(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 109 305 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
28.12.2016 Bulletin 2016/52

(21) Application number: **15174158.4**

(22) Date of filing: **26.06.2015**

(51) Int Cl.:
C11D 1/52 *(2006.01)* ***C11D 3/39*** *(2006.01)*
C11D 3/395 *(2006.01)* ***C11D 3/386*** *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA

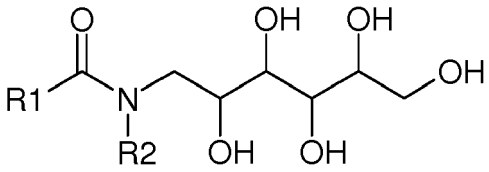
(71) Applicant: **Clariant International Ltd**
4132 Muttenz (CH)

(72) Inventors:
- **COHRS, Carsten**
  60316 Frankfurt (DE)
- **MUELLER, Christine**
  65462 Ginsheim-Gustavsburg (DE)

(74) Representative: **Paczkowski, Marcus et al**
Clariant Produkte (Deutschland) GmbH
Patent & License Management Chemicals
Industriepark Höchst / G 860
65926 Frankfurt am Main (DE)

(54) AUTOMATIC DISHWASHING DETERGENT COMPOSITIONS COMPRISING N-ACYLGLUCAMINE

(57) The present invention provides automatic dishwashing detergent compositions comprising
a) one or more N-Acylglucamines of formula (I)



(I)

or mixtures thereof, wherein
R1
is a linear or branched saturated alkyl group comprising from 11 to 21 carbon atoms or a linear or branched unsaturated alkenyl group with one or more double bonds and comprising from 11 to 21 carbon atoms,
R2
is hydrogen or a linear or branched saturated alkyl group comprising from 1 to 4 carbon atoms, and

b) one or more builder substances, and
c) a bleaching system, and
d) one or more enzymes.

The inventive automatic dishwashing detergent compositions in particular provide a favorable rinse performance, also in phosphate-free compositions, and also lead to an advantageous rinse performance while increasing the renewable carbon index of the automatic dishwashing detergent compositions.

EP 3 109 305 A1

Description

[0001] The present invention concerns automatic dishwashing detergent compositions which comprise specific N-Acylglucamines, a method of washing tableware in an automatic dishwashing machine using the inventive automatic dishwashing detergent compositions and the use of one or more of the specific N-Acylglucamines for improving the rinse performance of an inventive automatic dishwashing detergent composition, for improving the wetting of tableware or for reducing spotting and filming of tableware.

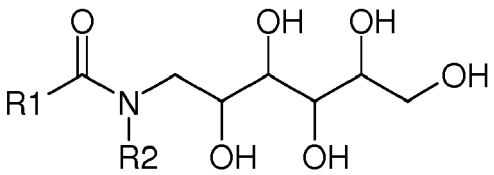
[0002] Automatic dishwashing, especially domestic dishwashing, has undergone continuous changes and improvement as the format moves into the direction of all-in-one dosing systems like tabs, pouches and even dosing units, demanding new surfactant systems which are effective as rinse surfactants against spotting and filming and show a good rinse performance while they are present through the whole washing cycle. In addition, environmental trends, like washing at lower temperatures and with less water, the reduction or even ban of phosphates like sodium tripolyphosphate (STPP) and the demand to use raw materials from renewable resources (represented by the renewable carbon index = RCI) instead of petroleum based chemicals challenge the formulator in his choice of the surfactant system. On the other hand, there is a unique requirement of very low foaming compositions, which is incompatible with most common surfactant systems typically used in other cleaning compositions, e.g. hand dishwashing liquids, where stable foam is seen as desirable.

[0003] As effective and well-established rinse surfactants, nonionic surfactants like for example alkyl alcohols or alkoxylated alkyl alcohols such as ethoxylated alkyl alcohols are regularly used. However, these surfactants often exhibit the disadvantage of being based on petroleum-based chemicals and of possessing a low RCI. Furthermore, these surfactants often are not sufficiently effective as rinse surfactants in phosphate-free automatic dishwashing detergents.

[0004] It was an object of the present invention to provide automatic dishwashing detergent compositions which contain environmental friendly rinse surfactant systems and which, besides a favorable cleaning performance, in particular also show an improved rinse performance.

[0005] Surprisingly, it has now been found that this object is achieved with automatic dishwashing detergent compositions comprising

a) one or more N-Acylglucamines of formula (I)



(I)

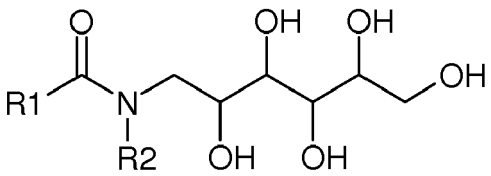
or mixtures thereof, wherein

R1 is a linear or branched saturated alkyl group comprising from 11 to 21 carbon atoms or a linear or branched unsaturated alkenyl group with one or more double bonds and comprising from 11 to 21 carbon atoms,
R2 is hydrogen or a linear or branched saturated alkyl group comprising from 1 to 4 carbon atoms, and

b) one or more builder substances, and
c) a bleaching system, and
d) one or more enzymes.

[0006] The present invention therefore provides automatic dishwashing detergent compositions comprising

a) one or more N-Acylglucamines of formula (I)



(I)

or mixtures thereof, wherein

R1 is a linear or branched saturated alkyl group comprising from 11 to 21 carbon atoms or a linear or branched unsaturated alkenyl group with one or more double bonds and comprising from 11 to 21 carbon atoms,
R2 is hydrogen or a linear or branched saturated alkyl group comprising from 1 to 4 carbon atoms, and

b) one or more builder substances, and
c) a bleaching system, and
d) one or more enzymes.

[0007] Due to the presence of the one or more surfactants of the formula (I) the inventive automatic dishwashing detergent compositions show an improved wetting of tableware, reduced spotting and filming of tableware, a favorable rinse performance and possess a favorable cleaning performance. The surfactants of the formula (I) do not impart to major foaming and insofar the inventive compositions are furthermore low foaming. The surfactants of the formula (I) are aerobic and anaerobic biodegradable, are based - due to their acyl component R1 CO and their glucamine component - on renewable primary products with a high renewable carbon index (RCI) from 93 % to 96 %. Common rinse surfactants like fatty alcohol alkoxylates usually have a renewable carbon index lower than 50%. Furthermore, the surfactants of the formula (I) provide a low aquatic toxicity and are therefore applicable surfactants for ecolabel products. Insofar the inventive automatic dishwashing detergent compositions are also environmentally friendly.

[0008] The inventive automatic dishwashing detergent compositions furthermore have the advantage that the one or more surfactants of the formula (I) contained therein reveal their advantageous properties and in particular provide a favorable rinse performance also in phosphate-free compositions. Compared with common low foaming non-ionic surfactants the one or more surfactants of the formula (I) lead to a similar or improved rinse performance while increasing the renewable carbon index of the inventive automatic dishwashing detergent compositions.

[0009] Low foaming nonionic surfactants that belong to the group of rinse surfactants and that are regularly used in automatic dishwashing are e.g. alkyl alcohols or alkoxylated alkyl alcohols. Typical examples of such nonionic surfactants are fatty alcohol alkoxylates, end-capped fatty alcohol alkoxylates, ethylene oxide propylene oxide block copolymers, alkoxylated fatty acids, fatty acid polyglycol ethers, fatty acid amide polyglycol ethers, fatty amine polyglycol ethers, ethoxylated triglycerides, mixed ethers, epoxy capped poly(oxyalkylated) alcohols, alkyl polyglycosides, sugar esters, sorbitan esters, and polysorbates. Particularly, fatty alcohol ethoxylates, fatty alcohol ethoxylates propoxylates and end-capped fatty alcohol alkoxylates are used as low foaming rinse surfactants in automatic dishwashing detergent compositions.

