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(54) **granular DETERGENT COMPOSITION**

granulare WASCHMITTELZUSAMMENSETZUNG

COMPOSITION DETERGENTE granulé

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Description

Technical Field

[0001] The present invention relates to a granular detergent composition comprising an anionic sulphate surfactant and a hydrotrope. The invention also relates to a detergent particle comprising an anionic sulphate surfactant and a hydrotrope. The invention also relates to the use of a hydrotrope in a detergent composition which comprises an anionic sulphate surfactant and which upon contact with water can form a viscous mixture to reduce the viscosity of this mixture.

Background to the Invention

[0002] There is a constant need amongst consumers of detergents for improved detergents which have a better cleaning performance whilst being economic in use. Detergent manufacturers are therefore faced with the challenge to improve their detergents without incurring increased production costs caused by the use of more expensive ingredients or production methods.

[0003] It has been found that one of the main difficulties encountered by consumers of detergent products, especially laundry and dish washing detergents, is the formation of residues or insoluble clumps of detergent in the dispensing drawer, dispensing device or even in the (dish) washing machine, in particular the formation of gel residues. This is undesirable because these residues or gels are difficult to remove from the machines and can give the machine an unclean appearance. Furthermore, the formation of residues, insoluble clumps or gels leads to an non-economic use of the detergent product: incomplete delivery of the detergent product into the wash water can lead to a poorer cleaning performance unless the consumer adds some extra detergent product to the wash. This is not an efficient or economic use of the product and is undesirable for the consumer.

[0004] Therefore, there is a need to improve the delivery of detergent compositions. One approach to this problem has been to improve the solubility of detergents. This has resulted in a change of detergent compositions and ways of formulating. However, even rapidly dissolving detergents have the tendency to stick together to form gels or insoluble clumps upon first contact with water. Even though a more rapid dissolving can lead to the reduction of the contact time of the undissolved product with the water, this does not solve this problem sufficiently. There will still be a poor delivery of the detergent. The problem of poor delivery of the detergent to the wash can also be addressed by improving the dispension of the detergent.

[0005] The Applicants have found that this problem is even more apparent when anionic sulphate surfactants (which can be partially or mostly water-soluble) are employed in the granular detergent composition. The problem can even be increased when the anionic sulphate surfactant is present in a dried particle. It is believed that gel formation can be set off by the anionic sulphate surfactant which may tend to promote gel formation upon contact with water, rather than dissolving completely in the water. This can then prevent delivery of other components of the detergent into the wash water. Furthermore, it is believed that when the anionic sulphate surfactant is present in a dried particle, gel formation is even increased, because the dried particle is hygroscopic. The gel is subsequently difficult to dispense, leading to residues and insoluble clumps in the machine and in particular in the dispensing drawer or device.

[0006] The Applicants have found that this problem of gel formation and poor dispensing can be solved or ameliorated by the incorporation of a granular detergent composition comprising:

a) an anionic sulphate surfactant present at a level of from 0.01% to 95% by weight of the composition;
b) a hydrotrope present at a level of from 0.01% to 60% by weight of the composition

characterised in that the granular composition comprises (1) spray dried particles comprising the anionic sulphate and the hydrotrope and (2) agglomerate particles containing 0% to 1.8%, by weight, of the hydrotrope.

[0007] In general, hydrotropes are known in the art as compounds which have the property to increase the solubility of slightly soluble compounds. Various uses of hydrotropes in detergents, in particular in liquid detergents, have been described. WO 95/30730 describes hydrotropes as an aid for phase stabilisation in liquid detergents. US 3,926,827 describes hydrotropes as components which can retain oxygen bubbles, giving the detergent more volume. GB 1591516 describes hydrotropes as a process aid to obtain free-flowing detergent mixtures. However, the use of hydrotropes in granular detergent compositions comprising anionic sulphate surfactant to obtain improved dispensing of the detergent composition is not known in the art.

[0008] US-A-3 915 903 and GB-A-2158 087 disclose a detergent composition made by a spray-drying process of an aqueous slurry comprising (a) about 4-35% of alkyl sulfate and (b) about 1% of a hydrotrope. However, both documents are silent about a second type of particle.

[0009] US-A-5 569 645 discloses an optimum ratio of detergent agglomerates and spray-dried particles which results in less caking. The agglomerates comprise surfactants selected from anionic, nonionic, zwitterionic, etc. of which the

anionic surfactants can be selected from sulfonates, sarcosinates, sulfates, etc.. Hydrotropes are only optional components without any weight range given. Although a list of optional components were claimed in claim 1, hydrotropes are not considered essential to the invention of this document.

[0010] In the present invention, it is believed that the hydrotrope reduces the viscosity of gels formed by the sulphate surfactant which is present in the detergent composition, or detergent particle, upon contact with water. This produces improved dispensing of the detergent composition into the wash water by minimising the formation of insoluble clumps or gels or residues in the machine. Reduction of the detergent clumps, residues or gels in the machine and in particular in the dispensing drawer or dispensing device, leads to a cleaner appearance of the washing machine and more efficient and cost-effective performance of the detergent composition.

Summary of the Invention

[0011] According to the present invention there is provided a granular detergent composition comprising:

a) an anionic sulphate surfactant present at a level of from 0.01% to 95% by weight of the composition;
b) a hydrotrope present at a level of from 0.01% to 60% by weight of the composition

characterised in that the granular composition comprises (1) spray dried particles comprising the anionic sulphate and the hydrotrope and (2) agglomerate particles containing 0% to 1.8%, by weight, of the hydrotrope. The invention also provides a detergent particle comprising an anionic sulphate surfactant, present at a level of from 0.01% to 60% by weight of the composition, and a hydrotrope, present at a level of from 0.01% to 45% by weight of the particle.

[0012] The invention also provides improved dispensing of detergent compositions by use in a detergent composition which comprises a surfactant component comprising an anionic sulphate surfactant, the surfactant component upon contact with water forming a viscous mixture, of a hydrotrope to reduce the viscosity of the mixture.

Detailed Description of the Invention

Anionic sulphate surfactant

[0013] The anionic sulphate surfactant of the invention is present in the detergent composition at a level of from 0.01% to 95%, more preferably from 0.5% to 45%, more preferably from 1 % to 30%, most preferably from 3% to 20% by weight of the composition.

[0014] When present in a spray dried particle, comprising the hydrotrope, the anionic sulphate surfactant is preferably present at a level of from 0.01% to 60%, more preferably from 0.3% to 30%, most preferably from 1% to 20% by weight of the particle.

[0015] By anionic sulfate surfactants, when used herein, is meant the linear and branched primary and secondary alkyl sulfates, alkyl ether sulphates, fatty oleoyl glycerol sulfates, alkyl phenol ethylene oxide ether sulfates, the C_5-C_{17} acyl-N-(C_1-C_4 alkyl) and -N-(C_1-C_2 hydroxyalkyl)glucamine sulfates, and sulfates of alkylpolysaccharides such as the sulfates of alkylpolyglucoside (the nonionic nonsulfated compounds being described herein).

[0016] Alkyl sulfate surfactants are most preferably selected from the linear and branched primary C_{10}-C_{18} alkyl sulfates, more preferably the C_{11}-C_{15} branched chain alkyl sulfates and the C_{12}-C_{14} linear chain alkyl sulfates.

[0017] A highly preferred sulphate surfactant are the sodium or potassium salts of the sulphates, produced by sulphating C_8-C_{18} alcohols derived from tallow or coconut oil. Also highly preferred can be the sodium or potassium salts of the sulphates C16-C18 alcohols derived from palmeric fatty acid or stearic fatty acid.

[0018] The cation of the anionic sulphate surfactant may be hydrogen, ammonium or alcohol amine, but preferably sodium or potassium.

[0019] The ratio of the anionic sulphate surfactant to the hydrotrope is preferably from 100:1 to 1:2, more preferably from 50:1 to 1:1, most preferably from 20:1 to 2:1.

Hydrotrope

[0020] In accordance with the invention a hydrotrope is present in the particle, comprising the anionic sulphate surfactant or used in the granular detergent composition, comprising a surfactant component, comprising the anionic sulphate surfactant and optionally any additional surfactant as described herein.

[0021] The anionic sulphate surfactant (comprised in the surfactant component), comprised in the particle, forms upon contact with water a viscous mixture, as described above. The hydrotrope is used to reduce the viscosity of the mixture. Thus, by the term hydrotrope when used herein is meant any of the hydrotropes known in the art, capable of reducing the viscosity of a mixture, comprising water and an anionic sulphate surfactant.

[0022] The level of hydrotrope in the granular detergent composition is from 0.01 % to 60%, more preferably from 0.1 % to 30%, even more preferably from 0.3% to 10%, most preferably from 0.5% to 5%, whereby from 0.0% to 1.8% by weight of the composition is a hydrotrope-containing agglomerate.

[0023] The level of the hydrotrope in the spray-dried particle, is preferably from 0.01% to 60%, preferably from 0.1% to 25%, more preferably from 0.4% to 15%, most preferably from 0.5% to 5% by weight of the particle.

[0024] Only upto 1.8% of the hydrotrope, more preferably upto 1.0%, most preferably 0% of the hydrotrope, is comprised in an agglomerate, because it is found that these levels of agglomerated hydrotrope are more useful for the present invention.

[0025] Any of the hydrotropes known in the art can be used in the present invention. Among such hydrotropes there can be mentioned the short-chain (C_1-C_4) alk-aryl sulfonates.

The invention herein should be understood to cover sulfonic acid. However, since the pH of the detergent composition or the particle of the present invention is typically in the alkaline range, the hydrotrope component exists primarily as the ionized salt, when water, even small amount, are present during the formulation of the particle or the composition comprising the particle. In other words, although the hydrotrope may be added to the composition in its acidic form, it is likely to appear in the formula as a salt derivative.

[0026] The water-soluble salts useful in the present invention include the alkali metal, alkaline earth metal, alkyl amine and ammonium salts of the sulfonic acid. Preferred salts are sodium, potassium, and monoethanolamine sulfonate, and mixtures thereof.

[0027] In particular, the toluene sulfonates, the cumene sulfonates, the xylene sulfonates may be used in this invention. Most preferred is a sodium toluene sulfonate, being preferably a sodium toluene monosulphonate.

Use of the hydrotrope

[0028] The hydrotrope of the present invention is used in the granular detergent compositions, comprising a surfactant component, comprising an anionic sulphate surfactant to reduce the viscosity of the surfactant component upon contact with water. Preferably, a surfactant component which has a first viscosity A of at least 15000 cP in a 25% by weight solution in water at 20°C, as measured by the Surfactant Viscosity Test as described below, has when a hydrotrope is used in the surfactant component, a second viscosity B which is 25% less then the first viscosity A.

[0029] The surfactant component comprises anionic sulphate surfactant and optionally one or more surfactants, selected from the surfactants as described herein.

Surfactant Viscosity Test

[0030] In the Surfactant Viscosity Test the viscosity of the surfactant component, which comprises all of the surfactants in the detergent composition at the respective weight ratios in the detergent compositions and comprises an anionic sulphate surfactant.

