



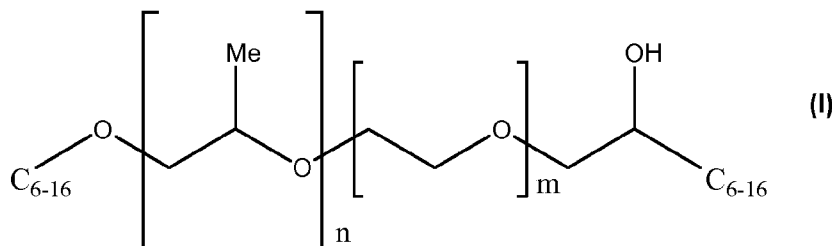
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(54) **Title:** DETERGENT COMPOSITION WITH IMPROVED DRYING PERFORMANCE



(57) **Abstract:** A detergent composition with a superior drying performance is provided comprising a surfactant according to the formula: Formula (I) Wherein n = 0-5 and m = 10-50; or formula (2): R¹O(AlkO)_xM(OAlk)_yOR² wherein R¹ and R² are independently a branched or straight chain, saturated or unsaturated, and possibly hydroxylated, alkyl radicals with 4 to 22 carbon atoms. wherein Alk is a branched or unbranched alkyl radical with 2-4 carbon atoms; wherein x and y are independently an integer between 1 and 70; wherein M is an alkyl radical selected from the group CH₂, CHR³, CR³R⁴, CH₂CHR³, CHR³CHR⁴; and wherein R³ and R⁴ are independently branched or straight chain, saturated or unsaturated, alkyl radicals with 1 to 18 carbon atoms.

DETERGENT COMPOSITION WITH IMPROVED DRYING PERFORMANCE

The present invention relates to detergent compositions for automatic
5 dishwashing machines. In particular, automatic dishwashing detergent
compositions that have superior drying performance.

Consumers demand that their detergent compositions provide many different
benefits.

10

One desired feature of a detergent composition suitable for use in an automatic
dishwasher is that the resulting wash liquor dries quickly and evenly.

Consumers do not like to find wet tableware after a wash cycle. Nor do they like
15 finding streaks or residues on their cleaned and dried tableware.

Providing a detergent composition that dries efficiently and evenly is therefore
desirable from an aesthetic standpoint.

20 There is also an environmental benefit. The more effectively the wash liquor
dries, the shorter drying cycle that is required by the machines. Or lower
temperatures may be utilised during the drying cycle. Thus improved drying
performance saves both energy and money.

25 Drying performance is usually improved with the use of surfactants. However
the presence of these surfactants can adversely effect the main wash/rinse
performance of the formulation, or are lost in the main wash and not effective
due to low concentration in the rinsing and drying stages.

30 Because of this, and to avoid using very high concentrations of surfactants,
specialised surfactant containing compositions to improve drying are often
added separately at the end of the wash cycle. These products are usually
called rinse aids.

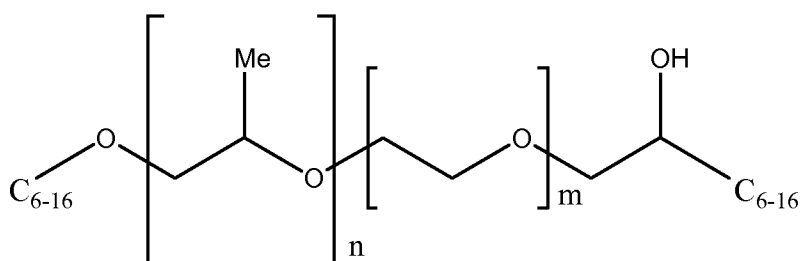
The need for a separate rinse product adds additional cost for the consumer and complexity for the designer of the machine.

Even with these rinse products a compromise usually has to be found between
 5 rinse performance and drying performance. Surfactants that provide good
 rinse performance can often adversely effect drying performance and vice
 versa.

It has surprisingly been found by the applicant, a particular class of non-ionic
 10 surfactants that provides excellent drying performance without compromising
 rinse performance.

The excellent drying performance is particularly improved with respect to plastic
 materials, such as food storage pots.

15 In a first aspect of the present invention a detergent composition is provided
 with a superior drying performance comprising at least one non-ionic surfactant
 according to formula 1:



20

Wherein $n = 0-5$ and $m = 10-50$;

Or formula 2:

25 $\text{R}^1\text{O}(\text{AlkO})_x\text{M}(\text{OAlk})_y\text{OR}^2$

Wherein R^1 and R^2 are independently branched or straight chain, saturated or
 unsaturated, and possibly hydroxylated, alkyl radicals with 4 to 22 carbon
 atoms;

wherein Alk is a branched or unbranched alkyl radical with 2-4 carbon atoms;
 wherein x and y are independently an integer between 1 and 70; and
 wherein M is an alkyl radical selected from the group CH_2 , CHR^3 , CR^3R^4 ,
 CH_2CHR^3 , CHR^3CHR^4 ,

- 5 wherein R^3 and R^4 are independently a branched or straight chain saturated or unsaturated, alkyl radicals with 1 to 18 carbon atoms.