[0010] US 3,382,176 describes low foaming compositions particularly for use in mechanical dishwashers containing among others alkylene oxide adducts including fatty alcohol alkoxylates, alkoxylated fatty acids, fatty acid amide polyglycol ethers and fatty amine polyglycol ethers.

[0011] US 4,272,394 discloses automatic dishwashing detergents containing blends of low foaming nonionic surfactants composed of polyoxyalkylene-based low foaming nonionic surfactant including ethylene oxide propylene oxide block copolymers, alkoxylated fatty acids, fatty acid amide polyglycol ethers and fatty amine polyglycol ethers and a second nonionic surfactant having a low cloud point.

[0012] US 6,593,287 discloses alkyl end-capped nonionic surfactants and automatic dishwashing compositions containing them.

[0013] WO 94/22800 describes low foaming epoxy capped poly(oxyalkylated) alcohols and automatic dishwasher compositions containing them.

[0014] WO 88/09369 describes low foaming detergent composition suitable for automatic dishwashing containing alkyl polyglycosides.

[0015] N-Acylglucamines are a group of nonionic surfactants well known in the art. Typically, N-Acylglucamines are used as nonionic surfactants in laundry detergents, personal care formulations or rinse aid formulations for machine washing. Commercial rinse aids are liquid mixtures of low-foaming nonionic surfactants, organic acids such as, for example, citric acid and solvents such as, for example, ethanol and other additives such as hydrotropes, thickeners and/or foam inhibitors. Rinse aid formulations are typically liquid at 20 °C and possess an acidic pH value of 6 or lower. Typically, rinse aids are added into the dishwasher through the final rinse cycle of the dishwashing cycle. The function of rinse aids is to influence the interfacial tension of the water in the final rinse cycle in such a way that it is able to drain from the rinsed surfaces in the form of a thin film, so that no water droplets, streaks or films remain behind during the subsequent drying process.

[0016] WO 92/06154 discloses laundry detergent compositions containing N-Acylglucamines, detersive enzyme and anionic surfactant, nonionic surfactant or mixtures thereof.

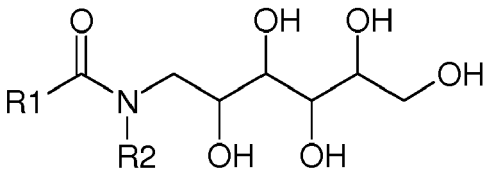
[0017] WO 92/06155 describes laundry detergent compositions comprising N-Acylglucamines and bleach.

[0018] WO 93/07246 discloses alkaline detergents containing N-Acylglucamines, inorganic alkaline agent, complexing agent and chlorine-free bleaching agent.

[0019] WO 95/02666 describes rinse aid formulations containing N-Acylglucamines.

[0020] The inventive automatic dishwashing detergent compositions may comprise more than one compound of the formula (I). In this case the inventive automatic dishwashing detergent compositions may e.g. comprise more than one compound of the formula (I) that differ in the group R1 and/or that differ in the group R2.

[0021] N-Acylglucamines contained in the inventive automatic dishwashing detergent compositions, also known as N-1-deoxisorbityl fatty acid amides or glucamides, are of the formula (I)



(I)

wherein R1 is a linear or branched saturated alkyl group comprising from 11 to 21 carbon atoms or a linear or branched unsaturated alkenyl group with one or more double bonds and comprising from 11 to 21 carbon atoms and R2 is hydrogen or a linear or branched saturated alkyl group comprising from 1 to 4 carbon atoms.

[0022] Preferably, in the one or more N-Acylglucamines of formula (I) R2 is a methyl group.

[0023] In the one or more N-Acylglucamines of formula (I) R1 preferably is a linear or branched saturated alkyl group comprising from 11 to 17 carbon atoms or a linear or branched unsaturated alkenyl group with one or more double bonds and comprising from 11 to 17 carbon atoms.

[0024] Particularly preferably, in the one or more N-Acylglucamines of formula (I) R1 is a linear or branched saturated alkyl group comprising from 15 to 17 carbon atoms or a linear or branched unsaturated alkenyl group with one or more double bonds and comprising from 15 to 17 carbon atoms.

[0025] In a preferred embodiment of the invention, 50 wt.-% or more, more preferably 60 to 99 wt.-% and even more preferably 70 to 98 wt.-% of the groups R1 in the one or more N-Acylglucamines of formula (I) are linear or branched saturated alkyl groups comprising 17 carbon atoms.

[0026] In a further preferred embodiment of the invention, at most 50 wt.-%, preferably 0.1 to 50 wt.-%, more preferably 0.5 to 40 wt.-% and even more preferably 1.0 to 30 wt.-% of the groups R1 in the one or more N-Acylglucamines of formula (I) are linear or branched saturated alkyl groups comprising 15 carbon atoms.

[0027] In a further preferred embodiment of the invention, 50 wt.-% or more, more preferably 80 wt.-% or more and even more preferably 90 wt.-% or more of the groups R1 in the one or more N-Acylglucamines of formula (I) are linear or branched unsaturated alkenyl groups with one or more double bonds.

[0028] In a particularly preferred embodiment of the invention, 50 wt.-% or more, more preferably 80 wt.-% or more and even more preferably 90 wt.-% or more of the groups R1 in the one or more N-Acylglucamines of formula (I) are linear or branched unsaturated alkenyl groups with one or more double bonds and comprising 17 carbon atoms.

[0029] Particularly preferably, in the one or more N-Acylglucamines of formula (I) R1 is a linear group.

[0030] In another preferred embodiment of the invention, in the one or more N-Acylglucamines of formula (I) R1 CO is derived from lauric acid, palmitic acid, stearic acid, oleic acid, linoleic acid and/or linolenic acid. In a particularly preferred embodiment of the invention, in the one or more N-Acylglucamines of formula (I) R1 CO is derived from stearic acid, oleic acid, linoleic acid and/or linolenic acid. In an even more preferred embodiment of the invention, in the one or more N-Acylglucamines of formula (I) R1 CO is derived from oleic acid, linoleic acid and/or linolenic acid and in an extraordinarily preferred embodiment of the invention, in the one or more N-Acylglucamines of formula (I) R1 CO is derived from oleic acid.

[0031] The inventive automatic dishwashing detergent compositions comprise the one or more N-Acylglucamines of formula (I) preferably in amounts from 0.1 to 15 wt.-%, more preferably in amounts from 0.2 to 10 wt.-% and even more preferably in amounts from 0.2 to 5 wt.-%, in each case based on the total weight of the automatic dishwashing detergent composition.

[0032] The N-methyl-N-Acylglucamines, also known as glucamides, may, as described in EP-A 0 550 637 and EP-A 0 285 768, be produced by reaction of the corresponding fatty acid esters or fatty acid ester mixtures with N-methyl-glucamine in the presence of a solvent that has hydroxyl groups or alkoxy groups. Suitable solvents are for example C_1-C_4 monohydric alcohols, ethylene glycol, propylene glycol, glycerol and alkoxylated alcohols. 1,2-Propylene glycol is preferred. N-methyl-glucamine may, as also described in EP 0 550 637, be produced by reductive amination of glucose with methylamine. Suitable fatty acid esters that are converted with the N-methyl-glucamines to glucamides according to the formula (I) are in general the methyl esters that are obtained by transesterification from natural fats and oils, for example the triglycerides.

[0033] The inventive automatic dishwashing detergent compositions further comprise one or more builder substances.

[0034] The builder substances as well as other ingredients usable in the inventive automatic dishwashing detergent compositions are e.g. described in US 2010/0160204 A1 and EP 1 757 676 A1.

[0035] Preferably, the inventive automatic dishwashing detergent compositions comprise one or more builder substances selected from the group consisting of carbonates, hydrogencarbonates, organic builders, preferably methylglycinediacetic acid (MGDA), silicates, phosphates, phosphonates and alkali-metal hydroxides.