[0031] Firstly, the viscosity A of a surfactant component comprising an anionic sulphate surfactant in water is determined:

10 grams of a surfactant component comprising an anionic sulphate surfactant is mixed with 30 grams of deionised water, comprising 0.5 grams $NaSO_4$ and 0.5 grams $NaCO_3$, at 20° Celcius. The resulting paste is left to stand for 30 seconds. The viscosity of the paste is measured by a Brookfield digital Viscometer (model DVII) which is supplied with a set of spindles of varying diameter and has adjustable speed settings. Selected is speed 12, spindle 3. The spindle is lowered into the paste up to the defined spindle mark and allowed to reach equilibrium in 10 seconds. Viscosity A can then be read, measured in centipoise (cP, 1 cP = 0.01 poise = 10^{-3} N s m^2).

[0032] In a preferred aspect of the invention, the surfactant component, comprising the anionic sulphate surfactant is such that the viscosity A is at least 15000 cP.

[0033] Secondly, the viscosity B of the above surfactant component, comprising the anionic sulphate surfactant and the hydrotrope in water is determined:

10 grams of the surfactant component, comprising the anionic sulphate surfactant, and x grams of the hydrotrope is mixed with 30 grams of deionised water, comprising 0.5 grams $NaSO_4$ and 0.5 grams $NaCO_3$, at 20° Celsius. The resulting paste is left to stand for 30 seconds. The viscosity of the paste is measured, as above, by a Brookfield digital Viscometer (model DVII), with speed 12, spindle 3. The spindle is lowered into the paste up to the defined spindle mark and allowed to reach equilibrium in 10 seconds. Viscosity B can then be read, measured in centipoise (cP).

[0034] The reduction of the viscosity, comparing viscosity A and B, is then determined with the following formula:

$$\frac{\text{Viscosity A-Viscosity B}}{\text{Viscosity A}} \times 100\% = \text{reduction of viscosity (in \%)}.$$

[0035] For the present invention the hydrotrope and the amount thereof is preferably such that the reduction of viscosity is at least 10%, most preferably at least 25%.

Anionic sulphonate surfactant

[0036] A highly preferred ingredient of the granular detergent composition or the particle of the invention is an anionic sulphonate surfactant.

[0037] The level of anionic sulphonate surfactant in the detergent composition is preferably from 0.01 % to 30%, more preferably from 0.5% to 20%, more preferably from 1% to 16%, most preferably from 5% to 12% by weight of the composition.

[0038] The level of anionic sulphonate surfactant in the particle is preferably from 0.01 % to 25%, preferably from 0.5% to 20%, more preferably from 3% to 16%, most preferably from 5% to 15% by weight of the particle.

[0039] Anionic sulfonate surfactants suitable for use herein include the salts (or optionally the acids) of C_5-C_{20} linear or branched alkylbenzene sulfonates, alkyl ester sulfonates, C_6-C_{22} primary or secondary alkane sulfonates, C_6-C_{24} olefin 'sulfonates, sulfonated polycarboxylic acids, alkyl glycerol sulfonates, preferably derived from alcohols derived from tallow or coconut oil, fatty acyl glycerol sulfonates, fatty oleyl glycerol sulfonates, and any mixtures thereof.

[0040] The cation of the anionic sulphonate surfactant may be hydrogen, ammonium or alcohol amine, but preferably sodium or potassium.

[0041] A highly preferred anionic sulphonate surfactant is a sodium or potassium salt of C_{10}-C_{18}, preferably C_{10}-C_{16}, more preferably C_{11}-C_{13}, branched or more preferably, linear alkylbenzene sulfonates.

Detergent particle

[0042] Both the anionic sulphate surfactant and hydrotrope are contained in a particle of detergent composition. The detergent composition may consist essentially of such particles or may comprise a mixture of the particles of the invention with additional particles having a different chemical composition. Preferably, the particle of the invention is present in a detergent composition at a level of from 5% to 85%, more preferably from 10% to 70%, most preferably from 30% to 60% by weight of the composition.

[0043] The particles of the invention comprise the anionic sulphate surfactant and hydrotrope as mentioned above, and preferably an anionic sulphonate surfactant.

[0044] The particles of the invention are formed by a process which includes a drying step. The drying step produces a final dried particle, generally having a free moisture content below 6% by weight, preferably less than 1% or more preferably less than 0.55, or even below 0.25% by weight.

[0045] As used herein, free-moisture content is determined by placing 5 grams of a sample of base detergent granules in a petri dish, placing the sample in a convection oven at 50°C (122°F) for 2 hours, followed by measurement of the weight loss due to water evaporation.

[0046] Generally the particles of the invention are formed in a process whereby a paste or slurry or crutcher mix comprising the anionic sulphate surfactant and hydrotrope, is formed into particles and spray-dried as known in the art.

[0047] A preferred process for manufacturing the particles comprises preparing an aqueous solution-dispersion, commonly referred to as a past or slurry or crutcher mix, comprising the components of the final particle. To save energy and to increase throughput of the drying equipment the crutcher mix will usually be of as high a solids content as feasible, e.g., 40% to 80%, with the balance, e.g. 20% to 60%, being water. More water may be used but then energy demands are increased, tower throughput are diminished, products resulting may be tackier and poorer flowing g and often the desired low density base and final detergent composition particles will not be obtained.

[0048] The particles are produced by spray drying, wherein the crutcher mix is sprayed at an elevated pressure (usually from 3 to 50 kg/cm^2, preferably 20 to 40kg/cm^2) through one or more spray nozzles into a drying tower; through which drying air passes to dry the resulting droplets of crutcher mix to globular the particles. Instead of spray nozzles, equivalent atomisers of other designs may also be used. The preferred spray tower design is counter-current, the height of the tower usually being from 5 to 25 meters and the entering hot air, usually the gaseous products of combustion of oil or gas, being at a temperature in the range of from 200° to 400°C and the outlet air usually at a temperature in the range of from 50° to 90°C. Concurrent tower designs may also be employed wherein similar inlet and outlet air temperatures obtain.

[0049] The nozzle size for producing droplets of crutcher mix will be chosen such particles of the preferred particle

size are formed, preferably of from 0.1 mm to 3.0 mm. Preferably, substantially all the particles are within this range when removed from the spray tower, but any off-size particles can be removed by screening, may be size-reduced to the desired size range or may be recycled in the same or a subsequent crutcher mix.

[0050] When an anionic sulphonate surfactant is present in the final particle, the anionic sulphonate surfactant will be comprised in the crutcher mix, together with the hydrotrope and the anionic sulphate surfactant.

[0051] It can be useful for the spray drying process that the crutcher. mix is substantially free from nonionic surfactant and/or cationic softeners or cationic surfactant. Thus, the particle of the invention is preferably substantially free from nonionic surfactant and/ or cationic softeners or cationic surfactant.

[0052] It can be particularly useful for the present invention that the anionic sulphate surfactant and the hydrotrope are present in a substantially phosphate-free particle.

[0053] Optionally, after drying is complete and the particles in the desired size range are obtained, additional detergent components can be added to the particles, preferably by spraying the molten component, which may be in concentrated aqueous solution but preferably is free of water, onto the surfaces of the tumbling base particles in an inclined drum, through which the particles progress from an elevation feed end to the discharge end.

[0054] The particle can be introduced to a detergent composition by any method, known in the art. Preferably, the particles are dry-added to the other detergent ingredients.

Additional ingredients

[0055] The detergent compositions or the particle, of the invention, may also contain additional ingredients or components. The precise nature of these additional ingredients, and levels of incorporation thereof will depend on the physical form of the final composition, and the precise nature of the washing operation for which it is to be used.

[0056] The detergent compositions of the invention, preferably contain one or more additional detergent components selected from additional surfactants, bleach, bleach activators, acid sources, builders, organic polymeric compounds, enzymes, suds suppressors, lime soap dispersants, soil suspension and anti-redeposition agents and corrosion inhibitors.

[0057] The particle preferably comprises as an additional ingredient one or more builders, preferably alumino silicates and/ or organic polycarboxylate polymers, alkali sources, or mixtures thereof Preferably, the particle is substantially free from nonionic and/ or cationic surfactants.

[0058] A typical listing of additional anionic, nonionic, ampholytic, and zwitterionic classes, and species of these surfactants, is given in U.S.P. 3,929,678 issued to Laughlin and Heuring on December 30, 1975. Further examples are given in "Surface Active Agents and Detergents" (Vol. I and II by Schwartz, Perry and Berch). A list of suitable cationic surfactants is given in U.S.P. 4,259,217 issued to Murphy on March 31, 1981.

Additional anionic surfactant

[0059] The granular detergent composition or the particle in accord with the present invention can comprise one or more additional anionic surfactants. Essentially any anionic surfactants useful for detersive purposes can be comprised in the detergent composition or optionally in the particle. These can include salts (including, for example, sodium, potassium, ammonium, and substituted ammonium salts such as mono- di- and triethanolamine salts) of the alkyl ethoxy sulphate, carboxylate and sarcosinate surfactant.

[0060] Other anionic surfactants include the isethionates such as the acyl isethionates, N-acyl taurates, fatty acid amides of methyl tauride, alkyl succinates and sulfosuccinates, monoesters of sulfosuccinate (especially saturated and unsaturated C_{12}-C_{18} monoesters) diesters of sulfosuccinate (especially saturated and unsaturated C_6-C_{14} diesters), N-acyl sarcosinates. Resin acids and hydrogenated resin acids are also suitable, such as rosin, hydrogenated rosin, and resin acids and hydrogenated resin acids present in or derived from tallow oil.

[0061] The level of anionic surfactant in the detergent composition is preferably from 4% to 60%, more preferably from 6% to 30%, most preferably from 10% to 20% by weight.

Alkyl ethoxysulfate surfactants

[0062] Alkyl ethoxysulfate surfactants are preferably selected from the group consisting of the C_{10}-C_{18} alkyl sulfates which have been ethoxylated with from 0.5 to 20 moles of ethylene oxide per molecule. More preferably, the alkyl ethoxysulfate surfactant is a C_{11}-C_{18}, most preferably C_{11}-C_{15} alkyl sulfate which has been ethoxylated with from 0.5 to 7, preferably from 1 to 5, moles of ethylene oxide per molecule.

Anionic carboxylate surfactant

[0063] Suitable anionic carboxylate surfactants include the alkyl ethoxy carboxylates, the alkyl polyethoxy polycarboxylate surfactants and the soaps ('alkyl carboxyls'), especially certain secondary soaps as described herein.

[0064] Suitable alkyl ethoxy carboxylates include those with the formula $RO(CH_2CH_2O)_x\ CH_2COO^-M^+$ wherein R is a C_6 to C_{18} alkyl group, x ranges from O to 10, and the ethoxylate distribution is such that, on a weight basis, the amount of material where x is 0 is less than 20% and M is a cation. Suitable alkyl polyethoxy polycarboxylate surfactants include those having the formula $RO\text{-}(CHR_1\text{-}CHR_2\text{-}O)\text{-}R_3$ wherein R is a C_6 to C_{18} alkyl group, x is from 1 to 25, R_1 and R_2 are selected from the group consisting of hydrogen, methyl acid radical, succinic acid radical, hydroxysuccinic acid radical, and mixtures thereof, and R_3 is selected from the group consisting of hydrogen, substituted or unsubstituted hydrocarbon having between 1 and 8 carbon atoms, and mixtures thereof.

