Glycol	6
Ethanol	2
Water	balance

Test preparation:

The following fabrics are provided for the whiteness benefit test:

- 10 Polyester 1: Polyester 854, available from Reichenbach Wirkstoffe (Germany)
Polyester 2: PW19, available from Empirical Manufacturing Company (Cincinnati, OH, USA).
Knitted Cotton 1: CW120, available from Empirical Manufacturing Company (Cincinnati, OH, USA).

15 "Washed and FE Treated" fabrics were prepared according to the following method: 400 g fabrics are washed in a WE Miniwasher (3.5 litre water) twice using the short program (45 minute wash cycle followed by three rinse cycles; total program is 90 minutes) at 60°C with 18.6 g Ariel Compact powder detergent, twice using the short program, at 60°C nil detergent, and then three
20 times using the short program at 40°C with 8.2 g Lenor Concentrate (a fabric enhancer) into each main wash. Fabrics are then dried in a tumble dryer on extra dry until dry.

"Washed" fabrics were prepared according to the following method: 400 g fabrics are washed in a WE Miniwasher (3.5 litre water) twice using the short program (45 minute wash cycle followed
25 by three rinse cycles; total program is 90 minutes) at 60°C with 18.6g Ariel Compact powder detergent and twice using the short program, at 60°C nil detergent. Fabrics are then dried in a tumble dryer on extra dry until dry.

Test Method:

- 30 Four fabric samples are prepared: Polyester 1, washed and FE treated; Polyester 2, washed and FE treated; Knitted Cotton 1, washed and FE treated; Knitted Cotton 2, washed.

Each sample is run in a 96 well plate simulated washing system that uses magnetized bearings to simulate the agitation of a typical full scale washing machine according to the following condi-

tions: 375 ppm detergent concentration, 150 µL water per well, 25°C, water hardness of 1.0 mM (2:1 Ca²⁺ : Mg²⁺ molar ratio), wash pH of 8, 3000 ppm Arizona test dust (supplied PTI, Powder Technology Inc).

- 5 Each polymer listed in table 2 is added at 100 ppm of the wash solution. Each fabric is washed for 60 minutes and dried in the dark under ambient conditions. For each wash condition, there are two 96 well plates, and eight internal replicates per 96 well plate, for a total of 16 replicates per wash condition.
- 10 When the samples are dry, L*, a*, b* and CIE WI are measured on each 96 well plate spot using a Spectrolino imaging system (Gretag Macbeth, Spectro Scan 3.273). For each treatment, the average CIE WI is determined. Delta CIE WI is the difference of the average CIE WI of the sample vs. the average CIE WI of a control sample without the tested polymer.
- 15 Biodegradation data:
Biodegradation in wastewater was tested in triplicate using the OECD 301F manometric respirometry method. OECD 301F is an aerobic test that measures biodegradation of a sample by measuring the consumption of oxygen. To a measured volume of medium, 100 mg/L test substance, which is the nominal sole source of carbon is added along with the inoculum (30
20 mg/L, aerated sludge taken from Mannheim waste water treatment plant). This is stirred in a closed flask at a constant temperature (20°C) for 28 days. The consumption of oxygen is determined by measuring the change in pressure in the apparatus using an OxiTop® C (Xylem 35 Analytics Germany Sales GmbH & Co KG). Evolved carbon dioxide is absorbed in a solution of sodium hydroxide. Nitrification inhibitors are added to the flask to prevent usage of oxygen due
25 to nitrification. The amount of oxygen taken up by the microbial population during biodegradation of the test substance (corrected for uptake by blank inoculum, run in parallel) is expressed as a percentage of ThOD (Theoretical oxygen demand, which is measured by the elemental analysis of the compound). A positive control Glucose/Glucosamine is run along with the test samples for each cabinet.