[0036] It is preferred to use carbonate(s) and/or hydrogencarbonate(s), by preference alkali carbonate(s), particularly preferably sodium carbonate. These substances are preferably used in quantities from 2 to 50 wt.-%, by preference from 10 to 30 wt.-%, and in particular from 10 to 25 wt.-%, based on the total weight of the inventive automatic dishwashing detergent composition.

[0037] Organic builders include polycarboxylates, polycarboxylic acids, polymeric carboxylates, aspartic acid, polyacetals, and dextrins.

[0038] Usable organic builders include polycarboxylic acids, which can be used in the form of the free acid and/or its sodium salts, "polycarboxylic acids" being understood as those carboxylic acids that carry more than one acid function. Examples are citric acid, adipic acid, succinic acid, glutaric acid, malic acid, tartaric acid, maleic acid, fumaric acid, sugar acids, aminocarboxylic acids, and nitrilotriacetic acid (NTA), as well as mixtures thereof. Free acids typically also have an acidifying component in addition to their builder effect, and thus also serve to establish a lower and milder pH for the inventive automatic dishwashing detergent compositions. Worthy of mention in this context are, in particular, citric acid, succinic acid, glutaric acid, adipic acid, gluconic acid, tartaric acid and any mixtures thereof.

[0039] Aminocarboxylic acids which are commonly used and preferred in the context of the present invention are, for example, ethylenediaminetetraacetic acid (EDTA), methylglycinediacetic acid (MGDA) and glutaminediacetic acid (GLDA). It is also possible to use mixtures.

[0040] Further preferred builder substances are polymeric aminodicarboxylic acids, salts thereof or precursor substances thereof. Particularly preferred polyaspartic acids, salts thereof or derivatives thereof are used.

[0041] Preferred inventive automatic dishwashing detergent compositions contain citrate as one of their builders. Inventive automatic dishwashing detergent compositions containing from 2 to 40 wt.-%, preferably from 5 to 30 wt.-%, and particularly preferably from 10 to 30 wt.-% citrate, based on the total weight of the inventive automatic dishwashing detergent composition, are preferred.

[0042] In another preferred embodiment of the invention, the inventive automatic dishwashing detergent compositions contain MGDA as one of their builders. Inventive automatic dishwashing detergent compositions contain preferably from 0.5 to 25 wt.-% and particularly preferably from 2 to 25 wt.-% MGDA, based on the total weight of the inventive automatic dishwashing detergent composition.

[0043] Polymeric carboxylates are also suitable as organic builders. These are, for example, the alkali-metal salts of polyacrylic acid or of polymethacrylic acid, for example, those having a relative molecular weight from 500 to 70,000 g/mol.

[0044] Suitable polymeric carboxylates are, in particular, polyacrylates, preferably having a molecular weight from 2000 to 20,000 g/mol. Because of their superior solubility, short-chain polyacrylates having molar weights from 2000 to 10,000 g/mol, and particularly preferably from 3000 to 5000 g/mol, may in turn be preferred.

[0045] Also suitable are copolymeric carboxylates. Suitable comonomers are monoethylenically unsaturated dicarboxylic acids such as maleic acid, fumaric acid, maleic anhydride, itaconic acid and citraconic acid. In particular, those copolymeric carboxylates of acrylic acid with methacrylic acid and acrylic acid or methacrylic acid with maleic acid and/or fumaric acid are suitable. Copolymers of acrylic acid with maleic acid containing from 50 to 90 wt.-% acrylic acid and from 10 to 50 wt.-% maleic acid have proven particularly suitable. Their relative molecular weight, based on free acids, is preferably from 2000 to 70,000 g/mol, more preferably from 20,000 to 50,000 g/mol, and in particular from 30,000 to 40,000 g/mol.

[0046] It is also possible to use copolymers of at least one monomer from the group consisting of monoethylenically unsaturated C_3-C_{10}-mono- or C_4-C_{10}-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 monomer, such as listed below.

[0047] Suitable hydrophobic monomers are, for example, isobutene, diisobutene, butane, pentene, hexene and styrene, olefins having 10 or more carbon atoms or mixtures thereof, such as, for example, 1-decene, 1-dodecene, 1-tetradecene, 1-hexadecene, 1-octahexene, 1-eicosene, 1-docosene, 1-tetracosene and 1-hexacosene, C_{22}-α-olefin, a mixture of C_{20}-C_{24}-α-olefins and polyisobutene having, on average, 12 to 100 carbon atoms per molecule.

[0048] Suitable hydrophilic monomers are monomers with sulfonate or phosphonate groups, and also nonionic monomers with hydroxyl function or alkylene oxide groups. Examples for the hydrophilic monomers listed above are 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.

[0049] Particular preferred monomers containing sulfonic acid groups here are 1-acrylamido-1-propanesulfonic acid, 2-acrylamido-2-propanesulfonic acid, 2-acrylamido-2-methyl-propanesulfonic acid, 2-methyacrylamido-2-methylpro-

panesulfonic 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 their sodium, potassium or ammonium salts.

[0050] Particular preferred monomers containing phosphonate groups are vinylphosphonic acid and its salts.

[0051] Moreover, amphoteric polymers can be used as builders.

[0052] In case the inventive automatic dishwashing detergent compositions comprise one or more (co)polymeric carboxylates, the amount of these (co)polymeric carboxylates in the inventive automatic dishwashing detergent compositions preferably is from 0.5 to 20 wt.-% and in particular from 3 to 10 wt.-%, based on the total weight of the inventive automatic dishwashing detergent composition.

[0053] Oxydisuccinates and other derivatives of disuccinates, preferably ethylenediaminedisuccinate, are also further preferred organic builders that are often also referred to as cobuilders. In this case, ethylenediamine-N,N'-disuccinate (EDDS) is preferably used in the form of its sodium or magnesium salts. Furthermore, in this connection, preference is also given to glyceryl disuccinates and glyceryl trisuccinates as builders or cobuilders.

[0054] Inventive automatic dishwashing detergent compositions may preferably contain, as a builder, crystalline sheet-form sodium silicates of the general formula $NaMSi_xO_{2x+1} \cdot yH_2O$ wherein M is sodium or hydrogen; x is a number from 1.9 to 22, by preference from 1.9 to 4, particularly preferred values for x being 2, 3, or 4; and y is a number from 0 to 33, by preference from 0 to 20.

[0055] Also usable are amorphous sodium silicates having a $Na_2O:SiO_2$ modulus from 1:2 to 1:3.3, preferably from 1:2 to 1:2.8, and in particular from 1:2 to 1:2.6, which by preference are dissolution-delayed and exhibit secondary washing properties.

[0056] In case the inventive automatic dishwashing detergent compositions comprise one or more silicates, the amount of these silicates in the inventive compositions preferably is from 5 to 30 wt.-% and more preferably from 10 to 25 wt.-%, based on the total weight of the inventive automatic dishwashing detergent composition.

[0057] Phosphates have been proven to be effective builders in terms of cleaning performance. Among the many commercially obtainable phosphates, alkali-metal phosphates have the greatest significance in the washing- and cleaning-agent industry, particularly pentasodium or pentapotassium triphosphate (sodium or potassium tripolyphosphate).

[0058] "Alkali-metal phosphates" is the summary designation for the alkali-metal (particularly sodium and potassium) salts of the various phosphoric acids, in which context a distinction can be made between metaphosphoric acids $(HPO_3)_m$ and orthophosphoric acid H_3PO_4, in addition to higher-molecular-weight representatives. Phosphates have a combination of advantages: they act as alkali carriers, prevent lime deposits on machine parts and contribute to cleaning performance.

[0059] Phosphates that are technically especially important are pentasodium triphosphate $Na_5P_3O_{10}$ (sodium tripolyphosphate) and the corresponding potassium salt pentapotassium triphosphate $K_5P_3O_{10}$ (potassium tripolyphosphate). Further preferred phosphates are the sodium potassium tripolyphosphates.