[0065] Suitable soap surfactants include the secondary soap surfactants which contain a carboxyl unit connected to a secondary carbon. Preferred secondary soap surfactants for use herein are water-soluble members selected from the group consisting of the water-soluble salts of 2-methyl-1-undecanoic acid, 2-ethyl-1-decanoic acid, 2-propyl-1-nonanoic acid, 2-butyl-1-octanoic acid and 2-pentyl-1-heptanoic acid. Certain soaps may also be included as suds suppressors.

Alkali metal sarcosinate surfactant

[0066] Other suitable anionic surfactants are the alkali metal sarcosinates of formula $R\text{-}CON\ (R^1)\ CH_2\ COOM$, wherein R is a C_5-C_{17} linear or branched alkyl or alkenyl group, R^1 is a C_1-C_4 alkyl group and M is an alkali metal ion. Preferred examples are the myristyl and oleoyl methyl sarcosinates in the form of their sodium salts.

Cationic surfactants

[0067] Another preferred surfactant useful in the detergent composition of the invention is one or more cationic surfactants. Suitable cationic surfactants include the quaternary ammonium surfactants selected from mono C_6-C_{16}, preferably C_6-C_{10} N-alkyl or alkenyl ammonium surfactants wherein the remaining N positions are substituted by methyl, hydroxyethyl or hydroxypropyl groups. Another preferred cationic surfactant is an C_6-C_{18} alkyl or alkenyl ester of an quaternary ammonium alcohol, such as quaternary choline esters.

[0068] In detergent compositions, comprising the particle, the level of cationic surfactant is preferably from 0.2% to 20%, more preferably from 0.5% to 15%, even more preferably from 1% to 10%, most preferably from 1% to 5% by weight of the composition.

Nonionic surfactant

[0069] The detergent composition of the present invention can contain a nonionic surfactant. It can be preferred that the particle does not comprise nonionic surfactant. The nonionic surfactant can be sprayed on the particle. Essentially any nonionic surfactant can be used herein.

[0070] In detergent compositions, comprising the particle, the level of nonionic surfactant is preferably from 1% to 30%, more preferably from 2% to 25%, even more preferably from 3% to 15%, most preferably from 4% to 12% by weight of the composition.

Alkoxylated nonionic surfactant

[0071] Essentially any alkoxylated nonionic surfactants are suitable herein. The ethoxylated and propoxylated nonionic surfactants are preferred.

[0072] Preferred alkoxylated surfactants can be selected from the classes of the nonionic condensates of alkyl phenols, nonionic ethoxylated alcohols, nonionic ethoxylated/propoxylated fatty alcohols, nonionic ethoxylate/propoxylate condensates with propylene glycol, and the nonionic ethoxylate condensation products with propylene oxide/ethylene diamine adducts.

Nonionic alkoxylated alcohol surfactant

[0073] The condensation products of aliphatic alcohols with from 1 to 25 moles of alkylene oxide, particularly ethylene oxide and/or propylene oxide, are suitable for use herein. The alkyl chain of the aliphatic alcohol can either be straight or branched, primary or secondary, and generally contains from 6 to 22 carbon atoms. Particularly preferred are the condensation products of alcohols having an alkyl group containing from 8 to 20 carbon atoms with from 2 to 10 moles

of ethylene oxide per mole of alcohol.

Nonionic polyhydroxy fatty acid amide surfactant

[0074] Polyhydroxy fatty acid amides suitable for use herein are those having the structural formula R^2CONR^1Z wherein : R1 is H, C_1-C_4 hydrocarbyl, 2-hydroxy ethyl, 2-hydroxy propyl, ethoxy, propoxy, or a mixture thereof, preferable C1-C4 alkyl, more preferably C_1 or C_2 alkyl, most preferably C_1 alkyl (i.e., methyl); and R_2 is a C_5-C_{31} hydrocarbyl, preferably straight-chain C_5-C_{19} alkyl or alkenyl, more preferably straight-chain C_9-C_{17} alkyl or alkenyl, most preferably straight-chain C_{11}-C_{17} alkyl or alkenyl, or mixture thereof; and Z is a polyhydroxyhydrocarbyl having a linear hydrocarbyl chain with at least 3 hydroxyls directly connected to the chain, or an alkoxylated derivative (preferably ethoxylated or propoxylated) thereof. Z preferably will be derived from a reducing sugar in a reductive animation reaction; more preferably Z is a glycityl.

Nonionic fatty acid amide surfactant

[0075] Suitable fatty acid amide surfactants include those having the formula:

$R^6CON(R^7)_2$ wherein R^6 is an alkyl group containing from 7 to 21, preferably from 9 to 17 carbon atoms and each R^7 is selected from the group consisting of hydrogen, C_1-C_4 alkyl, C_1-C_4 hydroxyalkyl, and $-(C_2H_4O)_xH$, where x is in the range of from 1 to 3.

Nonionic alkylpolysaccharide surfactant

[0076] Suitable alkylpolysaccharides for use herein are disclosed in U.S. Patent 4,565,647, Llenado, issued January 21, 1986, having a hydrophobic group containing from 6 to 30 carbon atoms and a polysaccharide, e.g., a polyglycoside, hydrophilic group containing from 1.3 to 10 saccharide units.

[0077] Preferred alkylpolyglycosides have the formula

$$R^2O(C_nH_{2n}O)t(glycosyl)_x$$

wherein R^2 is selected from the group consisting of alkyl, alkylphenyl, hydroxyalkyl, hydroxyalkylphenyl, and mixtures thereof in which the alkyl groups contain from 10 to 18 carbon atoms; n is 2 or 3; t is from 0 to 10, and x is from 1.3 to 8. The glycosyl is preferably derived from glucose.

Amphoteric surfactant

[0078] Optional amphoteric surfactants for use in the detergent compositions, or the particle, include the amine oxide surfactants and the alkyl amphocarboxylic acids.

[0079] Suitable amine oxides include those compounds having the formula $R^3(OR^4)_xN^0(R^5)_2$ wherein R^3 is selected from an alkyl, hydroxyalkyl, acylamidopropoyl and alkyl phenyl group, or mixtures thereof, containing from 8 to 26 carbon atoms; R^4 is an alkylene or hydroxyalkylene group containing from 2 to 3 carbon atoms, or mixtures thereof; x is from 0 to 5, preferably from 0 to 3; and each R^5 is an alkyl or hydroxyalkyl group containing from 1 to 3, or a polyethylene oxide group containing from 1 to 3 ethylene oxide groups. Preferred are C_{10}-C_{18} alkyl dimethylamine oxide, and $C_{10\text{-}18}$ acylamido alkyl dimethylamine oxide.

[0080] A suitable example of an alkyl aphodicarboxylic acid is Miranol(TM) C2M Conc. manufactured by Miranol, Inc., Dayton, NJ.

Zwitterionic surfactant

[0081] Optionally, zwitterionic surfactants can be incorporated into the detergent compositions. These surfactants can be broadly described as derivatives of secondary and tertiary amines, derivatives ofheterocyclic secondary and tertiary amines, or derivatives of quaternary ammonium, quaternary phosphonium or tertiary sulfonium compounds. Betaine and sultaine surfactants are exemplary zwitterionic surfactants for use herein.

[0082] Suitable betaines are those compounds having the formula $R(R')_2N^+R^2COO-$ wherein R is a C_6-C_{18} hydrocarbyl group, each R^1 is typically C_1-C_3 alkyl, and R^2 is a C_1-C_5 hydrocarbyl group. Preferred betaines are $C_{12\text{-}18}$ dimethyl-ammonio hexanoate and the $C_{10\text{-}18}$ acylamidopropane (or ethane) dimethyl (or diethyl) betaines. Complex betaine surfactants are also suitable for use herein.

Water-soluble builder compound

[0083] The the detergent compositions of the present invention can contain a water-soluble builder compound, typically present in detergent compositions at a level of from 1% to 80% by weight, preferably from 10% to 70% by weight, most preferably from 20% to 60% by weight of the composition.

[0084] Suitable water-soluble builder compounds include the water soluble monomeric polycarboxylates, or their acid forms, homo or copolymeric polycarboxylic acids or their salts in which the polycarboxylic acid comprises at least two carboxylic radicals separated from each other by not more that two carbon atoms, borates, phosphates, and mixtures of any of the foregoing.

[0085] The carboxylate or polycarboxylate builder can be monomeric or oligomeric in type although monomeric polycarboxylates are generally preferred for reasons of cost and performance.

[0086] Suitable carboxylates containing one carboxy group include the water soluble salts of lactic acid, glycolic acid and ether derivatives thereof. Polycarboxylates containing two carboxy groups include the water-soluble salts of succinic acid, malonic acid, (ethylenedioxy) diacetic acid, maleic acid, diglycolic acid, tartaric acid, tartronic acid and fumaric acid, as well as the ether carboxylates and the sulfinyl carboxylates. Polycarboxylates containing three carboxy groups include, in particular, water-soluble citrates, aconitrates and citraconates as well as succinate derivatives such as the carboxymethyloxysuccinates described in British Patent No. 1,379,241, lactoxysuccinates described in British Patent No. 1,389,732, and aminosuccinates described in Netherlands Application 7205873, and the oxypolycarboxylate materials such as 2-oxa-1,1,3-propane tricarboxylates described in British Patent No. 1,387,447.

[0087] Polycarboxylates containing four carboxy groups include oxydisuccinates disclosed in British Patent No. 1,261,829, 1,1,2,2-ethane tetracarboxylates, 1,1,3,3-propane tetracarboxylates and 1,1,2,3-propane tetracarboxylates. Polycarboxylates containing sulfo substituents include the sulfosuccinate derivatives disclosed in British Patent Nos. 1,398,421 and 1,398,422 and in U.S. Patent No. 3,936,448, and the sulfonated pyrolysed citrates described in British Patent No. 1,439,000. Preferred polycarboxylates are hydroxycarboxylates containing up to three carboxy groups per molecule, more particularly citrates.

[0088] Borate builders, as well as builders containing borate-forming materials that can produce borate under detergent storage or wash conditions are useful water-soluble builders herein.

[0089] Suitable examples of water-soluble phosphate builders are the alkali metal tripolyphosphates, sodium, potassium and ammonium pyrophosphate, sodium and potassium and ammonium pyrophosphate, sodium and potassium orthophosphate, sodium polymeta/phosphate in which the degree of polymerization ranges from about 6 to 21, and salts of phytic acid.

Partially soluble or insoluble builder compound

[0090] The detergent compositions, and /or the particle, of the present invention may contain a partially soluble or insoluble builder compound, typically present in the detergent composition at a level of from 1% to 80% by weight, preferably from 10% to 70% by weight, most preferably from 20% to 60% weight of the composition.