Claims

1. A process for producing a sulfatized esteramine (SEA) comprising step a):
- 5 a) reacting at least one alcohol containing at least two hydroxy groups (compound (A)) with at least one amino acid (compound (B)) and with sulfuric acid (compound (C)).
- 10 2. The process according to claim 1, wherein within step a) at least a fraction of compound (A) is first mixed with at least a fraction of compound (B), preferably the entire amount of compound (A) is first mixed with the entire amount of compound (B), and
- 15 i) followed by adding at least a fraction of compound (C) over a specific period of time and thereafter adding the remaining part of the total amount of compound (C) over a further period of time, the total period of time is preferably in the range of less than two hours, more preferably less than 30 minutes, most preferably between 5 and 15 minutes,
- 20 preferably followed by continuously adding the entire amount of compound (C) within an as short period of time as possible,
- and
- 25 ii) the reaction is carried out at a temperature of 80 to 200 °C for a period of time of from 1 to 30 hours, preferably 1 to 25 hours, more preferably 1 to 20 hours,
- at a pressure from 1.0 up to 10 bar, preferably 1.0 to 5 bar, most preferably 1.0 to 4 bar,
- 30 the reaction is optionally carried out in the presence of water, preferably by employing an aqueous solution of compound (B),
- and an optional step c) is performed after step a) is finished or at least partially in parallel to step a), preferably after step a) is finished, with step c) being the
- 35 removal of water and/or alcohols from the reaction mixture.
3. The process according to claim 1 or 2, wherein compound (A) is at least one alcohol containing at least two hydroxy groups selected from diols, polyols, alkoxylated diols and alkoxylated polyols,
- 40 more preferably, selected from sorbitol, 1,6-hexanediol, glycerol, 1,1,1-trimethylolpropan (TMP), pentaerythrit, erythrit, polyethyleneglycol, ethylene glycol, alkoxylated ethylene glycol, propylene glycol, alkoxylated propylene

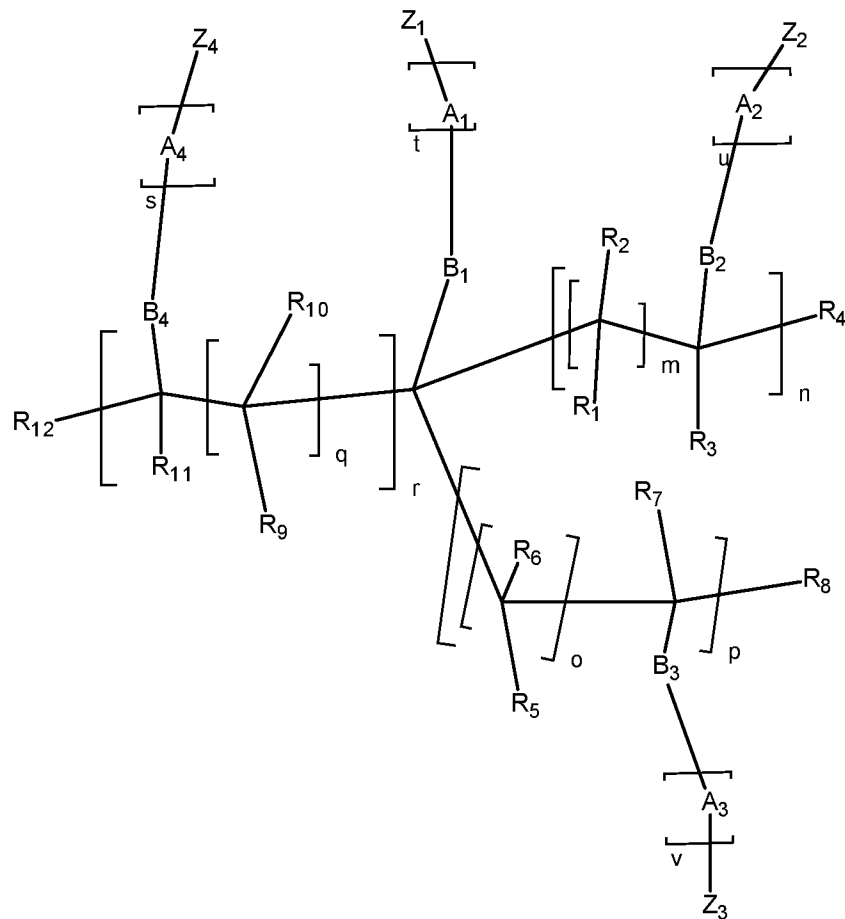
- glycol, polypropylene glycol, polyalkylene oxide block copolymers, alkoxyated sorbitol, alkoxyated 1,6-hexanediol, alkoxyated glycerol, alkoxyated TMP, alkoxyated erythrit and alkoxyated pentaerythrit, most preferably, selected from 1,6-hexanediol, alkoxyated sorbitol, alkoxyated glycerol, polyethylene glycol, block copolymers of ethylene oxide and propylene oxide, alkoxyated TMP, alkoxyated erythrit and alkoxyated pentaerythrit.
- 5
4. The process according to any of claims 1 to 3, wherein in case compound (A) comprises an alkoxyated alcohol containing at least two hydroxy groups, the alkoxyated fragment of the respective alcohol is based on at least one C₂-C₂₂ alkylene oxide, more preferably on ethylene oxide and/or propylene oxide, most preferably the respective alcohol comprises at least one block based on ethylene oxide and/or propylene oxide.
- 10
5. The process according to any of claims 1 to 4, wherein the process comprises step b), which is carried out prior to step a):
- 15
- b) at least one alcohol containing at least two hydroxy groups is reacted with at least one alkylene oxide in order to obtain an alkoxyated alcohol as compound (A), such reaction preferably being performed as semi-batch or batch reaction, more preferably semi batch reaction, to obtain an alkoxyated alcohol, preferably – in case of more than one alkylene oxide is employed – a polyalkylene oxide block copolymer in the polyalkoxyl-portion of the alkoxyated alcohol is obtained.
- 20
6. The process according to claim 5, wherein the at least one alkylene oxide is selected from ethylene oxide (EO) and propylene oxide (PO), preferably in an amount of from 1 to 150 mol EO and/or from 1 to 120 mol PO, and the at least one alcohol having a weight average molecular weight M_w of at most 500, preferably at most 300, more preferably at most 200, and most preferably at most 150 g/mol.
- 25
7. The process according to any claims 1 to 6, wherein in step a) the molar ratio of compound (C) to compound (B) is at least 100 mol-%, preferably in the range of 100 mol-% to 125 mol-%.
- 30
8. The process according to any of claims 1 to 7, wherein in step a) the molar ratio of compound (B) to the hydroxy groups of compound (A) is in the range of 10 mol-% to 50 mol-%.
- 35
- 40