[0060] If phosphates are used in the inventive automatic dishwashing detergent compositions, preferred compositions contain phosphate(s), preferably alkali-metal phosphate(s), particularly preferably pentasodium or pentapotassium triphosphate (sodium or potassium tripolyphosphate) in quantities from 2 to 50 wt.-%, preferably from 2 to 30 wt.-%, more preferably from 3 to 25 wt.-%, and particularly preferably from 3 to 15 wt.-%, based in each case on the total weight of the inventive automatic dishwashing detergent composition.

[0061] As further builders, inventive automatic dishwashing detergent compositions can contain one or more phosphonates that are often also referred to as cobuilders. The weight proportion of phosphonate, based on the total weight of the inventive automatic dishwashing detergent composition, preferably is from 0.5 to 20 wt.-%, and more preferably from 1.0 to 10 wt.-%.

[0062] Complexing phosphonates include a number of different compounds such as 1-hydroxyethane-1,1-diphosphonic acid (HEDP) or diethylenetriaminepenta(methylenephosphonic acid) (DTPMP). Hydroxyalkane- and aminoalkanephosphonates are particularly preferred. Among the hydroxyalkanephosphonates, 1-hydroxyethane-1,1-diphosphonate (HEDP) is of particular importance, preferably as a cobuilder. It is preferably used as a sodium salt, the disodium salt reacting neutrally and the tetrasodium salt in alkaline fashion (pH 9). Suitable aminoalkanephosphonates include ethylenediaminetetramethylenephosphonate (EDTMP), diethylenetriaminepentamethylenephosphonate (DTPMP), and their higher homologs. They are preferably used in the form of the neutrally reacting sodium salts (e.g. as a hexasodium salt of EDTMP or as a hepta- and octasodium salt of DTPMP). Of the class of the phosphonates, HEDP is preferred.

[0063] Inventive automatic detergent dishwashing compositions can contain as further builders alkali-metal hydroxides. These alkali carriers are used preferably only in small quantities, preferably in quantities of 10 wt.-% or less, more preferably 6 wt.-% or less, by preference 5 wt.-% or less, particularly preferably from 0.1 to 5 wt.-%, and in particular from 0.5 to 5 wt.-%, based on the total weight of the inventive automatic detergent dishwashing composition.

[0064] In a further preferred embodiment of the invention, the inventive automatic dishwashing detergent compositions comprise one or more builder substances selected from the group consisting of organic builders. In a particularly preferred

embodiment of the invention the inventive automatic dishwashing detergent compositions comprise one or more builder substances selected from the group consisting of citrate, methylglycinediacetic acid (MGDA) and ethylenediamine-N,N'-disuccinate (EDDS). In an even more preferred embodiment of the invention, the inventive automatic dishwashing detergent compositions comprise MGDA.

[0065] The inventive automatic detergent dishwashing compositions can contain the aforementioned builders both individually and as mixtures of two, three, four or more builders.

[0066] In a preferred embodiment of the invention the inventive automatic dishwashing detergent compositions do not comprise phosphate builders.

[0067] The inventive automatic dishwashing detergent compositions comprise the one or more builder substances preferably in amounts from 5 to 90 wt.-% and more preferably in amounts from 5 to 80 wt.-%, in each case based on the total weight of the inventive automatic dishwashing detergent composition.

[0068] The inventive automatic dishwashing detergent compositions comprise a bleaching system.

[0069] The bleaching system of the inventive automatic dishwashing detergent compositions preferably comprises one or more substances selected from the group consisting of bleaching agents, bleach activators and bleach catalysts.

[0070] As a bleaching agent, inventive automatic dishwashing detergent compositions can contain an oxygen bleaching agent. Among the compounds that serve as oxygen bleaching agents and yield H_2O_2 in water, sodium percarbonate, sodium perborate tetrahydrate, and sodium perborate monohydrate are particularly significant. Other usable bleaching agents include peroxypyrophosphates, citrate perhydrates, and peracid salts or peracids that yield H_2O_2, such as perbenzoates, peroxophthalates, diperazelaic acid, phthaloimino peracid, or diperdodecanedioic acid. Organic bleaching agents can also be used. Typical organic bleaching agents are diacyl peroxides such as dibenzoylperoxide. Further typical organic bleaching agents are peroxy acids such as alkylperoxy acids and arylperoxy acids.

[0071] Preferably, the inventive automatic dishwashing detergent compositions comprise one or more bleaching agents selected from the group consisting of oxygen bleaching agents, peroxypyrophosphates, citrate perhydrates, peracid salts or peracids that yield H_2O_2 and organic bleaching agents.

[0072] Particularly preferably, inventive automatic dishwashing detergent compositions contain, based on the total weight of the composition, from 1.0 to 20 wt.-%, preferably from 4.0 to 18 wt.-%, and more preferably from 8 to 15 wt.-% of an oxygen bleaching agent, preferably sodium percarbonate.

[0073] In order to achieve an improved bleaching effect when cleaning at temperatures of about 60 °C and below, inventive automatic dishwashing detergent compositions can additionally comprise one or more bleach activators. Preferably, the one or more bleach activators are selected from the group consisting of compounds that, under perhydrolysis conditions, yield aliphatic peroxycarboxylic acids having by preference 1 to 10 carbon atoms, in particular 2 to 4 carbon atoms, and/or optionally substituted perbenzoic acid. Substances that carry O- and/or N-acyl groups having the aforesaid number of carbon atoms, and/or optionally substituted benzoyl groups, are suitable. Polyacylated alkylenediamines are preferred, tetraacetylethylenediamine (TAED) having proven particularly suitable.

[0074] Bleach activators, in particular TAED, are preferably used in quantities of up to 10 wt.-%, in particular from 0.1 to 8 wt.-%, particularly from 2 to 8 wt.-%, and particularly preferably from 2 to 6 wt.-%, based in each case on the total weight of the bleach activator containing inventive automatic dishwashing detergent composition.

[0075] In addition to or instead of conventional bleach activators, so-called bleach catalysts can also be used. These substances are bleach-enhancing transition-metal salts or transition-metal complexes such as, for example, Mn, Fe, Co, Ru, or Mo salen complexes or carbonyl complexes. Mn, Fe, Co, Ru, Mo, Ti, V, and Cu complexes having nitrogen-containing tripod ligands, as well as Co, Fe, Cu, and Ru amine complexes, are also usable as bleach catalysts.

[0076] It is particularly preferred to use manganese complexes in oxidation states II, III, IV, or V, preferably containing one or more macrocyclic ligand(s) having the donor functions N, NR, PR, O, and/or S. Ligands having nitrogen donor functions are preferred. It is particularly preferred to use bleach catalyst(s) containing 1,4,7-trimethyl-1,4,7-triazacyclononane (Me-TACN), 1,4,7-triazacyclononane (TACN), 1,5,9-trimethyl-1,5,9-triazacyclododecane (Me-TACD), 2-methyl-1,4,7-trimethyl-1,4,7-triazacyclononane (Me/Me-TACN), and/or 2-methyl-1,4,7-triazacyclononane (Me/TACN) as macromolecular ligands. Suitable manganese complexes include $[Mn^{III}_2(\mu\text{-}O)_1(\mu\text{-}O)_1(\mu\text{-}OAc)_2(TACN)_2](ClO_4)_2$, $[Mn^{III}Mn^{IV}(\mu\text{-}O)_2(\mu\text{-}OAc)_1(TACN)_2](BPh_4)_2$, $[Mn^{IV}_4(\mu\text{-}O)_6(TACN)_4](ClO_4)_4$, $[Mn^{III}_2(\mu\text{-}O)_1(\mu\text{-}OAc)_2(Me\text{-}TACN)_2](ClO_4)_2$, $[Mn^{III}Mn^{IV}(\mu\text{-}O)_1(\mu\text{-}OAC)_2(Me\text{-}TACN)_2](ClO_4)_3$, $[Mn^{IV}_2(\mu\text{-}O)_3(Me\text{-}TACN)_2](PF_6)_2$, and $[Mn^{IV}_2(\mu\text{-}O)_3(Me/Me\text{-}TACN)_2](PF_6)_2(OAc{=}OC(O)CH_3)$.