[0091] In the particle, the partially soluble or insoluble builder compound is preferably present at a level of from 5% to 85% by weight, preferably from 15% to 60% by weight, most preferably from 20% to 50% weight of the particle.

[0092] Examples of largely water insoluble builders include the sodium aluminosilicates.

[0093] Suitable aluminosilicate zeolites have the unit cell formula $Na_z[(AlO_2)_z(SiO_2)_y]. xH_2O$ wherein z and y are at least 6; the molar ratio of z to y is from 1.0 to 0.5 and x is at least 5, preferably from 7.5 to 276, more preferably from 10 to 264. The aluminosilicate material are in hydrated form and are preferably crystalline, containing from 10% to 28%, more preferably from 18% to 22% water in bound form.

[0094] The aluminosilicate zeolites can be naturally occurring materials, but are preferably synthetically derived. Synthetic crystalline aluminosilicate ion exchange materials are available under the designations Zeolite A, Zeolite B, Zeolite P, Zeolite X, Zeolite HS and mixtures thereof. Zeolite A has the formula

$$Na_{12}[AlO_2)_{12}(SiO_2)_{12}]. xH_2O$$

wherein x is from 20 to 30, especially 27. Zeolite X has the formula $Na_{86}[(AlO_2)_{86}(SiO_2)_{106}]. 276 H_2O$.

[0095] Preferably, the particle of the invention does not comprise a crystalline layered silicate. However, preferred crystalline layered silicates for use in the detegrent compositions herein have the general formula

$$NaMSi_xO_{2x+1}.yH_2O$$

wherein M is sodium or hydrogen, x is a number from 1.9 to 4 and y is a number from 0 to 20. Crystalline layered sodium silicates of this type are disclosed in EP-A-0164514 and methods for their preparation are disclosed in DE-A-3417649 and DE-A-3742043. Herein, x in the general formula above preferably has a value of 2, 3 or 4 and is preferably 2. The most preferred material is δ-$Na_2Si_2O_5$, available from Hoechst AG as NaSKS-6.

Perhydrate bleaches

[0096] An preferred additional components of the detergent composition and/ or detergent particle is a perhydrate bleach, such as metal perborates, metal percarbonates, particularly the sodium salts. Perborate can be mono or tetra hydrated. Sodium percarbonate has the formula corresponding to $2Na_2CO_3.3H_2O_2$, and is available commercially as a crystalline solid.

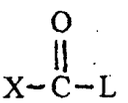
[0097] Potassium peroxymonopersulfate, sodium per is another optional inorganic perhydrate salt of use in the detergent compositions herein.

Organic peroxyacid bleaching system

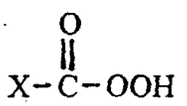
[0098] A preferred feature of detergent composition, and/ or particle is an organic peroxyacid bleaching system. In one preferred execution the bleaching system contains a hydrogen peroxide source and an organic peroxyacid bleach precursor compound. The production of the organic peroxyacid occurs by an in situ reaction of the precursor with a source of hydrogen peroxide. Preferred sources of hydrogen peroxide include inorganic perhydrate bleaches, such as the perborate bleach of the claimed invention. In an alternative preferred execution a preformed organic peroxyacid is incorporated directly into the composition. Compositions containing mixtures of a hydrogen peroxide source and organic peroxyacid precursor in combination with a preformed organic peroxyacid are also envisaged.

Peroxyacid bleach precursor

[0099] Peroxyacid bleach precursors are compounds which react with hydrogen peroxide in a perhydrolysis reaction to produce a peroxyacid. Generally peroxyacid bleach precursors may be represented as



where L is a leaving group and X is essentially any functiohatity, such that on perhydroloysis the structure of the peroxyacid produced is



[0100] Peroxyacid bleach precursor compounds are preferably incorporated at a level of from 0.5% to 20% by weight, more preferably from 1% to 15% by weight, most preferably from 1.5% to 10% by weight of the detergent compositions.

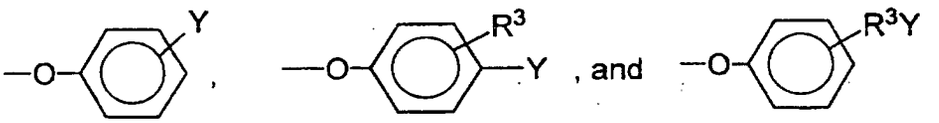
[0101] Suitable peroxyacid bleach precursor compounds typically contain one or more N- or O-acyl groups, which precursors can be selected from a wide range of classes.

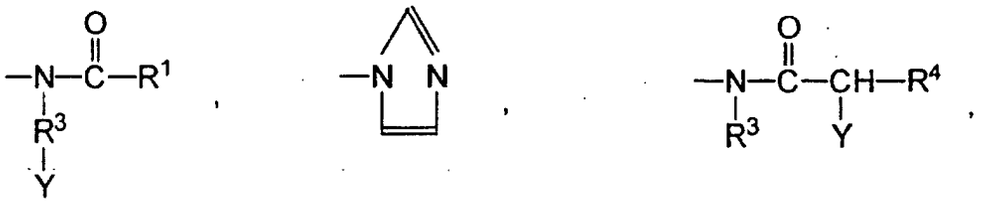
[0102] Suitable classes include anhydrides, esters, imides, lactams and acylated derivatives of imidazoles and oximes. Examples of useful materials within these classes are disclosed in GB-A-1586789. Suitable esters are disclosed in GB-A-836988, 864798, 1147871, 2143231 and EP-A-0170386.

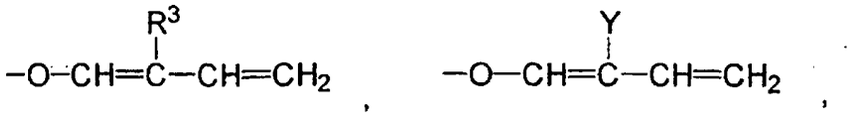
Leaving groups

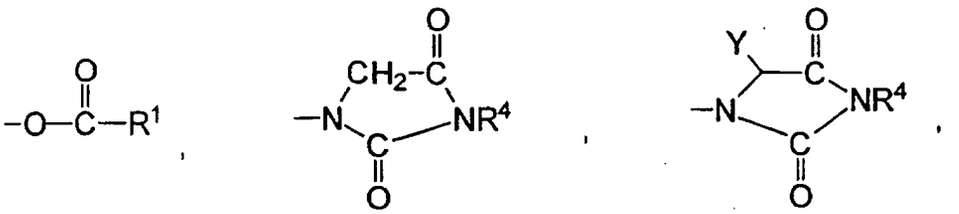
[0103] The leaving group, hereinafter L group, must be sufficiently reactive for the perhydrolysis reaction to occur within the optimum time frame (e.g., a wash cycle). However, if L is too reactive, this activator will be difficult to stabilize for use in a bleaching composition.

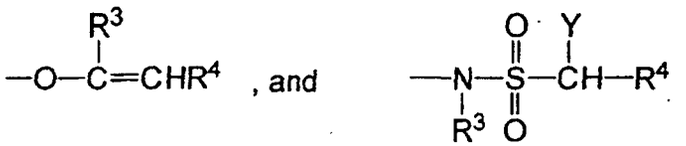
[0104] Preferred L groups are selected from the group consisting of:











and mixtures thereof, wherein R^1 is an alkyl, aryl, or alkaryl group containing from 1 to 14 carbon atoms, R^3 is an alkyl chain containing from 1 to 8 carbon atoms, R^4 is H or R^3, and Y is H or a solubilizing group. Any of R^1, R^3 and R^4 may be substituted by essentially any functional group including, for example alkyl, hydroxy, alkoxy, halogen, amine, nitrosyl, amide and ammonium or alkyl ammmonium groups.

[0105] The preferred solubilizing groups are $-SO_3^-M^+$, $-CO_2^-M^+$, $-SO_4^-M^+$, $-N^+(R^3)_4X^-$ and $O<--N(R^3)_3$ and most preferably $-SO_3^-M^+$ and $-CO_2^-M^+$ wherein R^3 is an alkyl chain containing from 1 to 4 carbon atoms, M is a cation which provides solubility to the bleach activator and X is an anion which provides solubility to the bleach activator. Preferably, M is an alkali metal, ammonium or substituted ammonium cation, with sodium and potassium being most preferred, and X is a halide, hydroxide, methylsulfate or acetate anion.

Alkyl percarboxylic acid bleach precursors

[0106] Alkyl percarboxylic acid bleach precursors form percarboxylic acids on perhydrolysis. Preferred precursors of this type provide peracetic acid on perhydrolysis.

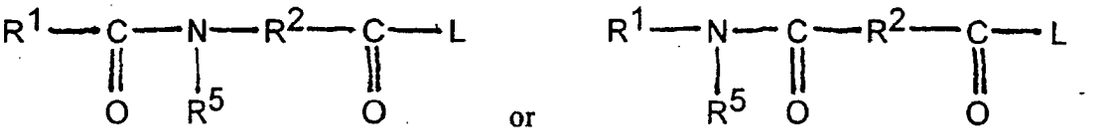
[0107] Preferred alkyl percarboxylic precursor compounds of the imide type include the N-,N,N^1N^1 tetra acetylated alkylene diamines wherein the alkylene group contains from 1 to 6 carbon atoms, particularly those compounds in which the alkylene group contains 1, 2 and 6 carbon atoms. Tetraacetyl ethylene diamine (TAED) is particularly preferred. The TAED is preferably not present in the agglomerated particle of the present invention, but preferably present

in the detergent composition, comprising the particle.

[0108] Other preferred alkyl percarboxylic acid precursors include sodium 3,5,5-tri-methyl hexanoyloxybenzene sulfonate (iso-NOBS), sodium nonanoyloxybenzene sulfonate (NOBS), sodium acetoxybenzene sulfonate (ABS) and pentaacetyl glucose.

Amide substituted alkyl peroxyacid precursors

[0109] Amide substituted alkyl peroxyacid precursor compounds are suitable herein, including those of the following general formulae:



wherein R^1 is an alkyl group with from 1 to 14 carbon atoms, R^2 is an alkylene group containing from 1 to 14 carbon atoms, and R^5 is H or an alkyl group containing 1 to 10 carbon atoms and L can be essentially any leaving group. Amide substituted bleach activator compounds of this type are described in EP-A-0170386.

Perbenzoic acid precursor

[0110] Perbenzoic acid precursor compounds provide perbenzoic acid on perhydrolysis. Suitable O-acylated perbenzoic acid precursor compounds include the substituted and unsubstituted benzoyl oxybenzene sulfonates, and the benzoylation products of sorbitol, glucose, and all saccharides with benzoylating agents, and those of the imide type including N-benzoyl succinimide, tetrabenzoyl ethylene diamine and the N-benzoyl substituted ureas. Suitable imidazole type perbenzoic acid precursors include N-benzoyl imidazole and N-benzoyl benzimidazole. Other useful N-acyl group-containing perbenzoic acid precursors include N-benzoyl pyrrolidone, dibenzoyl taurine and benzoyl pyroglutamic acid.

Cationic peroxyacid precursors

[0111] Cationic peroxyacid precursor compounds produce cationic peroxyacids on perhydrolysis.