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9. The process according to any of claims 1 to 8, wherein in step a) the molar ratio of compound (C) to the hydroxy groups of compound (A) is in the range of 10 mol-% to 62,5 mol-%.
- 5 10. The process according to any of claims 1 to 9, wherein in step a) at least 10 % of all hydroxy groups of compound (A) are reacted with compound (B) in order to form ester groups within the respective SEA and/or at least 10 % of all hydroxy groups of compound (A) are sulfatized in order to form OSO_3 fragments within the respective sulfatized esteramine.
- 10 11. The process according to claim 10, wherein in step a)
- 20 to 50, preferably 30 to 50, more preferably 40 to 50 % of all hydroxy groups of compound (A) are reacted with compound (B) in order to form ester groups within the respective SEA,
- 15 20 to 50, preferably 30 to 50, more preferably 40 to 50 % of all hydroxy groups of compound (A) are sulfatized in order to form OSO_3 fragments within the respective SEA, and
- 20 0 to 60 %, preferably up to 40, more preferably up to 20 %, of all hydroxy groups of compound (A) remain in unreacted form within the respective SEA.
- 25 12. The process according to any of claims 1 to 11, wherein compound (B) is at least one amino acid selected from the group of α -amino acids, β -amino acids, 6-amino hexane acid, 5-amino pentanoic acid, 4-amino butanoic acid, 3-amino propanoic acid, 12-amino dodecanoic acid and 11-aminoundecanoic acid,
- 30 preferably compound (B) is at least one amino acid selected from alanine, glycine, leucine, isoleucine, valine, proline, phenylalanine, arginine, asparagine, aspartic acid, glutamine, histidine, lysine, threonine, tryptophan, tyrosine, cysteine, methionine, serine, aminoisobutyric acid, 2-aminopentanoic acid, sarcosine, N,N-dimethylglycine, β -alanine, 6-amino hexane acid, N,N-dimethyl-6-aminohexane acid, 5-amino pentanoic acid, 4-amino butanoic acid, 3-amino propanoic acid, 12-amino dodecanoic acid and 11-aminoundecanoic acid,
- 35 more preferably compound (B) is at least one amino acid selected from alanine, glycine, leucine, isoleucine, valine, proline, phenylalanine, arginine, asparagine, aspartic acid, glutamine, histidine, lysine, threonine, tryptophan, tyrosine, cysteine, methionine, serine, aminoisobutyric acid, 2-aminopentanoic acid, β -alanine, 6-amino hexane acid, 5-amino pentanoic acid, 4-amino butanoic acid, 3-amino propanoic acid, 12-amino dodecanoic acid and 11-aminoundecanoic acid,
- 40 most preferably compound (B) is 6-aminohexane acid, alanine or β -alanine.