In a further aspect of the present invention the non ionic surfactant comprises Dehypon GRA™ manufactured by Cognis.

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In a further aspect of the present invention the non ionic surfactant comprises Dehypon E127™ manufactured by Cognis.

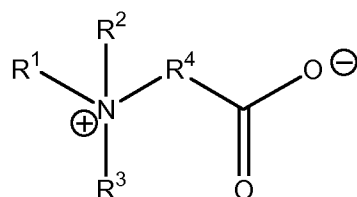
- 15 In a further aspect of the present invention a detergent composition is provided with a superior drying performance comprising at least two different non-ionic polymers according to formula 1 or formula 2.

In a further aspect of the present invention the at least two non-ionic surfactants comprise Dehypon GRA™ and Dehypon E127™.

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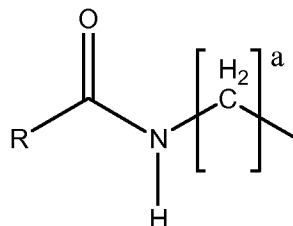
In a further aspect of the present invention the detergent composition may additionally comprise an amphoteric polymer.

- 25 In a further aspect of the present invention the amphoteric polymer has the general formula:.



Wherein;

R¹ is an alkyl group having 10 to 20 carbon atoms, preferably 12 to 16 carbon atoms or the amido radical:



5 Wherein R is an alkyl group having 9-19 carbon atoms and a is an integer between 1 and 4.

R² and R³ are each alkyl groups having 1 to 3 carbons and preferably 1 carbon; and

10 R⁴ is an alkylene or hydroxyalkylene group having from 1 to 4 carbon atoms and, optionally, one hydroxyl group.

Typical alkyldimethyl betaines include decyl dimethyl betaine or 2-(N-decyl-N, N-dimethyl-ammonia) acetate, coco dimethyl betaine or 2-(N-coco N, N-dimethylammonio) acetate, myristyl dimethyl betaine, palmityl dimethyl betaine, 15 lauryl diemethyl betaine, cetyl dimethyl betaine and stearyl dimethyl betaine. The amidobetaines similarly include cocoamidoethylbetaine and cocoamidopropyl betaine. A preferred betaine is coco (C₈-C₁₈) amidopropyl dimethyl betaine.

20 In a further aspect of the present invention the amphoteric polymer is produced by Rhodia under the tradename Mirapol Surf S.

The applicant has surprisingly found that surfactants of the type in formula 1 or formula 2 provide improved drying performance in automatic dishwashing 25 compositions while maintaining wash and rinse performance.

Thus rinse aid usage may be reduced or eliminated.

30 Preferably more than one surfactant, or at least two different surfactants from formula 1 or formula 2 are used in the detergent composition.

Each surfactant from formula 1 or formula 2 may be present from between 0.5 and 25% by weight of the detergent composition. Preferably each surfactant may be present between 1 and 15 %, more preferably between 1.5 and 10 % by weight and most preferably between 2% and 6% by weight of the detergent composition.

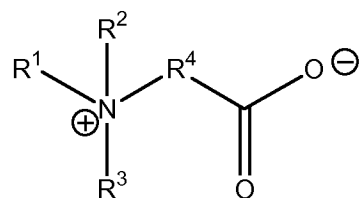
Highly effective but non limiting examples of effective surfactants described in formula 1 or formula 2 are Dehypon GRA™ and Dehypon E127™ which are supplied by Cognis.

Preferably the detergent composition additionally comprises an amphoteric surfactant.

Preferably the amphoteric surfactant is selected from the group comprising quaternized ammonium acrylamide/acrylic acid copolymers.

More preferably the amphoteric surfactant is selected from the general formula:

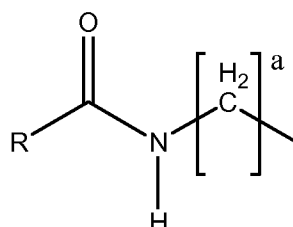
20



wherein;

R¹ is an alkyl group having 10 to 20 carbon atoms, preferably 12 to 16 carbon atoms or the amido radical:

25



wherein R is an alkyl group having 9-19 carbon atoms and a in an integer between 1 and 4;

wherein R² and R³ are each alkyl groups having 1 to 3 carbons and preferably 1 carbon; and

- 5 wherein R⁴ is an alkylene or hydroxyalkylene group having from 1 to 4 carbon atoms and, optionally, one hydroxyl group.

More preferably the amphoteric surfactant is a diallyl dimethyl ammonium acrylamide/acrylic acid copolymer. A particularly preferred material is produced
10 by Rodia under the tradename Mirapol Surf S. A more preferred material is Mirapol Surf S powder.

The detergent compositions may take any form known in the art. Possible forms include tablets, powders, gels, pastes and liquids. The detergent
15 compositions may also comprise a mixture of two or more forms. For example the composition may comprise a gel component and a free powder component. The particles of the present invention may be contained within the gel portion or the powder portion of the detergent composition, or contained within both portions.

20

Tablets may be homogeneous or composed of multi-layers. If the tablets are multi-layered then different layers may comprise different parts of the detergent composition. This may be done to increase stability or increase performance, or both. The particles of the present invention may be contained within one or
25 more layers of the tablets.