[0112] Typically, cationic peroxyacid precursors are formed by substituting the peroxyacid part of a suitable peroxyacid precursor compound with a positively charged functional group, such as an ammonium or alkyl ammmonium group, preferably an ethyl or methyl ammonium group. Cationic peroxyacid precursors are typically present in the solid detergent compositions as a salt with a suitable anion, such as a halide ion.

[0113] The peroxyacid precursor compound to be so cationically substituted may be a perbenzoic acid, or substituted derivative thereof, precursor compound as described hereinbefore. Alternatively, the peroxyacid precursor compound may be an alkyl percarboxylic acid precursor compound or an amide substituted alkyl peroxyacid precursor as described hereinafter.

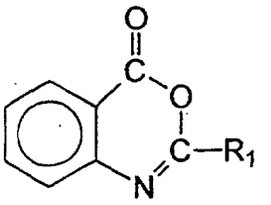
[0114] Cationic peroxyacid precursors are described in U.S. Patents 4,904,406; 4,751,015; 4,988,451; 4,397,757; 5,269,962; 5,127,852; 5,093,022; 5,106,528; U.K. 1,382,594; EP 475,512, 458,396 and 284,292; and in JP 87-318,332.

[0115] Examples of preferred cationic peroxyacid precursors are described in UK Patent Application No. 9407944.9 and US Patent Application Nos. 08/298903, 08/298650, 08/298904 and 08/298906.

[0116] Suitable cationic peroxyacid precursors include any of the ammonium or alkyl ammonium substituted alkyl or benzoyl oxybenzene sulfonates, N-acylated caprolactams, and monobenzoyltetraacetyl glucose benzoyl peroxides. Preferred cationic peroxyacid precursors of the N-acylated caprolactam class include the trialkyl ammonium methylene benzoyl caprolactams and the trialkyl ammonium methylene alkyl caprolactams.

Benzoxazin organic peroxyacid precursors

[0117] Also suitable are precursor compounds of the benzoxazin-type, as disclosed for example in EP-A-332,294 and EP-A-482,807, particularly those having the formula:

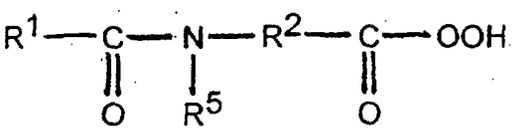


wherein R_1 is H, alkyl, alkaryl, aryl, or arylalkyl.

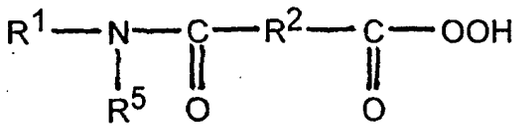
Preformed organic peroxyacid

[0118] The organic peroxyacid bleaching system may contain, in addition to, or as an alternative to, an organic peroxyacid bleach precursor compound, a preformed organic peroxyacid, typically at a level of from 1% to 15% by weight, more preferably from 1% to 10% by weight of the composition.

[0119] A preferred class of organic peroxyacid compounds are the amide substituted compounds of the following general formulae:



or



wherein R^1 is an alkyl, aryl or alkaryl group with from 1 to 14 carbon atoms, R^2 is an alkylene, arylene, and alkarylene group containing from 1 to 14 carbon atoms, and R^5 is H or an alkyl, aryl, or alkaryl group containing 1 to 10 carbon atoms. Amide substituted organic peroxyacid compounds of this type are described in EP-A-0170386.

[0120] Other organic peroxyacids include diacyl and tetraacylperoxides, especially diperoxydodecanedioc acid, diperoxytetradecanedioc acid and diperoxyhexadecanedioc acid. Mono- and diperazelaic acid, mono- and diperbrassylic acid and N-phthaloylaminoperoxicaproic acid are also suitable herein.

Acid source

[0121] An acid source, or source of acidity, can be present in the detergent composition or particle. When comprised in a detergent composition or particle, there is preferably an alkali source present, capable of reacting with the acid source to produce a gas.

[0122] The level of the acid source in the detegrent composition is preferably from 0.5% to 10 %, more preferably from 1% to 7%, most preferably from 2% to 5% by weight.

[0123] The source of acidity is preferably non-hygroscopic, which can improve storage stability. However, monohydrates acids can also be useful herein. Organic acids and their derivatives are preferred. The acid is preferably water-soluble. Suitable acids include citric, glutaric, succinic or adipic acid, monosodium phosphate, sodium hydrogen sulfate, boric acid, or a salt or an ester thereof. Citric acid is especially preferred.

Bleach catalyst

[0124] The compositions optionally contain a transition metal containing bleach catalyst. One suitable type of bleach catalyst is a catalyst system comprising a heavy metal cation of defined bleach catalytic activity, such as copper, iron or manganese cations, an auxiliary metal cation having little or no bleach catalytic activity, such as zinc or aluminum cations; and a sequestrant having defined stability constants for the catalytic and auxiliary metal cations, particularly

ethylenediaminetetraacetic acid, ethylenediaminetetra(methylenephosphonic acid) and water-soluble salts thereof. Such catalysts are disclosed in U.S. Pat. 4,430,243.

[0125] Other types of bleach catalysts include the manganese-based complexes disclosed in U.S. Pat. 5,246,621 and U.S. Pat. 5,244,594. Preferred examples of these catalysts include $Mn^{IV}_2(u\text{-}O)_3$(1,4,7-trimethyl-1,4,7-triazacyclononane)$_2$-$(PF_6)_2$, $Mn^{III}_2(u\text{-}O)_1(u\text{-}OAc)_2$(1,4,7-trimethyl-1,4,7-triazacyclononane)$_2$-$(ClO_4)_2$, $Mn^{IV}_4(u\text{-}O)_6$(1,4,7-triazacyclononane)$_4$-$(ClO_4)_2$, $Mn^{III}Mn^{IV}_4(u\text{-}O)_1(u\text{-}OAc)_2$-(1,4,7-trimethyl-1,4,7-triazacyclononane)$_2$-$(ClO_4)_3$, and mixtures thereof. Others are described in European patent publication no. 549,272. Other ligands suitable for use herein include 1,5,9-trimethyl-1,5,9-triazacyclododecane, 2-methyl-1,4,7-triazacyclononane, 2-methyl-1,4,7-triazacyclononane, 1,2,4,7-tetramethyl-1,4,7-triazacyclononane, and mixtures thereof.

[0126] For examples of suitable bleach catalysts see U.S. Pat. 4,246,612 and U.S. Pat. 5,227,084. See also U.S. Pat. 5,194,416 which teaches mononuclear manganese (IV) complexes such as Mn(1,4,7-trimethyl-1,4,7-triazacyclononane)$(OCH_3)_3$-(PF_6). Still another type of bleach catalyst, as disclosed in U.S. Pat. 5,114,606, is a water-soluble complex of manganese (III), and/or (IV) with a ligand which is a non-carboxylate polyhydroxy compound having at least three consecutive C-OH groups. Other examples include binuclear Mn complexed with tetra-N-dentate and bi-N-dentate ligands, including $N_4Mn^{III}(u\text{-}O)_2Mn^{IV}N_4)^+$ and $[Bipy_2Mn^{III}(u\text{-}O)_2Mn^{IV}bipy_2]$-$(ClO_4)_3$.

[0127] Further suitable bleach catalysts are described, for example, in European patent No. 408,131 (cobalt complex catalysts), European patent publication nos. 384,503, and 306,089 (metallo-porphyrin catalysts), U.S. 4,728,455 (manganese/multidentate ligand catalyst), U.S. 4,711,748 and European patent publication no. 224,952, (absorbed manganese on aluminosilicate catalyst), U.S. 4,601,845 (aluminosilicate support with manganese and zinc or magnesium salt), U.S. 4,626,373 (manganese/ligand catalyst), U.S. 4,119,557 (ferric complex catalyst), German Pat. specification 2,054,019 (cobalt chelant catalyst) Canadian 866,191 (transition metal-containing salts), U.S. 4,430,243 (chelants with manganese cations and non-catalytic metal cations), and U.S. 4,728,455 (manganese gluconate catalysts).

Heavy metal ion sequestrant

[0128] The detergent compositions and / orthe particle of the invention preferably contain as an optional component a heavy metal ion sequestrant. By heavy metal ion sequestrant it is meant herein components which act to sequester (chelate) heavy metal ions. These components may also have calcium and magnesium chelation capacity, but preferentially they show selectivity to binding heavy metal ions such as iron, manganese and copper.

[0129] Heavy metal ion sequestrants are generally present at a level of from 0.005% to 20%, preferably from 0.1% to 10%, more preferably from 0.25% to 7.5% and most preferably from 0.5% to 5% by weight of the compositions.

[0130] Suitable heavy metal ion sequestrants for use herein include organic phosphonates, such as the amino alkylene poly (alkylene phosphonates), alkali metal ethane 1-hydroxy disphosphonates and nitrilo trimethylene phosphonates.

[0131] Preferred among the above species are diethylene triamine penta (methylene phosphonate), ethylene diamine tri (methylene phosphonate) hexamethylene diamine tetra (methylene phosphonate) and hydroxy-ethylene 1,1 diphosphonate.

[0132] Other suitable heavy metal ion sequestrant for use herein include nitrilotriacetic acid and polyaminocarboxylic acids such as ethylenediaminotetracetic acid, ethylenetriamine pentacetic acid, ethylenediamine disuccinic acid, ethylenediamine diglutaric acid, 2-hydroxypropylenediamine disuccinic acid or any salts thereof. Especially preferred is ethylenediamine-N,N'-disuccinic acid (EDDS) or the alkali metal, alkaline earth metal, ammonium, or substituted ammonium salts thereof, or mixtures thereof.

[0133] Other suitable heavy metal ion sequestrants for use herein are iminodiacetic acid derivatives such as 2-hydroxyethyl diacetic acid or glyceryl imino diacetic acid, described in EP-A-317,542 and EP-A-399,133. The iminodiacetic acid-N-2-hydroxypropyl sulfonic acid and aspartic acid N-carboxymethyl N-2-hydroxypropyl-3-sulfonic acid sequestrants described in EP-A-516,102 are also suitable herein. The β-alanine-N,N'-diacetic acid, aspartic acid-N,N'-diacetic acid, aspartic acid-N-monoacetic acid and iminodisuccinic acid sequestrants described in EP-A-509,382 are also suitable.

[0134] EP-A-476,257 describes suitable amino based sequestrants. EP-A-510,331 describes suitable sequestrants derived from collagen, keratin or casein. EP-A-528,859 describes a suitable alkyl iminodiacetic acid sequestrant. Dipicolinic acid and 2-phosphonobutane-1,2,4-tricarboxylic acid are also suitable. Glycinamide-N,N'-disuccinic acid (GADS), ethylenediamine-N-N'-diglutaric acid (EDDG) and 2-hydroxypropylenediamine-N-N'-disuccinic acid (HPDDS) are also suitable.

Enzyme

[0135] Another preferred ingredient useful in the detergent compositions or optionally of the particle is one or more additional enzymes. Optionally, the enzymes or part thereof cam be present in the agglomerated or extruded particle

of the invention.