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13. The process according to any of claims 1 to 12, wherein the SEA is defined according to Formula (I),



5

(Formula I)

wherein independently from each other

- n being an integer from 1 to 12,
- 10 m being an integer for each repetition unit n independently selected from 0 to 12;
- p being an integer from 0 to 12,
- o being an integer for each repetition unit p independently selected from 0 to 12;
- 15 r being an integer from 0 to 12,
- q being an integer for each repetition unit r independently selected from 0 to 12;

s, t, u and v being an integer from 0 to 100;

A_1 , A_2 , A_3 , and A_4 are independently from each other and independently for each repetition unit s, t, u, or v, selected from the list consisting of alkyleneoxy group, such A-units stem from the reaction of one alcohol with at least two hydroxy groups with C₂ - C₂₂ alkylene oxides, e.g. in case of ethoxylated alcohols with at least two hydroxy groups A is “-O-CH₂-CH₂-“;

wherein for s, t, u, and/or v equal to 1 the oxygen atom of the A_1 , A_2 , A_3 , and A_4 group is bound to the B group and the following A_1 , A_2 , A_3 , and A_4 groups are always bound via the oxygen atom to the previous A_1 , A_2 , A_3 , and A_4 group;

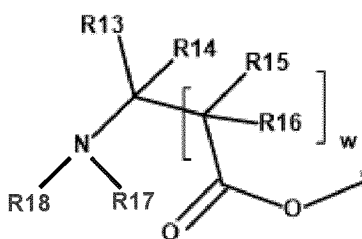
B_1 , B_2 , B_3 , and B_4 are independently from each other selected from the group consisting of a bond, linear C₁ to C₁₂ alkanediyl groups, and branched C₁ to C₁₂ alkanediyl groups;

such B-units are given by the molecular structure of one alcohol with at least two hydroxy groups;

R_1 , R_2 , R_3 , R_4 , R_5 , R_6 , R_7 , R_8 , R_9 , R_{10} , R_{11} and R_{12} being independently for each repetition unit selected from the group consisting of H, linear alkyl, branched alkyl, and cycloalkyl; such R-units are given by the molecular structure of one alcohol with at least two hydroxy groups;

Z_1 , and/or Z_2 , and/or Z_3 , and/or Z_4 , independently for each repetition unit n, p, and r, are selected from the group consisting of OH, and OSO₃⁻, and -OSO₃H and a compound according to Formula (II), wherein said compound according to Formula (II) connects to the compound according to Formula (I) via the bond labeled with *, such Z-units stem from the reaction of one alcohol with at least two hydroxy groups with at least one amino acid and with sulfuric acid;

with the proviso that at least 10 mol % to 50 mol% of the substituents Z_1 , and/or Z_2 , and/or Z_3 , and/or Z_4 , are a compound according to Formula (II), and at least 10 mol % to 50 mol% of the substituents Z_1 , and/or Z_2 , and/or Z_3 , and/or Z_4 , are a group consisting OSO₃⁻, or -OSO₃H, and 0 mol % to 60 mol% of the substituents Z_1 , and/or Z_2 , and/or Z_3 , and/or Z_4 , are OH;



(Formula II)

with independently from each other

w being an integer from 0 to 12;

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R_{13} , R_{14} , R_{15} , R_{16} , R_{17} and R_{18} independently being selected from the group consisting of H, linear alkyl, branched alkyl, and cycloalkyl; such R-units stem from the amino acid; R_{17} and R_{18} preferably selected from H or methyl, most preferably R_{17} and R_{18} are H.

- 5
14. A sulfatized esteramine (SEA) obtained by a process according to any of claims 1 to 13, wherein the at least one amino acid (compound (B)) is selected from α -amino acids or β -amino acids,
- 10 preferably selected from alanine, glycine, leucine, isoleucine, valine, proline, phenylalanine, arginine, asparagine, aspartic acid, glutamine, histidine, lysine, threonine, tryptophan, tyrosine, cysteine, methionine, serine, aminoisobutyric acid, 2-aminopentanoic acid, sarcosine, N,N-dimethylglycine, β -alanine; more preferably selected from alanine, β -alanine, glycine, valine, leucine, isoleucine;
- 15 most preferably selected from alanine and β -alanine.
15. Use of at least one sulfatized esteramine (SEA) according to claim 14 in a cleaning composition, fabric and home care product, industrial and institutional cleaning product, cosmetic or personal care product.
- 20
16. The use according to claim 15 in cleaning compositions and/or in fabric and home care products, preferably in fabric detergent formulation – such as preferably a laundry detergent – or dish wash detergent formulation, more preferably a hand dish wash or automatic dish wash detergent formulation.
- 25
17. The use according to claim 15 in fabric detergent formulation, preferably in laundry detergent formulation.
18. The use according to claim 16 or 17, the detergent formulation being in liquid or
- 30 semi-liquid form, preferably in liquid form.
19. The use according to claim 16, the detergent formulation being an automatic dish wash formulation being in solid form.
- 35
20. Composition being a cleaning composition, fabric and home care product, industrial and institutional cleaning product, cosmetic or personal care product, preferably a fabric detergent formulation or a dish wash detergent formulation, more preferably a hand dish wash detergent formulation or an automatic dish wash formulation, a laundry detergent, or a sprayable hard surface cleaning
- 40 formulation, preferably the composition being in liquid or semi-liquid form, more preferably in liquid form,