[0077] In a further preferred embodiment of the invention, the inventive automatic dishwashing detergent compositions comprise one or more bleach catalysts selected from the group consisting of bleach-enhancing transition-metal salts and transition-metal complexes, preferably from manganese complexes with 1,4,7-trimethyl-1,4,7-triazacyclononane (Me-TACN) and 1,2,4,7-tetramethyl-1,4,7-triazacyclononane (Me_4-TACN), since cleaning results can be significantly improved with these bleach catalysts.

[0078] Preferably, the bleaching system comprises one or more bleaching agents and one or more substances selected from the group consisting of bleach activators and bleach catalysts. Particularly preferably the bleaching system comprises one or more bleaching agents, one or more bleach activators and one or more bleach catalysts.

[0079] The inventive automatic dishwashing detergent compositions comprise the bleaching system preferably in amounts from 0.1 to 40 wt.-%, more preferably in amounts from 0.5 to 30 wt.-% and particularly preferably in amounts from 3 to 25 wt.-%, in each case based on the total weight of the inventive automatic dishwashing detergent composition.

[0080] The inventive automatic dishwashing detergent compositions also comprise one or more enzymes, preferably one or more enzymes selected from the group consisting of proteases, amylases, lipases, hemicellulases, cellulases, perhydrolases and oxidoreductases, as well as preferably mixtures thereof. These enzymes are, in principle, of natural origin. Improved variants based on the natural molecules are available for use in automatic dishwashing detergent compositions and are correspondingly preferred for use. Inventive automatic dishwashing detergent compositions comprise the one or more enzymes preferably in amounts from $1x10^{-6}$ to 5 wt.-%, based on active protein and furthermore based on the total weight of the inventive automatic dishwashing detergent composition. Protein concentration can be determined by known processes such as the BCA process or biuret process.

[0081] A protein and/or enzyme can be protected, especially during storage, from damage such as inactivation, denaturing, or decomposition (e.g. resulting from physical influences, oxidation or proteolytic cleavage). Inhibition of proteolysis is particularly preferred in microbial recovery of proteins and/or enzymes, particularly when the inventive automatic dishwashing detergent compositions also contain proteases. Inventive automatic dishwashing detergent compositions can contain stabilizers for this purpose; the provision of such agents in inventive automatic dishwashing detergent compositions represents a preferred embodiment of the present invention.

[0082] Those inventive automatic dishwashing detergent compositions containing, based on the total weight of the composition, from 0.1 to 12 wt.-%, by preference from 0.2 to 10 wt.-%, and in particular from 0.5 to 8 wt.-% of enzyme preparation, are particularly preferred.

[0083] Inventive automatic dishwashing detergent compositions can be prepared in solid or liquid form, as well as a combination of solid and liquid presentation forms.

[0084] The inventive automatic dishwashing detergent compositions may comprise other ingredients commonly used in automatic dishwashing detergent compositions. In a further preferred embodiment of the invention the inventive automatic dishwashing detergent compositions comprise one or more compounds selected from the group consisting of complexing agents, glass corrosion inhibitors, water, organic solvents, thickening agents, further surfactants (in addition to the one or more compounds of the formula (I)), suds suppressors, color speckles, silvercare, anti-tarnish agents, anti-corrosion agents, dyes, fillers, germicides, hydrotropes, anti-oxidants, enzyme stabilizing agents, perfumes, solubilizing agents, carriers, processing aids, pigments and pH control agents.

[0085] Glass corrosion inhibitors are further preferred ingredients of the inventive automatic dishwashing detergent compositions. Glass corrosion inhibitors prevent the occurrence of clouding, smearing, and scratches, as well as iridescence, on the glass surface of automatically cleaned glassware. Preferred glass corrosion inhibitors include magnesium and zinc salts and magnesium and zinc complexes.

[0086] Cleaning performance of inventive automatic dishwashing detergent compositions can be improved by addition of organic solvents. A preferred embodiment of the present invention is therefore automatic dishwashing detergent compositions that contain at least one organic solvent. Preferred liquid inventive automatic dishwashing detergent compositions contain, based on the total weight of the composition, organic solvent in amounts from 0.2 to 15 wt.-%, by preference from 0.5 to 12 wt.-%, and particularly preferably from 1.0 to 10 wt.-%.

[0087] These organic solvents are, for example, monoalcohols, diols, triols, polyols, ethers, esters and/or amides. Organic solvents that are water-soluble are particularly preferred in this context, "water-soluble" solvents for purposes of the present application being solvents that are completely miscible with water (i.e. with no miscibility gap) at room temperature.

[0088] Organic solvents from organic amines and/or alkanolamines are effective in cleaning performance, and particularly with regard to cleaning performance on bleachable stains, in particular on tea stains.

[0089] In order to achieve the desired viscosity for liquid inventive automatic dishwashing detergent compositions, thickening agents can be added thereto. Thickening agents commonly used in automatic dishwashing detergent compositions can also be used in the inventive compositions.

[0090] It is advantageous if the respective liquid inventive automatic dishwashing detergent compositions contain the thickening agent in amounts preferably from 0.1 to 8 wt.-%, more preferably from 0.2 to 6 wt.-%, and particularly preferably from 0.4 to 4 wt.-%, based on the total weight of the inventive automatic dishwashing detergent composition.

[0091] The further surfactants preferably are selected from the group consisting of zwitterionic surfactants, anionic surfactants and mixtures thereof.

[0092] The zwitterionic surfactant preferably is chosen from the group consisting of C_8 to C_{18} (preferably C_{12} to C_{18}) amine oxides and sulfo and hydroxy betaines, such as N-alkyl-N,N-dimethylammino-1-propane sulfonate where the alkyl group can be C_9 to C_{18}, preferably C_{10} to C_{14}.

[0093] The anionic surfactant preferably is chosen from alkylethoxysulfates, with a degree of ethoxylation greater than 3, preferably 4 to 10, and more preferably 6 to 8, and a chain length in the range of C_8 to C_{16} and preferably C_{11} to C_{15}. Additionally, branched alkylcarboxylates have been found to be useful for the purpose of the present invention when

the branch occurs in the middle and the average total chain length is 10 to 18, preferably 12 to 16 with the side branch having 2 to 4 carbons in length. An example is 2-butyloctanoic acid. The anionic surfactant is typically of a type having good solubility in the presence of calcium. Such anionic surfactants are further illustrated by sulfobetaines, alkyl(polyethoxy) sulfates (AES), and short chained C_6-C_{10} alkyl sulfates and sulfonates. Straight chain fatty acids have been shown to be ineffective due to their sensitivity to calcium.

[0094] In a further preferred embodiment of the present invention, the inventive automatic dishwashing detergent compositions do not comprise other surfactants in addition to the one or more compounds of the formula (I).

[0095] The suds suppressors, color speckles, silvercare, anti-tarnish and/or anti-corrosion agents, dyes, fillers, germicides, hydrotropes, anti-oxidants, enzyme stabilizing agents, perfumes, solubilizing agents, carriers, processing aids, pigments, and pH control agents can be chosen from the respective substances commonly used in automatic dishwashing detergent compositions.

[0096] In a further preferred embodiment of the invention, the inventive automatic dishwashing detergent compositions do not comprise phosphate builders and more preferably the inventive automatic dishwashing detergent compositions do not comprise phosphates, i.e. they are phosphate-free.

[0097] In a further preferred embodiment of the invention, the inventive automatic dishwashing detergent compositions are liquid at 20 °C. Liquid presentation forms, preferably based on water and/or organic solvents, can exist in thickened form as gels. Capsules are especially suitable as liquid presentation form, in single-phase or multi-phase. Preferably, the inventive liquid compositions comprise up to 60 wt.-% of water, more preferably from 10 to 60 wt.-% of water and even more preferably from 25 to 60 wt.-% of water, in each case based on the total weight of the inventive liquid automatic dishwashing detergent composition.