[0136] Preferred additional enzymatic materials include the commercially available lipases, cutinases, amylases, neutral and alkaline proteases, esterases, cellulases, pectinases, lactases and peroxidases conventionally incorporated into detergent compositions. Suitable enzymes are discussed in US Patents 3,519,570 and 3,533,139.

[0137] Preferred commercially available protease enzymes include those sold under the tradenames Alcalase, Savinase, Primase, Durazym, and Esperase by Novo Industries A/S (Denmark), those sold under the tradename Maxatase, Maxacal and Maxapem by Gist-Brocades, those sold by Genencor International, and those sold under the tradename Opticlean and Optimase by Solvay Enzymes. Protease enzyme may be incorporated into the compositions in accordance with the invention at a level of from 0.0001 % to 4% active enzyme by weight of the composition.

[0138] Preferred amylases include, for example, α-amylases obtained from a special strain of B licheniformis, described in more detail in GB-1,269,839 (Novo). Preferred commercially available amylases include for example, those sold under the tradename Rapidase by Gist-Brocades, and those sold under the tradename Termamyl and BAN by Novo Industries A/S. Amylase enzyme may be incorporated into the composition in accordance with the invention at a level of from 0.0001% to 2% active enzyme by weight of the composition.

[0139] Lipolytic enzyme may be present at levels of active lipolytic enzyme of from 0.0001% to 2% by weight, preferably 0.001% to 1% by weight, most preferably from 0.001% to 0.5% by weight of the compositions.

[0140] The lipase may be fungal or bacterial in origin being obtained, for example, from a lipase producing strain of Humicola sp., Thermomyces sp. or Pseudomonas sp. including Pseudomonas pseudoalcaligenes or Pseudomas fluorescens. Lipase from chemically or genetically modified mutants of these strains are also useful herein. A preferred lipase is derived from Pseudomonas pseudoalcaligenes, which is described in Granted European Patent, EP-B-0218272.

[0141] Another preferred lipase herein is obtained by cloning the gene from Humicola lanuginosa and expressing the gene in Aspergillus oryza, as host, as described in European Patent Application, EP-A-0258 068, which is commercially available from Novo Industri A/S, Bagsvaerd, Denmark, under the trade name Lipolase. This lipase is also described in U.S. Patent 4,810,414, Huge-Jensen et al, issued March 7, 1989.

Organic polymeric compound

[0142] Organic polymeric compounds are preferred additional the detergent compositions and/ or the particle, in accord with the invention, and are preferably present as components of any particulate components where they may act such as to bind the particulate component together. By organic polymeric compound it is meant herein essentially any polymeric organic compound commonly used as dispersants, and anti-redeposition and soil suspension agents in detergent compositions, including any of the high molecular weight organic polymeric compounds described as clay flocculating agents herein.

[0143] Organic polymeric compound is typically incorporated in the detergent compositions of the invention at a level of from 0.1% to 30%, preferably from 0.5% to 15%, most preferably from 1% to 10% by weight of the compositions.

[0144] Examples of organic polymeric compounds include the water soluble organic homo- or co-polymeric polycarboxylic acids or their salts in which the polycarboxylic acid comprises at least two carboxyl radicals separated from each other by not more than two carbon atoms. Polymers of the latter type are disclosed in GB-A-1,596,756. Examples of such salts are polyacrylates of MWt 2000-5000 and their copolymers with maleic anhydride, such copolymers having a molecular weight of from 20,000 to 100,000, especially 40,000 to 80,000.

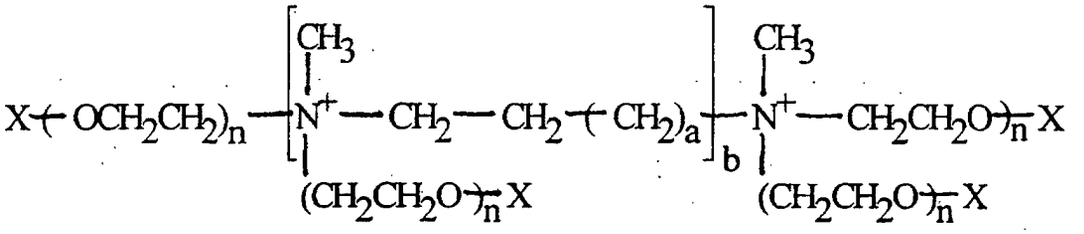
[0145] The polyamino compounds are useful herein including those derived from aspartic acid such as those disclosed in EP-A-305282, EP-A-305283 and EP-A-351629.

[0146] Terpolymers containing monomer units selected from maleic acid, acrylic acid, polyaspartic acid and vinyl alcohol, particularly those having an average molecular weight of from 5,000 to 10,000, are also suitable herein.

[0147] Other organic polymeric compounds suitable for incorporation in the detergent compositions herein include cellulose derivatives such as methylcellulose, carboxymethylcellulose, hydroxypropylmethylcellulose and hydroxyethylcellulose.

[0148] Further useful organic polymeric compounds are the polyethylene glycols, particularly those of molecular weight 1000-10000, more particularly 2000 to 8000 and most preferably about 4000.

[0149] Another organic compound, which is a preferred clay dispersant/ anti-redeposition agent, for use herein, can be the ethoxylated cationic monoamines and diamines of the formula:



wherein X is a nonionic group selected from the group consisting of H, C_1-C_4 alkyl or hydroxyalkyl ester or ether groups, and mixtures thereof, a is from 0 to 20, preferably from 0 to 4 (e.g. ethylene, propylene, hexamethylene) b is 1 or 0; for cationic monoamines (b=0), n is at least 16, with a typical range of from 20 to 35; for cationic diamines (b=1), n is at least about 12 with a typical range of from about 12 to about 42.

[0150] Other dispersants/ anti-redeposition agents for use herein are described in EP-B-011965 and US 4,659,802 and US 4,664,848.

Suds suppressing system

[0151] The detergent compositions, when formulated for use in machine washing compositions, preferably comprise a suds suppressing system present at a level of from 0.01% to 15%, preferably from 0.05% to 10%, most preferably from 0.1% to 5% by weight of the composition.

[0152] Suitable suds suppressing systems for use herein may comprise essentially any known antifoam compound, including, for example silicone antifoam compounds and 2-alkyl alcanol antifoam compounds.

[0153] By antifoam compound it is meant herein any compound or mixtures of compounds which act such as to depress the foaming or sudsing produced by a solution of a detergent composition, particularly in the presence of agitation of that solution.

[0154] Particularly preferred antifoam compounds for use herein are silicone antifoam compounds defined herein as any antifoam compound including a silicone component. Such silicone antifoam compounds also typically contain a silica component. The term "silicone" as used herein, and in general throughout the industry, encompasses a variety of relatively high molecular weight polymers containing siloxane units and hydrocarbyl group of various types. Preferred silicone antifoam compounds are the siloxanes, particularly the polydimethylsiloxanes having trimethylsilyl end blocking units.

[0155] Other suitable antifoam compounds include the monocarboxylic fatty acids and soluble salts thereof. These materials are described in US Patent 2,954,347, issued September 27, 1960 to Wayne St. John. The monocarboxylic fatty acids, and salts thereof, for use as suds suppressor typically have hydrocarbyl chains of 10 to 24 carbon atoms, preferably 12 to 18 carbon atoms. Suitable salts include the alkali metal salts such as sodium, potassium, and lithium salts, and ammonium and alkanolammonium salts.

[0156] Other suitable antifoam compounds include, for example, high molecular weight fatty esters (e.g. fatty acid triglycerides), fatty acid esters of monovalent alcohols, aliphatic C_{18}-C_{40} ketones (e.g. stearone) N-alkylated amino triazines such as tri- to hexa-alkylmelamines or di- to tetra alkyldiamine chlortriazines formed as products of cyanuric chloride with two or three moles of a primary or secondary amine containing 1 to 24 carbon atoms, propylene oxide, bis stearic acid amide and monostearyl di-alkali metal (e.g. sodium, potassium, lithium) phosphates and phosphate esters.

[0157] A preferred suds suppressing system comprises

(a) antifoam compound, preferably silicone antifoam compound, most preferably a silicone antifoam compound comprising in combination

(i) polydimethyl siloxane, at a level of from 50% to 99%, preferably 75% to 95% by weight of the silicone antifoam compound; and

(ii) silica, at a level of from 1% to 50%, preferably 5% to 25% by weight of the silicone/silica antifoam compound;

wherein said silica/silicone antifoam compound is incorporated at a level of from 5% to 50%, preferably 10% to 40% by weight;

(b) a dispersant compound, most preferably comprising a silicone glycol rake copolymer with a polyoxyalkylene

content of 72-78% and an ethylene oxide to propylene oxide ratio of from 1:0.9 to 1:1.1, at a level of from 0.5% to 10%, preferably 1% to 10% by weight; a particularly preferred silicone glycol rake copolymer of this type is DCO544, commercially available from DOW Corning under the tradename DCO544;

(c) an inert carrier fluid compound, most preferably comprising a C_{16}-C_{18} ethoxylated alcohol with a degree of ethoxylation of from 5 to 50, preferably 8 to 15, at a level of from 5% to 80%, preferably 10% to 70%, by weight;

[0158] A highly preferred particulate suds suppressing system is described in EP-A-0210731 and comprises a silicone antifoam compound and an organic carrier material having a melting point in the range 50°C to 85°C, wherein the organic carrier material comprises a monoester of glycerol and a fatty acid having a carbon chain containing from 12 to 20 carbon atoms. EP-A-0210721 discloses other preferred particulate suds suppressing systems wherein the organic carrier material is a fatty acid or alcohol having a carbon chain containing from 12 to 20 carbon atoms, or a mixture thereof, with a melting point of from 45°C to 80°C.

Clay softening system

[0159] The detergent compositions may contain a clay softening system comprising a clay mineral compound and optionally a clay flocculating agent.

[0160] The clay mineral compound is preferably a smectite clay compound. Smectite clays are disclosed in the US Patents Nos. 3,862,058, 3,948,790, 3,954,632 and 4,062,647. European Patents Nos. EP-A-299,575 and EP-A-313,146 in the name of the Procter and Gamble Company describe suitable organic polymeric clay flocculating agents.

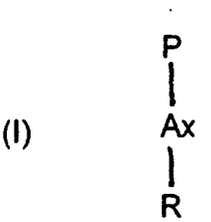
Polymeric dye transfer inhibiting agents

[0161] The detergent compositions may also comprise from 0.01% to 10%, preferably from 0.05% to 0.5% by weight of polymeric dye transfer inhibiting agents.