- Comprising at least one SEA according to claim 14 at a concentration of from about 0.1% to about 50%, preferably from about 0,25% to 15%, more preferably from about 0.5% to about 10%, and even more preferably from about 0.5% to about 5%, and most preferably in amounts of up to 3%, each in weight % in relation to the total weight of such composition/product,
- optionally further comprising from about 1% to about 70% by weight of a surfactant system, wherein specifically for a liquid hand dish wash detergent and a sprayable hard surface cleaning formulation such composition comprising from 0.1% to 50%, preferably from 1% to 35%, more preferably from 3% to 30%, by weight of the total composition of a surfactant system, such surfactant system preferably comprising from 60% to 90%, more preferably from 70% to 80% by weight of the surfactant system of an anionic surfactant, optionally in addition comprising at least one enzyme, preferably selected from one or more lipas-es, hydrolases, amylases, proteases, cellulases, mannanases, hemicellulases, phospholipases, esterases, xylanases, DNases, dispersins, pectinases, oxidoreductases, cutinases, lactases and peroxidases, more preferably at least two of the aforementioned types;
- optionally further comprising an antimicrobial agent preferably being 2-phenoxyethanol; preferably comprising said antimicrobial agent in an amount ranging from 2 ppm to 5%, more preferably 0.1 to 2% by weight of the composition;
- optionally further comprising 4,4'-dichloro 2-hydroxydiphenylether in a concentration from 0.001 to 3%, preferably 0.002 to 1%, more preferably 0.01 to 0.6%, each by weight of the composition.
21. The composition of Claim 20 being in liquid or semi-liquid form, preferably being a concentrated liquid detergent formulation, single mono doses laundry detergent formulation, liquid hand dish washing detergent formulation or a sprayable hard surface cleaning detergent,
- further comprising at least one of i) at least one antimicrobial agent, preferably 2-phenoxyethanol, in an amount ranging from 2ppm to 5%, more preferably 0.1 to 2% by weight of the composition, and ii) 4,4'-dichloro 2-hydroxydiphenylether in a concentration from 0.001 to 3%, preferably 0.002 to 1%, more preferably 0.01 to 0.6%, each by weight of the composition.
22. A method of preserving a composition according to any of Claims 20 or 21 against microbial contamination or growth, which method comprises addition of an antimicrobial agent being 2-phenoxyethanol to the composition which is an aqueous composition comprising water as solvent.
23. A method of laundering fabric or of cleaning hard surfaces, which method comprises treating a fabric or a hard surface with a composition according to

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any of Claims 20 to 21, wherein the composition comprises 4,4'-dichloro 2-hydroxydiphenylether, preferably in a concentration of from 0.001 to 3%, preferably 0.002 to 1%, more preferably 0.01 to 0.6%, each by weight of the composition.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2023/072843

A. CLASSIFICATION OF SUBJECT MATTER		
INV. C08G65/26 C08G65/326 C08G65/332 C08G65/333 C11D1/29 C07C303/34 ADD. According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) C08G C11D C07C		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2022/002761 A2 (BASF SE [DE]) 6 January 2022 (2022-01-06) cited in the application examples claims page 13, line 25 - page 14, line 20 -----	1-23
Y	WO 2019/007750 A1 (BASF SE [DE]) 10 January 2019 (2019-01-10) cited in the application claim 6 examples -----	1-20
Y	WO 2021/239453 A1 (UNILEVER IP HOLDINGS B V [NL]; UNILEVER GLOBAL IP LTD [GB] ET AL.) 2 December 2021 (2021-12-02) page 14, lines 17-27 -----	21-23
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
14 November 2023		29/11/2023
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Schlicke, Benedikt

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2023/072843

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