The detergent compositions may be housed in PVOH rigid capsules or film blisters. These PVOH capsules or blisters may have a single compartment or may be multi-compartment.

30

Multi-compartment blisters or capsules may have different portions of the composition in each compartment, or the same composition in each

compartment. The distinct regions/or compartments may contain any proportion of the total amount of ingredients as desired.

5 The PVOH capsules or film blisters may be filled with tablets, powders, gels, pastes or liquids, or combinations of these.

The detergent compositions may comprise any ingredients known in the art. These may include components such as builders, The builder may be either a phosphorous-containing builder or a phosphorous-free builder as desired.

10

If phosphorous-containing builders are also to be used it is preferred that mono-phosphates, di-phosphates, tri-polyphosphates or oligomeric-polyphosphates are used. The alkali metal salts of these compounds are preferred, in particular the sodium salts. An especially preferred builder is sodium tripolyphosphate (STPP). Conventional amounts of the phosphorous-containing builders may be used typically in the range of from 15 % by weight to 60 % by weight, such as from 20 % by weight to 50 % by weight or from 25 % by weight to 40 % by weight.

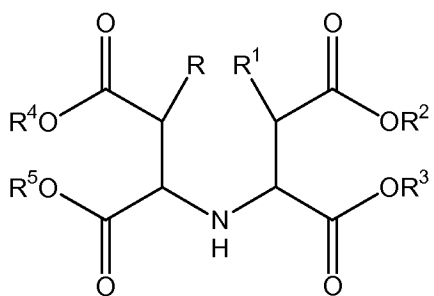
20 If a phosphorous-free builder is included it is preferably chosen from amino acid based compounds and/or succinate based compounds. The terms 'succinate based compound' and 'succinic acid based compound' are used interchangeably herein. Conventional amounts of the amino acid based compound and/or succinate based compound may be used typically in the range of from 05% by weight to 80% by weight, such as from 15 % by weight to 25 70% by weight or from 20 % by weight to 60 % by weight.

Preferred examples of amino acid based compounds which may be used are MGDA (methyl-glycine-diacetic acid, and salts and derivatives thereof) and 30 GLDA (glutamic-N,N-diacetic acid and salts and derivatives thereof). Other suitable builders are described in US 6, 426, 229 which are incorporated by reference herein. Particular suitable builders include; for example, aspartic acid-N-monoacetic acid (ASMA), aspartic acid-N,N-diacetic acid (ASDA), aspartic

acid-N- monoproionic acid (ASMP), iminodisuccinic acid (IDA), N-(2-sulfomethyl) aspartic acid (SMAS), N- (2-sulfoethyl)aspartic acid (SEAS), N- (2-sulfomethyl)glutamic acid (SMGL), N-(2- sulfoethyl)glutamic acid (SEGL), N-methyliminodiacetic acid (MIDA), α - alanine-N,N-diacetic acid (α -ALDA), β -alanine-N,N-diacetic acid (β -ALDA), serine-N,N-diacetic acid (SEDA), isoserine-N,N-diacetic acid (ISDA), phenylalanine-N,N-diacetic acid (PHDA), anthranilic acid-N,N- diacetic acid (ANDA), sulfanilic acid-N,N-diacetic acid (SLDA), taurine-N, N-diacetic acid (TUDA) and sulfomethyl-N,N-diacetic acid (SMDA) and alkali metal salts or ammonium salts thereof.

10

Further preferred succinate compounds are described in US-A-5,977,053 and have the formula;



15

in which R, R¹, independently of one another, denote H or OH, R², R³, R⁴, R⁵, independently of one another, denote a cation, hydrogen, alkali metal ions and ammonium ions, ammonium ions having the general formula R⁶ R⁷ R⁸ R⁹ N⁺ and R⁶, R⁷, R⁸, R⁹, independently of one another, denoting hydrogen, alkyl radicals having 1 to 12 C atoms or hydroxyl-substituted alkyl radicals having 2 to 3 C atoms.

20

Preferred examples include tetrasodium iminosuccinate. Iminodisuccinic acid (IDS) and (hydroxy)iminodisuccinic acid (HIDS) and alkali metal salts or ammonium salts thereof are especially preferred succinate based builder salts.

25

It is especially preferred according to the present invention that the builder comprises methyl-glycine-diacetic acid, glutamic-N,N-diacetic acid, tetrasodium

imminosuccinate, or (hydroxy)iminodisuccinic acid and salts or derivatives thereof.

The phosphorous-free builder may also or alternatively comprise non-polymeric
5 organic molecules with carboxylic group(s). Builder compounds which are
organic molecules containing carboxylic groups include citric acid, fumaric acid,
tartaric acid, maleic acid, lactic acid and salts thereof. In particular the alkali or
alkaline earth metal salts of these organic compounds may be used, and
especially the sodium salts. An especially preferred phosphorous-free builder is
10 sodium citrate. Such polycarboxylates which comprise two carboxyl groups
include, for example, water-soluble salts of, malonic acid,
(ethylenedioxy)diacetic acid, maleic acid, diglycolic acid, tartaric acid, tartronic
acid and fumaric acid. Such polycarboxylates which contain three carboxyl
groups include, for example, water-soluble citrate. Correspondingly, a suitable
15 hydroxycarboxylic acid is, for example, citric acid.