[0098] In a further preferred embodiment of the invention the inventive automatic dishwashing detergent compositions are solid at 20 °C. Powders, granulates, extrudates, or compactates, particularly tablets, in single-phase or multi-phase, are especially suitable as solid presentation forms. Tablets are formulated for single dose applications. Preferably, the inventive solid compositions comprise less than 20 wt.-% of water, more preferably from 0.1 to 20 wt.-% of water and even more preferably from 0.5 to 5 wt.-% of water, in each case based on the total weight of the inventive solid automatic dishwashing detergent composition. In another preferred embodiment of the invention, the inventive automatic dishwashing detergent compositions are water-free.

[0099] In an even more preferred embodiment of the invention the inventive automatic dishwashing detergent compositions are present in the form of a tablet.

[0100] Because elevated alkalinity of the inventive automatic dishwashing detergent compositions contributes to the cleaning performance of these compositions, but also to the corrosive and irritating effect of these compositions, preferred inventive automatic dishwashing detergent compositions have an alkaline pH at 20 °C from 8 to 14, preferably from 9 to 11.5, and more preferably from 9.5 to 11.5, measured as a solution of 10 wt.-% of the liquid or solid inventive automatic dishwashing detergent composition in water.

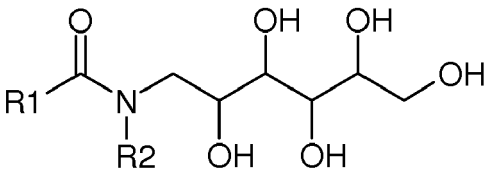
[0101] The inventive automatic dishwashing detergent compositions are advantageously suited for washing tableware in automatic dishwashing machines, whereby soiled tableware is treated in an automatic dishwashing machine with an aqueous alkaline composition comprising an inventive automatic dishwashing detergent composition.

[0102] Therefore, the present invention also provides a method of washing tableware in an automatic dishwashing machine, comprising treating soiled tableware in an automatic dishwashing machine with an aqueous alkaline composition comprising an inventive automatic dishwashing detergent composition.

[0103] In the inventive method of washing tableware the pH value of the aqueous alkaline composition preferably is 8 or higher and more preferably 9 or higher.

[0104] The one or more N-Acylglucamines of formula (I) are advantageously suited for improving the rinse performance of an inventive automatic dishwashing detergent composition, for improving the wetting of tableware or for reducing spotting and filming of tableware, preferably in an inventive method of washing tableware in an automatic dishwashing machine.

[0105] Therefore, the present invention also provides the use of one or more N-Acylglucamines of formula (I)



(I)

or mixtures thereof, wherein

R1 is a linear or branched saturated alkyl group comprising from 11 to 21 carbon atoms or a linear or branched

unsaturated alkenyl group with one or more double bonds and comprising from 11 to 21 carbon atoms,
R2 is hydrogen or a linear or branched saturated alkyl group comprising from 1 to 4 carbon atoms

for improving the rinse performance of an inventive automatic dishwashing detergent composition, for improving the wetting of tableware or for reducing spotting and filming of tableware, preferably in an inventive method of washing tableware in an automatic dishwashing machine.

[0106] The preferred embodiments given above for the inventive automatic dishwashing detergent compositions also apply accordingly to the inventive method of washing tableware in an automatic dishwashing machine and to the inventive use of one or more N-Acylglucamines of formula (I) for improving the rinse performance of an inventive automatic dishwashing detergent composition, for improving the wetting of tableware and reducing spotting and filming of tableware.

[0107] The examples below are intended to illustrate the invention in detail without, however, limiting it thereto. Unless explicitly stated otherwise, all of the percentages are percentages by weight (% by wt. or wt.-%).

Examples: Rinse performance of automatic dishwashing detergents:

[0108] The rinse performance of formulation F1 containing N-Methyl-N-oleoylglucamine was investigated. The rinse performance of formulations F2 and F3 containing N-Methyl-N-$C_{8/10}$-acylglucamine or a fatty alcohol alkoxylate were tested as comparative examples.

[0109] Test conditions:

Dishwasher:	Miele G 1222 SC GSL
Test dishes (8 groups):	6 drinking glasses (higher quality)
	6 drinking glasses (lower quality)
	3 polypropylene bowls
	3 melamin plates
	3 butter dishes + 4 knives (stainless steel; lower quality)
	4 knives (stainless steel; higher quality)
	3 porcelain plates (higher quality)
	3 porcelain plates (lower quality)
Dishwasher program:	Program 4, R = 2 without pre-wash
	Main wash at 50 °C
	Rinse cycle at 65 °C
Water hardness:	21 °dH
Water softening:	none
Detergent dosage:	18 g added in the dosing chamber before starting the test
Soil:	100 g of frozen soil added immediately after the dosage chamber opened
Rinse-aid:	none
No. of cleaning cycles:	4

[0110] All items besides the polypropylene bowls were pre-treated once with demineralized water, Neodisher A 8, citric acid and again demineralized water.

Evaluation:

[0111] The evaluation of the test dishes was started earliest 30 minutes after opening the door of the dishwasher after completion of the dishwashing cycle. In each test the dishwashing cycles 2 - 4 were evaluated. Each test dish was assessed according to the following rating:
Rinse effects considered for visual grading:

Spots	Spots with different size and intensity
Contact spots	Spots coming from contact points between tableware and parts of the dishwasher
Stripes	Rinse streaks
Filming	Continuous film spread evenly over the test dish
Structured filming	Scattered, ruptured film
Solid residues	Solid powdered or crystalline residues

(continued)

Fatty residues Fatty drops or filming

Visual Grading:

10 perfect
9 perfect to just visible
8 just visible
7 just visible to visible
6 visible
5 visible to interfering
4 interfering
3 interfering to not acceptable
2 not acceptable
1 absolutely not acceptable

[0112] The combination of the above mentioned seven rinse effects results in a score from 1 - 10 according to the visual grading above for each test dish, a score of 1 standing for the worst performance, a score of 10 for the best performance. For each of the 8 test dish groups listed above, the average score for all dishes of the group and all three evaluated dishwashing cycles 2 - 4 was formed. To compare the different formulations F1 - F3, the sum of the average scores for each test dish group was used as overall rinse performance. This leads to a theoretical maximum value with best rinse performance of 80.0 and a theoretical minimal value with poorest rinse performance of 8.0.

Compositions:

[0113] The compositions of formulations F1 - F3 and the values for the overall rinse performance are given in the following Table A.

Table A: Composition and overall rinse performance values for F1 - F3

Component	F1 wt.-%*)	F2 wt.-%*)	F3 wt.-%*)
Trisodium citrate dihydrate	30.0	30.0	30.0
Sodium carbonate	20.0	20.0	20.0
Sodium silicate	2.0	2.0	2.0
MGDA-Na_3	15	15	15
Polycarboxylate	10	10	10
Sodium percarbonate	9.0	9.0	9.0
TAED	2.0	2.0	2.0
HEDP	0.9	0.9	0.9
Protease	0.5	0.5	0.5
Amylase	0.5	0.5	0.5
N-Methyl-N-oleoylglucamine	3.5	-	-
N-Methyl-N-$C_{8/10}$-acylglucamine	-	3.5	-
$C_{12/15}$-oxo alcohol alkoxylate	-	-	3.5
Water	Ad 100	Ad 100	Ad 100
Sodium sulfate	-	-	2.4**)
Overall rinse performance	35.3	24.5	25.6

*) Ingredients are added in wt.-% related to their active content.
**) Sodium sulphate is added as filler for a constant mass balance of the automatic dishwashing composition without any function and without having an influence on the performance of the automatic dishwashing composition.

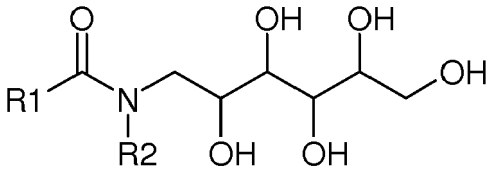
[0114] From the results of Table A above it can be seen that the use of the inventive automatic dishwashing detergent composition F1 results in better values for the rinse performance compared to the use of the comparative formulations F2 and F3.