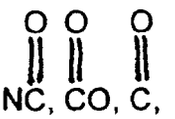
[0162] The polymeric dye transfer inhibiting agents are preferably selected from polyamine N-oxide polymers, copolymers of N-vinylpyrrolidone and N-vinylimidazole, polyvinylpyrrolidonepolymers or combinations thereof.

a) Polyamine N-oxide polymers

[0163] Polyamine N-oxide polymers suitable for use herein contain units having the following structure formula :

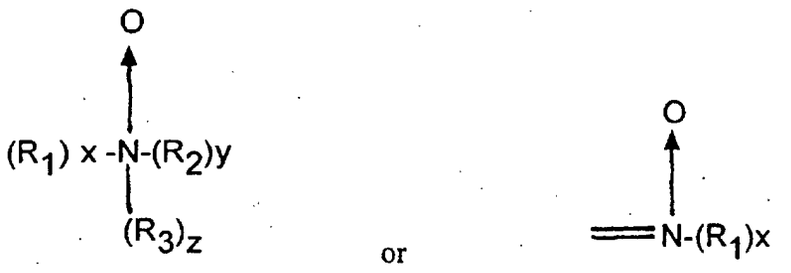


wherein P is a polymerisable unit, and
A is



- O-, -S-, -N-; x is O or 1;
R are aliphatic, ethoxylated aliphatics, aromatic, heterocyclic or alicyclic groups or any combination thereof whereto the nitrogen of the N-O group can be attached or wherein the nitrogen of the N-O group is part of these groups.

[0164] The N-O group can be represented by the following general structures :



wherein R1, R2, and R3 are aliphatic groups, aromatic, heterocyclic or alicyclic groups or combinations thereof, x or/and y or/and z is 0 or 1 and wherein the nitrogen of the N-O group can be attached or wherein the nitrogen of the N-O group forms part of these groups. The N-O group can be part of the polymerisable unit (P) or can be attached to the polymeric backbone or a combination of both.

[0165] Suitable polyamine N-oxides wherein the N-O group forms part of the polymerisable unit comprise polyamine N-oxides wherein R is selected from aliphatic, aromatic, alicyclic or heterocyclic groups. One class of said polyamine N-oxides comprises the group of polyamine N-oxides wherein the nitrogen of the N-O group forms part of the R-group. Preferred polyamine N-oxides are those wherein R is a heterocyclic group such as pyrndine, pyrrole, imidazole, pyrrolidine, piperidine, quinoline, acridine and derivatives thereof.

[0166] Other suitable polyamine N-oxides are the polyamine oxides whereto the N-O group is attached to the polymerisable unit. A preferred class of these polyamine N-oxides comprises the polyamine N-oxides having the general formula (I) wherein R is an aromatic,heterocyclic or alicyclic groups wherein the nitrogen of the N-O functional group is part of said R group. Examples of these classes are polyamine oxides wherein R is a heterocyclic compound such as pyrridine, pyrrole, imidazole and derivatives thereof.

[0167] The polyamine N-oxides can be obtained in almost any degree of polymerisation, The degree of polymerisation is not critical provided the material has the desired water-solubility and dye-suspending power. Typically, the average molecular weight is within the range of 500 to 1000,000.

b) Copolymers of N-vinylpyrrolidone and N-vinylimidazole

[0168] Suitable herein are coploymers of N-vinylimidazole and N-vinylpyrrolidone having an average molecular weight range of from 5,000 to 50,000. The preferred copolymers have a molar ratio of N-vinylimidazole to N-vinylpyrrolidone from 1 to 0.2.

c) Polyvinylpyrrolidone

[0169] The detergent compositions herein may also utilize polyvinylpyrrolidone ("PVP") having an average molecular weight of from 2,500 to 400,000. Suitable polyvinylpyrrolidones are commercially valuable from ISP Corporation, New York, NY and Montreal, Canada under the product names PVP K-15 (viscosity molecular weight of 10,000), PVP K-30 (average molecular weight of 40,000), PVP K-60 (average molecular weight of 160,000); and PVP K-90 (average molecular weight of 360,000). PVP K-15 is also available from ISP Corporation. Other suitable polyvinylpyrrolidones which are commercially available from BASF Cooperation include Sokalan HP 165 and Sokalan HP 12.

d) Polyvinyloxazolidone

[0170] The detergent compositions herein may also utilize polyvinyloxazolidones as polymeric dye transfer inhibiting agents. Said polyvinyloxazolidones have an average molecular weight of from 2,500 to 400,000.

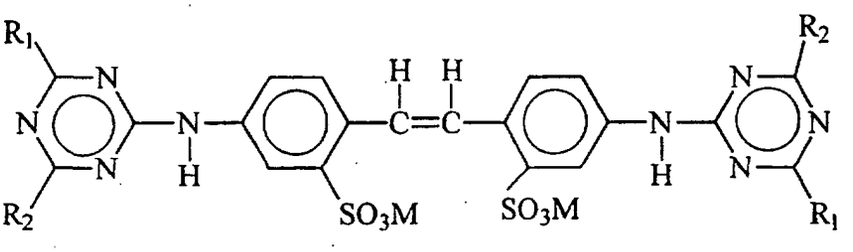
e) Polyvinylimidazole

[0171] The detergent compositions herein may also utilize polyvinyl imidazole as polymeric dye transfer inhibiting agent. Said polyvinylimidazoles preferably have an average molecular weight of from 2,500 to 400,000.

Optical brightener

[0172] The detergent compositions herein also optionally contain from about 0.005% to 5% by weight of certain types of hydrophilic optical brighteners.

[0173] Hydrophilic optical brighteners useful herein include those having the structural formula:



wherein R_1 is selected from anilino, N-2-bis-hydroxyethyl and NH-2-hydroxyethyl; R_2 is selected from N-2-bis-hydroxyethyl, N-2-hydroxyethyl-N-methylamino, morphilino, chloro and amino; and M is a salt-forming cation such as sodium or potassium.

[0174] When in the above formula, R_1 is anilino, R_2 is N-2-bis-hydroxyethyl and M is a cation such as sodium, the brightener is 4,4',-bis[(4-anilino-6-(N-2-bis-hydroxyethyl)-s-triazine-2-yl)amino]-2,2'-stilbenedisulfonic acid and disodium salt. This particular brightener species is commercially marketed under the tradename Tinopal-UNPA-GX by Ciba-Geigy Corporation. Tinopal-UNPA-GX is the preferred hydrophilic optical brightener useful in the detergent compositions herein.

[0175] When in the above formula, R_1 is anilino, R_2 is N-2-hydroxyethyl-N-2-methylamino and M is a cation such as sodium, the brightener is 4,4'-bis[(4-anilino-6-(N-2-hydroxyethyl-N-methylamino)-s-triazine-2-yl)amino]2,2'-stilbenedisulfonic acid disodium salt. This particular brightener species is commercially marketed under the tradename Tinopal 5BM-GX by Ciba-Geigy Corporation.

[0176] When in the above formula, R_1 is anilino, R_2 is morphilino and M is a cation such as sodium, the brightener is 4,4'-bis[(4-anilino-6-morphilino-s-triazine-2-yl)amino]2,2'-stilbenedisulfonic acid, sodium salt. This particular brightener species is commercially marketed under the tradename Tinopal AMS-GX by Ciba Geigy Corporation.

Other optional ingredients

[0177] Other optional ingredients suitable for inclusion in the detergent compositions and/or the particle include perfumes, colours and filler salts, with sodium sulfate being a preferred filler salt.

pH of the compositions

[0178] The detergent composition preferably have a pH measured as a 1% solution in distilled water of at least 10.0, preferably from 10.0 to 12.5, most preferably from 10.5 to 12.0.

Form of the compositions

[0179] The compositions are granular. The compositions can be of the form of a low- density granular detergent composition or the so-called concentrated granular detergent compositions adapted to be added to a washing machine by means of a dispensing device placed in the machine drum with the soiled fabric load, or can be added to the wash by means of a dispensing drawer, or can be added freely into the machine, preferably on the bottom of the machine.

[0180] The mean particle size of the base composition of granular compositions in accordance with the invention can be from 0.1.mm to 5.0 mm, but it should preferably be such that no more that 5% of particles are greater than 1.7mm in diameter and not more than 5% of particles are less than 0.15mm in diameter.

[0181] The term mean particle size as defined herein is calculated by sieving a sample of the composition into a number of fractions (typically 5 fractions) on a series of Tyler sieves. The weight fractions thereby obtained are plotted against the aperture size of the sieves. The mean particle size is taken to be the aperture size through which 50% by weight of the sample would pass.

[0182] The bulk density of granular detergent compositions is typically of at least 500 g/litre, more preferably from 650 g/litre to 1200 g/litre. Bulk density is measured by means of a simple funnel and cup device consisting of a conical funnel moulded rigidly on a base and provided with a flap valve at its lower extremity to allow the contents of the funnel to be emptied into an axially aligned cylindrical cup disposed below the funnel. The funnel is 130 mm high and has internal diameters of 130 mm and 40 mm at its respective upper and lower extremities. It is mounted so that the lower extremity is 140 mm above the upper surface of the base. The cup has an overall height of 90 mm, an internal height of 87 mm and an internal diameter of 84 mm. Its nominal volume is 500 ml.

[0183] To carry out a measurement, the funnel is filled with powder by hand pouring, the flap valve is opened and powder allowed to overfill the cup. The filled cup is removed from the frame and excess powder removed from the cup by passing a straight edged implement eg; a knife, across its upper edge. The filled cup is then weighed and the value obtained for the weight of powder doubled to provide a bulk density in g/litre. Replicate measurements are made as required.

Laundry washing method

[0184] Machine laundry methods herein typically comprise treating soiled laundry with an aqueous wash solution in a washing machine having dissolved or dispensed therein an effective amount of a machine laundry detergent composition in accord with the invention. By an effective amount of the detergent composition it is meant from 40g to 300g of product dissolved or dispersed in a wash solution of volume from 5 to 65 litres, as are typical product dosages and wash solution volumes commonly employed in conventional machine laundry methods.

Packaging for the compositions

[0185] Commercially marketed executions of the bleaching compositions can be packaged in any suitable container including those constructed from paper, cardboard, plastic materials and any suitable laminates. A preferred packaging execution is described in European Application No. 94921505.7.