Preferably the total amount of builder present is an amount of at least 20 % by
weight, and most preferably at least 25 % by weight, preferably in an amount of
up to 70 % by weight, preferably up to 65 % by weight, more preferably up to 60
20 % by weight. The actual amount used in the compositions will depend upon the
nature of the builder used. If desired a combination of phosphorous-containing
and phosphorous-free builders may be used.

The detergent compositions may optionally further comprise a secondary
25 builder (or cobuilder). Preferred secondary builders include homopolymers and
copolymers of polycarboxylic acids and their partially or completely neutralized
salts, monomeric polycarboxylic acids and hydroxycarboxylic acids and their
salts, phosphates and phosphonates, and mixtures of such substances.
Preferred salts of the abovementioned compounds are the ammonium and/or
30 alkali metal salts, i.e. the lithium, sodium, and potassium salts, and particularly
preferred salts is the sodium salts. Secondary builders which are organic are
preferred. A polymeric polycarboxylic acid is the homopolymer of acrylic acid.

Other suitable secondary builders are disclosed in WO 95/01416, to the contents of which express reference is hereby made.

5 Preferably the total amount of co-builder present is an amount of up to 10 % by weight, preferably at least 5 % by weight. The actual amount used in the compositions will depend upon the nature of the builder used.

10 The detergent compositions may also comprise a source of acidity or a source of alkalinity, to obtain the desired pH, on dissolution, especially if the composition is to be used in an automatic dishwashing application. Preferred silicates are sodium silicates such as sodium disilicate, sodium metasilicate and crystalline phyllosilicates. A source of acidity may suitably be any suitable acidic compound for example a polycarboxylic acid. For example a source of alkalinity may be a carbonate or bicarbonate (such as the alkali metal or alkaline earth metal salts). A source of alkalinity may suitably be any suitable basic compound for example any salt of a strong base and a weak acid. When an alkaline composition is desired silicates are amongst the suitable sources of alkalinity.

20 The detergent compositions may comprise one or more anti-corrosion agents, especially when the detergent compositions are for use in automatic dishwashing operations. These anti-corrosion agents may provide benefits against corrosion of glass and/or metal and the term encompasses agents that are intended to prevent or reduce the tarnishing of non-ferrous metals, in particular of silver and copper.

25 The detergent compositions may include further surfactants. The Surfactant may also be included in the detergent composition and any of nonionic, anionic, cationic, amphoteric or zwitterionic surface active agents or suitable mixtures thereof may be used. Many such suitable surfactants are described in Kirk Othmer's Encyclopedia of Chemical Technology, 3rd Ed., Vol. 22, pp. 360-379, "Surfactants and Detergent Systems", incorporated by reference herein. In

general, bleach-stable surfactants are preferred according to the present invention.

5 Non-ionic surfactants are especially preferred according to the present invention, especially for automatic dishwashing compositions. For laundry and cleaning applications (excluding automatic dishwashing) other surfactants such as anionic surfactants are preferably included and suitable types are well known in the art.

10 A preferred class of nonionic surfactants is ethoxylated non-ionic surfactants prepared by the reaction of a monohydroxy alkanol or alkylphenol with 6 to 20 carbon atoms. Preferably the surfactants have at least 12 moles particularly preferred at least 16 moles, and still more preferred at least 20 moles, such as at least 25 moles of ethylene oxide per mole of alcohol or alkylphenol.

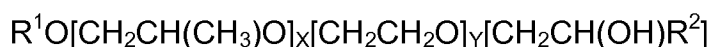
15 Particularly preferred non-ionic surfactants are the non-ionics from a linear chain fatty alcohol with 16-20 carbon atoms and at least 12 moles, particularly preferred at least 16 and still more preferred at least 20 moles, of ethylene oxide per mole of alcohol.

20 According to one embodiment of the invention, the additional non-ionic surfactants additionally may comprise propylene oxide units in the molecule. Preferably these PO units constitute up to 25 % by weight, preferably up to 20 % by weight and still more preferably up to 15 % by weight of the overall
25 molecular weight of the non-ionic surfactant.

Surfactants which are ethoxylated mono-hydroxy alkanols or alkylphenols, which additionally comprises polyoxyethylene-polyoxypropylene block copolymer units may be used. The alcohol or alkylphenol portion of such
30 surfactants constitutes more than 30 % by weight, preferably more than 50 % by weight, more preferably more than 70 % by weight of the overall molecular weight of the non-ionic surfactant.

Another class of suitable non-ionic surfactants includes reverse block copolymers of polyoxyethylene and polyoxypropylene and block copolymers of polyoxyethylene and polyoxypropylene initiated with trimethylolpropane.

- 5 Another preferred class of nonionic surfactant can be described by the formula:



- 10 where R^1 represents a linear or branched chain aliphatic hydrocarbon group with 4-18 carbon atoms or mixtures thereof, R^2 represents a linear or branched chain aliphatic hydrocarbon rest with 2-26 carbon atoms or mixtures thereof, x is a value between 0.5 and 1.5 and y is a value of at least 15.