[0115] Furthermore, in the above example the inventive automatic dishwashing detergent composition F1 shows a very good overall cleaning performance.

Claims

1. Automatic dishwashing detergent composition comprising

a) one or more N-Acylglucamines of formula (I)



(I)

or mixtures thereof, wherein

R1 is a linear or branched saturated alkyl group comprising from 11 to 21 carbon atoms or a linear or branched unsaturated alkenyl group with one or more double bonds and comprising from 11 to 21 carbon atoms,
R2 is hydrogen or a linear or branched saturated alkyl group comprising from 1 to 4 carbon atoms, and

b) one or more builder substances, and
c) a bleaching system, and
d) one or more enzymes.

2. Automatic dishwashing detergent composition according to claim 1, **characterized in that** R2 in the one or more N-Acylglucamines of formula (I) is a methyl group.

3. Automatic dishwashing detergent composition according to claim 1 or 2, **characterized in that** R1 in the one or more N-Acylglucamines of formula (I) is a linear or branched saturated alkyl group comprising from 11 to 17 carbon atoms or a linear or branched unsaturated alkenyl group with one or more double bonds and comprising from 11 to 17 carbon atoms.

4. Automatic dishwashing detergent composition according to claim 3, **characterized in that** R1 in the one or more N-Acylglucamines of formula (I) is a linear or branched saturated alkyl group comprising from 15 to 17 carbon atoms or a linear or branched unsaturated alkenyl group with one or more double bonds and comprising from 15 to 17 carbon atoms.

5. Automatic dishwashing detergent composition according to one or more of claims 1 to 4, **characterized in that** in the one or more N-Acylglucamines of formula (I) 50 wt.-% or more, preferably 60 to 99 wt.-% and more preferably 70 to 98 wt.-% of the groups R1 are linear or branched saturated alkyl groups comprising 17 carbon atoms.

6. Automatic dishwashing detergent composition according to one or more of claims 1 to 5, **characterized in that** in the one or more N-Acylglucamines of formula (I) at most 50 wt.-%, preferably 0.1 to 50 wt.-%, more preferably 0.5 to 40 wt.-% and even more preferably 1.0 to 30 wt.-% of the groups R1 are linear or branched saturated alkyl groups comprising 15 carbon atoms.

7. Automatic dishwashing detergent composition according to one or more of claims 1 to 6, **characterized in that** in the one or more N-Acylglucamines of formula (I) 50 wt.-% or more, preferably 80 wt.-% or more and more preferably 90 wt.-% or more of the groups R1 are linear or branched unsaturated alkenyl groups with one or more double bonds.

8. Automatic dishwashing detergent composition according to one or more of claims 1 to 7, **characterized in that** in

the one or more N-Acylglucamines of formula (I) 50 wt.-% or more, preferably 80 wt.-% or more and more preferably 90 wt.-% or more of the groups R1 are linear or branched unsaturated alkenyl groups with one or more double bonds and comprising 17 carbon atoms.

9. Automatic dishwashing detergent composition according to one or more of claims 1 to 8, **characterized in that** in the one or more N-Acylglucamines of formula (I) R1 is a linear group.

10. Automatic dishwashing detergent composition according to one or more of claims 1 to 4 and 6 to 9, **characterized in that** R1 CO is derived from oleic acid.

11. Automatic dishwashing detergent composition according to one or more of claims 1 to 10, **characterized in that** it comprises the one or more N-Acylglucamines of formula (I) in amounts from 0.1 to 15 wt.-%, preferably in amounts from 0.2 to 10 wt.-% and more preferably in amounts from 0.2 to 5 wt.-%, in each case based on the total weight of the automatic dishwashing detergent composition.

12. Automatic dishwashing detergent composition according to one or more of claims 1 to 11, **characterized in that** it comprises one or more builder substances selected from the group consisting of carbonates, hydrogencarbonates, organic builders, silicates, phosphates, phosphonates and alkali-metal hydroxides.

13. Automatic dishwashing detergent composition according to one or more of claims 1 to 12, **characterized in that** it comprises one or more builder substances selected from the group consisting of organic builders.

14. Automatic dishwashing detergent composition according to one or more of claims 1 to 13, **characterized in that** it comprises one or more builder substances selected from the group consisting of citrate, methylglycinediacetic acid and ethylenediamine-N,N'-disuccinate.

15. Automatic dishwashing detergent composition according to one or more of claims 1 to 14, **characterized in that** it comprises the one or more builder substances in amounts from 5 to 90 wt.-% and preferably in amounts from 5 to 80 wt.-%, in each case based on the total weight of the automatic dishwashing detergent composition.

16. Automatic dishwashing detergent composition according to one or more of claims 1 to 15, **characterized in that** the bleaching system comprises one or more substances selected from the group consisting of bleaching agents, bleach activators and bleach catalysts.

17. Automatic dishwashing detergent composition according to claim 16, **characterized in that** it comprises one or more bleaching agents selected from the group consisting of oxygen bleaching agents, peroxypyrophosphates, citrate perhydrates, peracid salts or peracids that yield H_2O_2 and organic bleaching agents.

18. Automatic dishwashing detergent composition according to claim 16 or 17, **characterized in that** it comprises one or more bleach activators selected from the group consisting of compounds that, under perhydrolysis conditions, yield aliphatic peroxycarboxylic acids having by preference 1 to 10 carbon atoms, in particular 2 to 4 carbon atoms, and/or optionally substituted perbenzoic acid.

19. Automatic dishwashing detergent composition according to one or more of claims 16 to 18, **characterized in that** it comprises one or more bleach catalysts selected from the group consisting of bleach-enhancing transition-metal salts and transition-metal complexes.

20. Automatic dishwashing detergent composition according to one or more of claims 1 to 19, **characterized in that** it comprises the bleaching system in amounts from 0.1 to 40 wt.-%, preferably in amounts from 0.5 to 30 wt.-% and more preferably in amounts from 3 to 25 wt.-%, in each case based on the total weight of the inventive automatic dishwashing detergent composition.

21. Automatic dishwashing detergent composition according to one or more of claims 1 to 20, **characterized in that** it comprises one or more enzymes selected from the group consisting of proteases, amylases, lipases, hemicellulases, cellulases, perhydrolases and oxidoreductases.

22. Automatic dishwashing detergent composition according to one or more of claims 1 to 21, **characterized in that** it comprises the one or more enzymes in amounts from $1x10^{-6}$ to 5 wt.-%, based on active protein and furthermore

based on the total weight of the automatic dishwashing detergent composition.

23. Automatic dishwashing detergent composition according to one or more of claims 1 to 22, **characterized in that** it comprises one or more compounds selected from the group consisting of complexing agents, glass corrosion inhibitors, water, organic solvents, thickening agents, further surfactants, suds suppressors, color speckles, silvercare, anti-tarnish agents, anti-corrosion agents, dyes, fillers, germicides, hydrotropes, anti-oxidants, enzyme stabilizing agents, perfumes, solubilizing agents, carriers, processing aids, pigments and pH control agents.

24. Automatic dishwashing detergent composition according to one or more of claims 1 to 23, **characterized in that** it does not comprise phosphate builders and preferably is phosphate-free.

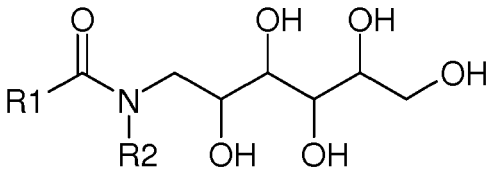
25. Automatic dishwashing detergent composition according to one or more of claims 1 to 24, **characterized in that** it is solid at 20 °C and is present in the form of a tablet.

26. Automatic dishwashing detergent composition according to one or more of claims 1 to 25, **characterized in that** it has an alkaline pH at 20 °C from 8 to 14, preferably from 9 to 11.5, and more preferably from 9.5 to 11.5, measured as a solution of 10 wt.-% of the liquid or solid automatic dishwashing detergent composition in water.