- 15 Another group of preferred nonionic surfactants are the end-capped polyoxyalkylated non-ionics of formula:



- 20 where R^1 and R^2 represent linear or branched chain, saturated or unsaturated, aliphatic or aromatic hydrocarbon groups with 1-30 carbon atoms, R^3 represents a hydrogen atom or a methyl, ethyl, n-propyl, iso-propyl, n-butyl, 2-butyl or 2-methyl-2-butyl group, x is a value between 1 and 30 and, k and j are values between 1 and 12, preferably between 1 and 5. When the value of x is >2 each R^3 in the formula above can be different. R^1 and R^2 are preferably
 25 linear or branched chain, saturated or unsaturated, aliphatic or aromatic hydrocarbon groups with 6-22 carbon atoms, where group with 8 to 18 carbon atoms are particularly preferred. For the group R^3 H, methyl or ethyl is particularly preferred. Particularly preferred values for x are comprised between
 1 and 20, preferably between 6 and 15.

30

As described above, in case $x > 2$, each R^3 in the formula can be different. For instance, when $x = 3$, the group R^3 could be chosen to build ethylene oxide ($R^3 = H$) or propylene oxide ($R^3 = \text{methyl}$) units which can be used in every single

order for instance (PO)(EO)(EO), (EO)(PO)(EO), (EO)(EO)(PO), (EO)(EO)(EO), (PO)(EO)(PO), (PO)(PO)(EO) and (PO)(PO)(PO). The value 3 for x is only an example and bigger values can be chosen whereby a higher number of variations of (EO) or (PO) units would arise.

5

Particularly preferred end-capped polyoxyalkylated alcohols of the above formula are those where k=1 and j=1 originating molecules of simplified formula:



10

The use of mixtures of different nonionic surfactants is suitable in the context of the present invention for instance mixtures of alkoxyated alcohols and hydroxy group containing alkoxyated alcohols.

15 Other suitable surfactants are disclosed in WO 95/01416, to the contents of which express reference is hereby made.

Preferably the non-ionic surfactants are present in the shaped body or the detergent composition in an amount of from 0.1 % by weight to 20 % by weight, 20 more preferably 1% by weight to 15 % by weight, such as 2 % to 10 % by weight based on the total weight of the detergent composition.

The detergent compositions may also include enzymes. It is preferred that the enzyme is selected from proteases, lipases, amylases, cellulases and 25 peroxidases, with proteases and amylases, especially proteases being most preferred. It is most preferred that protease and/or amylase enzymes are included in the compositions according to the invention as such enzymes are especially effective for example in dishwashing detergent compositions. Any suitable species of these enzymes may be used as desired. More than one 30 species may be used.

The detergent compositions may also comprise bleach additives or bleach activation catalysts The composition may preferably comprise one or more

bleach activators or bleach catalysts depending upon the nature of the bleaching compound. Any suitable bleach activator may be included for example TAED if this is desired for the activation of the bleach material. Any suitable bleach catalyst may be used for example manganese acetate or
5 dinuclear manganese complexes such as those described in EP-A-1,741,774.

The organic peracids such as perbenzoic acid and peroxy-carboxylic acids e.g. PAP do not require the use of a bleach activator or catalyst as these bleaches are active at relatively low temperatures such as about 30°C and this
10 contributes to such bleach materials being especially preferred according to the present invention.

Water may be included in the detergent composition.

15 The detergent compositions may also comprise a source of acidity or a source of alkalinity, to obtain the desired pH, on dissolution, especially if the composition is to be used in an automatic dishwashing application. Preferred silicates are sodium silicates such as sodium disilicate, sodium metasilicate and crystalline phyllosilicates. A source of acidity may suitably be any suitable acidic
20 compound for example a polycarboxylic acid. For example a source of alkalinity may be a carbonate or bicarbonate (such as the alkali metal or alkaline earth metal salts). A source of alkalinity may suitably be any suitable basic compound for example any salt of a strong base and a weak acid. When an alkaline composition is desired silicates are amongst the suitable sources of
25 alkalinity.

The detergent compositions may comprise one or more anti-corrosion agents, especially when the detergent compositions are for use in automatic dishwashing operations. These anti-corrosion agents may provide benefits
30 against corrosion of glass and/or metal and the term encompasses agents that are intended to prevent or reduce the tarnishing of non-ferrous metals, in particular of silver and copper.

- It is known to include a source of multivalent ions in detergent compositions, and in particular in automatic dishwashing compositions, for anti-corrosion benefits. For example, multivalent ions and especially zinc, bismuth and/or manganese ions have been included for their ability to inhibit such corrosion.
- 5 Organic and inorganic redox-active substances which are known as suitable for use as silver/copper corrosion inhibitors are mentioned in WO 94/26860 and WO 94/26859. Suitable inorganic redox-active substances are, for example, metal salts and/or metal complexes chosen from the group consisting of zinc, bismuth, manganese, titanium, zirconium, hafnium, vanadium, cobalt and
- 10 cerium salts and/or complexes, the metals being in one of the oxidation states II, III, IV, V or VI. Particularly suitable metal salts and/or metal complexes are chosen from the group consisting of MnSO_4 , Mn(II) citrate, Mn(II) stearate, Mn(II) acetylacetonate, Mn(II) [1-hydroxyethane-1,1-diphosphonate], V_2O_5 , V_2O_4 , VO_2 , TiOSO_4 , K_2TiF_6 , K_2ZrF_6 , CoSO_4 , $\text{Co}(\text{NO}_3)_2$, Zinc acetate, zinc sulphate and $\text{Ce}(\text{NO}_3)_3$. Any suitable source of multivalent ions may be used,
- 15 with the source preferably being chosen from sulphates, carbonates, acetates, gluconates and metal-protein compounds. Zinc salts are specially preferred corrosion inhibitors.
- 20 Preferred silver/copper anti-corrosion agents are benzotriazole (BTA) or bis-benzotriazole and substituted derivatives thereof. Other suitable agents are organic and/or inorganic redox-active substances and paraffin oil. Benzotriazole derivatives are those compounds in which the available substitution sites on the aromatic ring are partially or completely substituted.
- 25 Suitable substituents are linear or branch-chain C_{1-20} alkyl groups and hydroxyl, thio, phenyl or halogen such as fluorine, chlorine, bromine and iodine. A preferred substituted benzotriazole is tolyltriazole.
- Any conventional amount of the anti-corrosion agents may be included.
- 30 However, it is preferred that they are present in an total amount of from 0.01% by weight to 5% by weight, preferably 0.05 % by weight to 3 % by weight, more preferably 0.1 % by weight to 2.5% by weight, such as 0.2% by weight to 2 % by weight based on the total weight.

Polymers intended to improve the cleaning performance of the detergent compositions may also be included therein. For example sulphonated polymers may be used. Preferred examples include copolymers of $\text{CH}_2=\text{CR}^1-\text{CR}^2\text{R}^3-\text{O}-\text{C}_4\text{H}_9\text{R}^4-\text{SO}_3\text{X}$ wherein R^1 , R^2 , R^3 , R^4 are independently 1 to 6 carbon alkyl or hydrogen, and X is hydrogen or alkali with any suitable other monomer units including modified acrylic, fumaric, maleic, itaconic, aconitic, mesaconic, citraconic and methylenemalonic acid or their salts, maleic anhydride, acrylamide, alkylene, vinylmethyl ether, styrene and any mixtures thereof. Other suitable sulfonated monomers for incorporation in sulfonated (co)polymers are 2-acrylamido-2-methyl-1-propanesulphonic acid, 2-methacrylamido-2-methyl-1-propanesulphonic acid, 3-methacrylamido-2-hydroxy-propanesulphonic acid, allylsulphonic acid, methallylsulphonic acid, 2-hydroxy-3-(2-propenyloxy)propanesulphonic acid, 2-methyl-2-propenen-1-sulphonic acid, styrenesulphonic acid, vinylsulphonic acid, 3-sulphopropyl acrylate, 3-sulphopropylmethacrylate, sulphomethylacrylamide, sulphomethylmethacrylamide and water soluble salts thereof. Suitable sulphonated polymers are also described in US 5308532 and in WO 2005/090541.

When a sulfonated polymer is present, it is preferably present in an amount of at least 0.1% by weight, preferably at least 0.5 % by weight, more preferably at least 1 % by weight, and most preferably at least 3 % by weight, up to 40 % by weight, preferably up to 25 % by weight, more preferably up to 15 % by weight, and most preferably up to 10 % by weight.

The detergent composition may also comprise one or more foam control agents. Suitable foam control agents for this purpose are all those conventionally used in this field, such as, for example, silicones and their derivatives and paraffin oil. The foam control agents are preferably present in amounts of 0.5 % by weight or less.

The detergent compositions may also comprise minor, conventional, amounts of preservatives.

Drying Performance Testing

The following compositions were tested. All were formulated into 20.8 gram tablets.

5

Composition A represents a control formulation. Formulations B-E represent non-limiting compositions according to the present invention.

Compositions for testing (weight %)					
Ingredients	A	B	C	D	E
Non-ionic surfactant Dehypon E 127 TM	0	6	4	6	4
Nonionic surfactant Dehypon GRA TM	0	0	2	0	2
Non-ionic surfactant Lutensol AT 25 TM	6	0	0	0	0
Amphoteric polymer Mirapol Surf S TM	0	0	0	0.25	0.25
Anionic Polymer	6	6	6	6	6
Sodium Percarbonate	10.5	10.5	10.5	10.5	10.5
TAED	3	3	3	3	3
Sodium carbonate	15	15	15	15	15
Protease	2	2	2	2	2
Amylase	1	1	1	1	1
STPP	47	47	47	47	47
Phosphonate	1	1	1	1	1
Water	12.5	8.5	8.5	8.5	8.5

10

For this purpose a machine load consisting of china, glass, plastic and stainless steel was, after adding a defined amount of soil into a dishwasher (Bosch

SGS058M02EU/36; Eco 50° with deactivated automatic detergent detecting adjustment of the rinse program [= with deactivated “auto 3 in 1 function”]) was cleaned with 20.8g of the ADW detergents listed in the table below at 21°dH. The dosing was done in the main wash cycle.