27. Method of washing tableware in an automatic dishwashing machine, **characterized in that** soiled tableware is treated in an automatic dishwashing machine with an aqueous alkaline composition comprising an automatic dishwashing detergent composition according to one or more of claims 1 to 26.

28. Method according to claim 27, **characterized in that** the pH value of the aqueous alkaline composition is 8 or higher and preferably 9 or higher.

29. Use of one or more N-Acylglucamines of formula (I)



(I)

or mixtures thereof, wherein

R1 is a linear or branched saturated alkyl group comprising from 11 to 21 carbon atoms or a linear or branched unsaturated alkenyl group with one or more double bonds and comprising from 11 to 21 carbon atoms,
R2 is hydrogen or a linear or branched saturated alkyl group comprising from 1 to 4 carbon atoms

for improving the rinse performance of an automatic dishwashing detergent composition according to one or more of claims 1 to 26, for improving the wetting of tableware or for reducing spotting and filming of tableware, preferably in a method according to claim 27 or 28.

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 15 17 4158

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 98/17759 A1 (PROCTER & GAMBLE [US]; HALL ROBIN GIBSON [GB]; MOSS MICHAEL ALAN JOHN) 30 April 1998 (1998-04-30)	1-28	INV. C11D1/52 C11D3/39 C11D3/395 C11D3/386
Y	* example 8 * * claims 1,15 * * page 41, paragraph 2 - paragraph 3 * * page 37, paragraph 1 - page 39, paragraph 1 * * page 12, paragraph 1 - page 27, paragraph 4 * * page 8, paragraph 5 *	29	
X,D	WO 92/06154 A1 (PROCTER & GAMBLE [US]) 16 April 1992 (1992-04-16)	1-28	
Y	* claims * * examples XI,XIV,XVI * * page 59, line 31 - page 60, line 32 * * page 49, line 14 - page 50, line 3 * * page 2, line 28 - line 34 * * page 7, line 4 - page 10, line 5 *	29	
X	WO 97/25397 A1 (PROCTER & GAMBLE [US]; MCKILLOP KIRSTEN LOUISE [US]; FOLEY PETER ROBER) 17 July 1997 (1997-07-17)	1-24, 26-28	TECHNICAL FIELDS SEARCHED (IPC) C11D
Y	* example IV * * claims * * page 21, line 7 - page 23, line 10 * * page 10, line 31 - page 13, line 7 * * page 7, line 20 - page 8, line 28 *	29	

-/--

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 November 2015	Neys, Patricia

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 15 17 4158

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 2 292 564 A (PROCTER & GAMBLE [US]) 28 February 1996 (1996-02-28) * claims * * examples I-VI * * page 32, paragraph 2 - page 34, last paragraph * * page 14, paragraph 3 - page 21, last paragraph * * page 9, paragraph 1 *	1-26	
X	WO 97/00936 A1 (PROCTER & GAMBLE [US]; BOUTIQUE JEAN POL [BE]; GOSSELINK EUGENE PAUL [) 9 January 1997 (1997-01-09) * claims * * example * * page 41, last paragraph - page 43, paragraph 1 * * page 39, paragraph 2 - page 40, paragraph 2 * * page 33, paragraph 1 * * page 24, paragraph 5 - page 28, last paragraph *	1-4,9, 11-25	TECHNICAL FIELDS SEARCHED (IPC)
Y	US 5 691 300 A (FABRY BERND [DE] ET AL) 25 November 1997 (1997-11-25) * claims * * examples 3,6,9,12 * * column 2, line 46 - line 51 * * column 3, line 29 - line 51 *	29	
A,D	WO 93/07246 A1 (BEROL NOBEL AB [SE]; EKA NOBEL AB [SE]) 15 April 1993 (1993-04-15) * claims * * example 5 * * page 1, line 1 - line 10 * * page 4, line 6 - line 8 * * page 4, line 26 - line 30 * * page 5, line 26 - page 6, line 3 *	1-29	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 November 2015	Neys, Patricia

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 17 4158

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

26-11-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9817759 A1	30-04-1998	AR 010003 A1	17-05-2000
		AT 223956 T	15-09-2002
		BR 9712363 A	31-08-1999
		CA 2268518 A1	30-04-1998
		DE 69715463 D1	17-10-2002
		DE 69715463 T2	07-08-2003
		EP 0970169 A1	12-01-2000
		MA 24380 A1	01-07-1998
		WO 9817759 A1	30-04-1998
WO 9206154 A1	16-04-1992	AT 155521 T	15-08-1997
		AU 663851 B2	26-10-1995
		AU 8669991 A	28-04-1992
		BR 9106919 A	17-08-1993
		CA 2092556 A1	29-03-1992
		CN 1061042 A	13-05-1992
		CZ 9300373 A3	13-04-1994
		CZ 9300576 A3	13-04-1994
		DE 69126879 D1	21-08-1997
		DE 69126879 T2	19-02-1998
		EP 0550695 A1	14-07-1993
		HU T63871 A	28-10-1993
		IE 913410 A1	08-04-1992
		JP 2854136 B2	03-02-1999
		JP H06501042 A	27-01-1994
		NZ 240027 A	27-06-1995
		SK 21093 A3	06-10-1993
		SK 46293 A3	12-01-1994
		TR 25688 A	01-09-1993
		TW 200526 B	21-02-1993
		WO 9206154 A1	16-04-1992
WO 9725397 A1	17-07-1997	AR 005345 A1	28-04-1999
		BR 9612408 A	13-07-1999
		CA 2241884 A1	17-07-1997
		CN 1209161 A	24-02-1999
		CO 4700537 A1	29-12-1998
		EP 0882118 A1	09-12-1998
		JP H11501981 A	16-02-1999
		US 6162778 A	19-12-2000
		WO 9725397 A1	17-07-1997
GB 2292564 A	28-02-1996	BR 9508535 A	28-10-1997
		CN 1159824 A	17-09-1997
		EG 20780 A	29-02-2000
		EP 0775190 A1	28-05-1997

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 17 4158

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

26-11-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		GB 2292155 A	14-02-1996
		GB 2292564 A	28-02-1996
		IL 114824 A	28-10-1999
		JP H10504056 A	14-04-1998
		MA 23645 A1	01-04-1996
		PE 13696 A1	07-05-1996
		TR 9500995 A2	21-06-1996
		WO 9605280 A1	22-02-1996
		ZA 9506663 A	22-03-1996
WO 9700936 A1	09-01-1997	DE 69514691 D1	24-02-2000
		DE 69514691 T2	10-08-2000
		EP 0833886 A1	08-04-1998
		JP H11508291 A	21-07-1999
		WO 9700936 A1	09-01-1997
US 5691300 A	25-11-1997	AT 176921 T	15-03-1999
		CA 2167170 A1	26-01-1995
		DE 4323253 C1	05-01-1995
		DK 0708815 T3	27-09-1999
		EP 0708815 A1	01-05-1996
		ES 2129661 T3	16-06-1999
		US 5691300 A	25-11-1997
		WO 9502666 A1	26-01-1995
WO 9307246 A1	15-04-1993	AU 2698992 A	03-05-1993
		DE 69211704 D1	25-07-1996
		DE 69211704 T2	31-10-1996
		EP 0606407 A1	20-07-1994
		US 5395543 A	07-03-1995
		WO 9307246 A1	15-04-1993

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 3382176 A **[0010]**
- US 4272394 A **[0011]**
- US 6593287 B **[0012]**
- WO 9422800 A **[0013]**
- WO 8809369 A **[0014]**
- WO 9206154 A **[0016]**
- WO 9206155 A **[0017]**
- WO 9307246 A **[0018]**
- WO 9502666 A **[0019]**
- EP 0550637 A **[0032]**
- EP 0285768 A **[0032]**
- US 20100160204 A1 **[0034]**
- EP 1757676 A1 **[0034]**