5

The drying index was determined 30 minutes after the end of the complete dishwashing program. The door of the dishwasher was kept closed during these 30 minutes.

- 10 The maximum score for ideal drying is 0, the worst score is 6. The reported value represents the average of three trials.

Drying performance					
Surface	A	B	C	D	E
China	1.76	0.07	0.21	0.16	0.43
Glass	1.19	0.03	0.08	0.14	0.08
Plastic	5.97	0.31	0.47	0.19	0.42
Stainless Steel	0.83	0.28	0.33	0.32	0.49

- 15 The compositions of the invention (B-D) clearly demonstrate superior drying performance over the control composition (A). Drying performance is improved on all surfaces.

20 The Rinse Performance was determined in an extra test with the same test conditions as used for drying performance.

The load was evaluated for spotting and filming. Scale is from 1 to 10, wherein 10 is the best score.

25

Rinse performance [spotting]					
Surface	A	B	C	D	E
Long drink glasses	5.6	3.9	3.1	4.7	4.5
Whiskey glasses	6.1	3.7	3.0	5.2	5.3
Ventura knives	5.4	5.6	5.8	5.6	5.8
Porcelain plates	6.0	5.6	5.1	6.0	6.1
Melamine plastic plates	3.5	4.0	5.2	4.1	3.8
PP Bowl	3.0	4.0	3.8	3.8	4.0

Rinse performance [filming]					
Surface	A	B	C	D	E
China	7.0	6.9	7.0	6.2	5.8
Glass	7.9	8.0	7.0	6.3	5.8
Plastic	7.9	7.9	7.9	7.9	7.9
Stainless Steel	7.9	8.0	8.0	8.0	7.7
Melamine plastic plates	7.6	7.7	7.8	7.8	7.8
PP Bowl	8.0	8.0	8.7	8.7	8.0

5

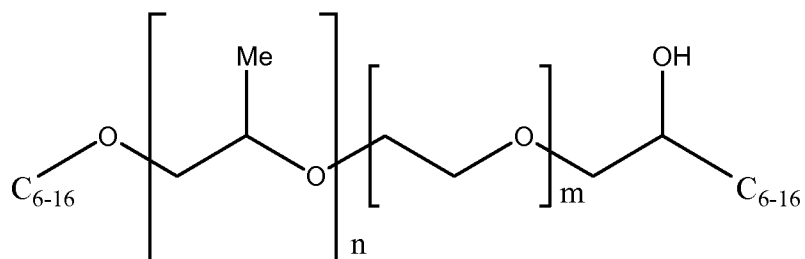
It can be seen from the rinsing tables that the compositions of the present invention (B-E) offer a similar rinsing performance to that of the control formulation A. Thus the compositions of the present invention provide superior drying performance while maintaining rinsing performance.

10

CLAIMS

1. A detergent composition with a superior drying performance comprising at least one non-ionic surfactant having the general formula:

5



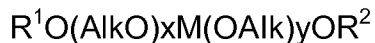
wherein

$n = 0-5$ and

$m = 10-50$

10

or having the general formula 2:



15 wherein R^1 and R^2 are independently a branched or straight chain, saturated or unsaturated, and possibly hydroxylated, alkyl radicals with 4 to 22 carbon atoms.

wherein Alk is a branched or unbranched alkyl radical with 2-4 carbon atoms;

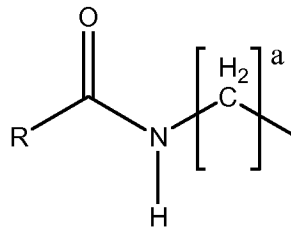
wherein x and y are independently an integer between 1 and 70; and

20 wherein M is an alkyl radical selected from the group CH_2 , CHR^3 , CR^3R^4 , CH_2CHR^3 , CHR^3CHR^4 ,

wherein R^3 and R^4 are independently a branched or straight chain saturated or unsaturated, alkyl radicals with 1 to 18 carbon atoms.

25

2. The detergent composition according claim 1 wherein the non ionic surfactant comprises Dehypon GRA™.



wherein R is an alkyl group having 9-19 carbon atoms and a is an integer between 1 and 4;

R² and R³ are each alkyl groups having 1 to 3 carbons and preferably 1 carbon;

5 and

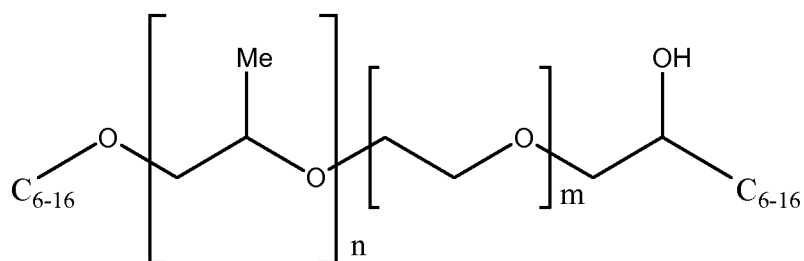
R⁴ is an alkylene or hydroxyalkylene group having from 1 to 4 carbon atoms and, optionally, one hydroxyl group.

10. The detergent composition according to any of claims 7 - 9 wherein the amphoteric polymer is a diallyl dimethyl ammonium acrylamide/acrylic acid copolymer, preferably Mirapol Surf S™ as supplied by Rhodia.

11. The detergent composition according to any of the preceding claims wherein the detergent composition is an automatic dishwashing composition.

15

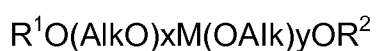
12. The use of at least two non-ionic surfactants according to the formula 1:



Wherein n = 0-5 and m = 10-50

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Or formula 2:



wherein R^1 and R^2 are independently a branched or straight chain, saturated or unsaturated, and possibly hydroxylated, alkyl radicals with 4 to 22 carbon atoms.

wherein Alk is a branched or unbranched alkyl radical with 2-4 carbon atoms;

5 wherein x and y are independently an integer between 1 and 70;

wherein M is an alkyl radical selected from the group CH_2 , CHR^3 , CR^3R^4 , CH_2CHR^3 , CHR^3CHR^4 ; and

wherein R^3 and R^4 are independently branched or straight chain, saturated or unsaturated, alkyl radicals with 1 to 18 carbon atoms;

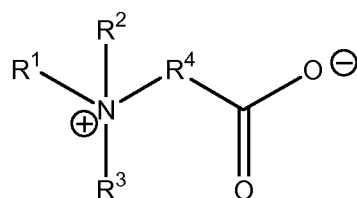
10

to improve the drying performance of a detergent composition.

13. The use according to claim 12 wherein additionally an amphoteric polymer is also used to improve the drying performance of a detergent composition.

15

14. The use according to claim 13 wherein the amphoteric polymer is selected from the general formula:

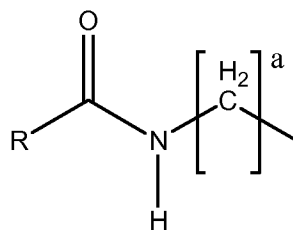


20

Wherein;

R^1 is an alkyl group having 10 to 20 carbon atoms, preferably 12 to 16 carbon atoms or the amido radical:

25



wherein R is an alkyl group having 9-19 carbon atoms and a in an integer between 1 and 4;

R² and R³ are each alkyl groups having 1 to 3 carbons and preferably 1 carbon; and

- 5 R⁴ is an alkylene or hydroxyalkylene group having from 1 to 4 carbon atoms and, optionally, one hydroxyl group.

15. The use according to claim 13 or 14 wherein the at least two non-ionic surfactants comprise Dehypon GRA™ and Dehypon E127™ supplied by
10 Cognis and the amphoteric polymer comprises a diallyl dimethyl ammonium acrylamide/acrylic acid copolymer, preferably Mirapol Surf S™ as supplied by Rhodia.

16. The use according to any of claims 12 to 15 wherein the detergent
15 composition is an automatic dishwashing composition.

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2012/050523

A. CLASSIFICATION OF SUBJECT MATTER
INV. C11D1/72 C11D1/825 C11D3/37
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)
C11D
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, WPI Data

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X	WO 2010/063690 A1 (HENKEL AG & CO KGAA [DE]; ZIPFEL JOHANNES [DE]; WARKOTSCH NADINE [DE];) 10 June 2010 (2010-06-10)	1-6,11, 12
Y	page 15, paragraphs 2,4; claims 1-14; examples V1-V3,E1,E2; tables 1a-7b page 1, paragraph 7 page 10, paragraphs 3,4 page 11, paragraphs 2,3 page 12, paragraphs 1-6,8 page 13, paragraphs 1,3 page 14, paragraph 1-3 page 16, paragraphs 3,4 page 26, paragraph 3	1-16
X	----- EP 1 764 408 A1 (COGNIS IP MAN GMBH [DE]) 21 March 2007 (2007-03-21) paragraphs [0003] - [0013], [0031] - [0040]; claims 1-12; table 2 ----- -/--	1-16

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	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"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
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 29 June 2012	Date of mailing of the international search report 10/07/2012
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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 Klier, Erich
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INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2012/050523

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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X	WO 2009/100855 A2 (COGNIS IP MAN GMBH [DE]; ALEXANDRE TERESA [DE]; RATHS HANS-CHRISTIAN [] 20 August 2009 (2009-08-20) page 1, paragraph 1-37; claims 1-16; example I -----	1-16
X	EP 1 321 509 A1 (COGNIS DEUTSCHLAND GMBH [DE] COGNIS IP MAN GMBH [DE]) 25 June 2003 (2003-06-25) paragraphs [0007], [0009] - [0020]; claims 1-18; table 1 -----	1-16
Y	WO 99/58633 A1 (UNILEVER PLC [GB]; UNILEVER NV [NL]) 18 November 1999 (1999-11-18) page 5, lines 17-21; claims 1-11; examples 1-3; tables 1-14 page 8, line 1 - page 15, line 14 -----	1-16

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International application No

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