Abbreviations used in following Examples

[0186] In the detergent compositions, the abbreviated component identifications have the following meanings:

LAS :	Sodium linear C_{12} alkyl benzene sulfonate
TAS :	Sodium tallow alkyl sulfate
C45AS :	Sodium C_{14}-C_{15} linear alkyl sulfate
CxyEzS :	Sodium C_{1x}-C_{1y} branched alkyl sulfate condensed with z moles of ethylene oxide
C45E7 :	A C_{14-15} predominantly linear primary alcohol condensed with an average of 7 moles of ethylene oxide
C25E3 :	A C_{12-15} branched primary alcohol condensed with an average of 3 moles of ethylene oxide
C25E5 :	A C_{12-15} branched primary alcohol condensed with an average of 5 moles of ethylene oxide
CEQ :	$R_1COOCH_2CH_2.N^+(CH_3)_3$ with R_1 = C_{11}-C_{13}
QAS :	$R_2.N^+(CH_3)_2(C_2H_4OH)$ with R_2 = C_6 - C_{14}
Soap :	Sodium linear alkyl carboxylate derived from an 80/20 mixture of tallow and coconut oils.
STS :	sodium toluene sulphonate
SXS :	sodium xylene sulphonate
SBS :	sodium benzene sulphonate
TFAA :	C_{16}-C_{18} alkyl N-methyl glucamide
TPKFA :	C12-C14 topped whole cut fatty acids
STPP :	Anhydrous sodium tripolyphosphate
Zeolite A :	Hydrated Sodium Aluminosilicate of formula $Na_{12}(Al0_2SiO_2)_{12}$. $27H_2O$ having a primary particle size in the range from 0.1 to 10 micrometers
NaSKS-6 :	Crystalline layered silicate of formula δ-$Na_2Si_2O_5$
Citric acid :	Anhydrous citric acid
Carbonate :	Anhydrous sodium carbonate with a particle size between 200 μm and 900μm
Bicarbonate :	Anhydrous sodium bicarbonate with a particle size distribution between 400μm and 1200μm
Silicate :	Amorphous Sodium Silicate (SiO_2:Na_2O; 2.0 ratio)
Sodium sulfate :	Anhydrous sodium sulfate
Citrate :	Tri-sodium citrate dihydrate of activity 86.4% with a particle size distribution between 425 μm and 850 μm
MA/AA :	Copolymer of 1:4 maleic/acrylic acid, average molecular weight about 70,000.
CMC :	Sodium carboxymethyl cellulose
QEA1 :	bis($(C_2H_5O)(C_2H_4O)_n$) (CH_3) -N^+-C_6H_{12}-N^+-(CH_3) bis((C_2H_5O)-$(C_2H_4O)_n$), wherein n=from 20 to 30
Protease :	Proteolytic enzyme of activity 4KNPU/g sold by NOVO Industries A/S under the tradename Savinase
Alcalase :	Proteolytic enzyme of activity 3AU/g sold by NOVO Industries A/S

Cellulase :	Cellulytic enzyme of activity 1000 CEVU/g sold by NOVO Industries A/S under the tradename Carezyme
Amylase :	Amylolytic enzyme of activity 60KNU/g sold by NOVO Industries A/S under the tradename Termamyl 60T
Lipase :	Lipolytic enzyme of activity 100kLU/g sold by NOVO Industries A/S under the tradename Lipolase
Endolase :	Endoglucanase enzyme of activity 3000 CEVU/g sold by NOVO Industries A/S
PB4 :	Sodium perborate tetrahydrate of nominal formula $NaBO_2.3H_2O.H_2O_2$
PB1 :	Anhydrous sodium perborate monohydrate bleach of nominal formula $NaBO_2.H_2O_2$
Percarbonate :	Sodium Percarbonate of nominal formula $2Na_2CO_3.3H_2O_2$
NOBS :	Nonanoyloxybenzene sulfonate in the form of the sodium salt.
NAC-OBS :	(Nonanamido caproyl) oxybenzene sulfonate in the form of the sodium salt.
TAED :	Tetraacetylethylenediamine
DTPMP :	Diethylene triamine penta (methylene phosphonate), marketed by Monsanto under the Trade name Dequest 2060
EDDS :	sodium salts of ethylene diamine disuccinate
Photoactivated :	Sulfonated Zinc Phthlocyanine encapsulated in bleach dextrin soluble polymer
Brightener 1 :	Disodium 4,4'-bis(2-sulphostyryl)biphenyl
Brightener 2 :	Disodium 4,4'-bis(4-anilino-6-morpholino-1.3.5-triazin-2-yl)amino) stilbene-2:2'-disulfonate.
HEDP :	1,1-hydroxyethane diphosphonic acid
PVNO :	Polyvinylpyridine N-oxide
PVPVI :	Copolymer of polyvinylpyrolidone and vinylimidazole
SRP 1 :	Sulfobenzoyl end capped esters with oxyethylene oxy and terephtaloyl backbone
SRP 2 :	Diethoxylated poly (1, 2 propylene terephtalate) short block polymer
Silicone antifoam :	Polydimethylsiloxane foam controller with siloxane-oxyalkylene copolymer as dispersing agent with a ratio of said foam controller to said dispersing agent of 10:1 to 100:1.
Alkalinity :	% weight equivalent of NaOH, as obtained using the alkalinity release test method described herein.

[0187] In the following Examples all levels are quoted as % by weight of the composition:

Example 1

[0188] The following high density granular laundry detergent compositions A to F were prepared in accord with the invention:

	A	B	C	D	E	F
LAS	6.0	8.0	8.0	12.0	14.0	8.0
C25E3	3.4	-	3.4	3.4	-	3.4
C46AS	-	2.0	-	-	3.0	4.0
TAS	3.0	7.0	5.0	2.0	1.0	0.5
STS	5.0	1.5	3.5	1.2	0.8	1.8
QAS	-	-	0.8	-	-	0.8
Zeolite A	18.1	18.1	18.1	18.1	18.1	18.1
Carbonate	13.0	13.0	13.0	27.0	27.0	27.0
Silicate	1.4	1.4	1.4	3.0	3.0	3.0
Sulfate	26.1	26.1	26.1	26.1	26.1	26.1
MA/AA	0.3	0.3	0.3	0.3	0.3	0.3
CMC	0.2	0.2	0.2	0.2	0.2	0.2
PB4	9.0	9.0	9.0	9.0	9.0	9.0
TAED	1.5	1.5.	1.0	1.5	-	1.5

(continued)

	A	B	C	D	E	F
NAC-OBS	-	-	0.5	1.0	2.0	-
DTPMP	0.25	0.25	0.25	0.25	0.25	0.25
EDDS	-	-	0.25	0.4	-	-
HEDP	0.3	0.3	0.3	0.3	0.3	0.3
Protease	0.26	0.26	0.26	0.26	0.26	0.26
Amylase	0.1	0.1	0.1	0.1	0.1	0.1
Photoactivated bleach (ppm)	15 ppm	15 ppm	15 ppm	15 ppm	15 ppm	15 ppm
Brightener 1	0.09	0.09	0.09	0.09	0.09	0.09
Perfume	0.3	0.3	0.3	0.3	0.3	0.3
Silicone antifoam	0.5	0.5	0.5	0.5	0.5	0.5
Misc/minors to 100%						
Density in g/litre	850	850	850	850	850	850

Example 2

[0189] The following granular laundry detergent compositions G to I were prepared in accord with the invention:

	G	H	I
LAS	5.25	5.61	8.0
TAS	1.25	1.86	1.57
C45AS	-	2.24	3.89
C25E3S	-	0.76	1.18
C45E7	3.25	-	5.0
C25E3	-	5.5	-
QAS	0.8	-	2.0
STS	1.8	1.5	-
SBS	-	-	2.0
STPP	19.7	-	-
Zeolite A	-	19.5	19.5
NaSKS-6/citric acid (79:21)	-	10.6	10.6
Carbonate	6.1	21.4	21.4
Bicarbonate	-	2.0	2.0
Silicate	6.8	-	-
Sulfate	39.8	-	14.3
MA/AA	0.8	1.6	1.6
CMC	0.2	0.4	0.4

(continued)

	G	H	I
PB4	5.0	12.7	-
TAED	0.5	3.1	-
DTPMP	0.25	0.2	0.2
HEDP	-	0.3	0.3
Protease	0.26	0.85	0.85
Lipase	0.15	0.15	0.15
Cellulase	0.28	0.28	0.28
Amylase	0.1	0.1	0.1
PVP	0.9	1.3	0.8
Photoactivated bleach (ppm)	15 ppm	27 ppm	27 ppm
Brightener 1	0.08	0.19	0.19
Brightener 2	-	0.04	0.04
Perfume	0.3	0.3	0.3
Silicone antifoam	0.5	2.4	2.4
Minors/misc to 100%			
Density in g/litre	750	750	750

Example 3

[0190] The following granular detergent formulations were prepared in accord with the invention.

		J	K	L	M
Spray dried particle					
	LAS	-	5.0	-	6.0
	TAS	7.0	3.0	8.0	5.0
	Zeolite A	-	27.0	-	20.0
	STPP	24.0	-	24.0	-
	Sulfate	9.0	6.0	13.0	-
	MA/AA	2.0	4.0.	6.0	4.0
	Silicate	7.0	-	3.0	3.0
	CMC	1.0	1.0	0.5	0.6
	Brightener 1	0.2	0.2	0.2	0.2
	Silicone antifoam	1.0	0.1	0.1	0.3
	DTPMP	0.4	0.4	0.2	0.4
	STS	12.0	1.8	1.0	2.5
Spray on					
	C45E7	-	-	-	-
	C45E2	2.5	2.5	-	-

(continued)

		J	K	L	M
	C45E3	2.6	2.5	-	-
	Perfume	0.3	0.3	0.3	0.2
	Silicone antifoam	0.3	0.3	0.3	-
Dry additives					
	Sulfate	3.0	3.0	5.0	10.0
	Carbonate	6.0	13.0	15.0	14.0
	PB1	-	-	-	1.5
	PB4	18.0	18.0	10.0	18.5
	TAED	3.0	2.0	-	2.0
	NAC-OBS	-	2.0	4.0	-
	Protease	1.0	1.0	1.0	1.0
	Lipase	0.4	0.4	0.4	0.2
	Amylase	0.2	0.2	0.2	0.4
	Photoactivated bleach	-	-	-	15 ppm
Misc/minor to 100%					

Example 4

[0191] The following granular detergent formulations were prepared in accord with the invention.

		N	O	P	Q	R	S
Spray dried particle							
	LAS	22.0	5.0	4.0	9.0	8.0	6.0
	C45AS	-	7.0	6.0	-	-	-
	TAS	7.0	4.0	3.0	1.8	2.0	3.0
	STS	0.9	1.5	1.7	11.8	3.0	1.5
	Zeolite A	6.0	16.0	14.0	19.0	16.0	14.0
	MA/AA	6.0	3.0	3.0	3.0	2.0	3.0
	AA	-	3.0	3.0	-	-	-
	Sulfate	7.0	18.3	11.3	14.0	15.3	10.0
	Silicate	5.0	1.0	1.0	-	1.0	-
	Carbonate	28.3	9.0	7.0	15.7	14.0	10.0
	PEG 4000	0.5	1.5	1.5	-	-	-
	EDDS	2.0	-	-	0.1	0.2	0.3
	HEDP	0.4	-	0.5	0.2	0.5	0.5
	QEA	-	-	0.8	-	0.8	0.5
	QAS	-	-	-	1.0	0.5	-
	Brightener 2	0.2	0.3	0.3	0.3	0.3	0.3
Spray on							

(continued)

		N	O	P	Q	R	S
	C25E9	1.0	-	-	-	-	-
	C45E7	-	2.0	2.0	3.5	2.0	2.0
	Perfume	1.0	0.3	0.3	1.0	0.3	0.3
Agglomerates							
TAS		0.5	-	-	-	1.0	0.9
	C45AS	-	5.0	5.0	-	5.0	5.0
	LAS	-	2.0	2.0	-	2.0	2.0
	Zeolite A	-	7.5	7.5	-	7.5	7.5
	Carbonate	-	4.0	4.0	-	4.0	4.0
	PEG 4000	-	0.5	0.5	-	-	-
	Misc (water etc)	-	2.0	2.0	-	-	2.0
Dry additives							
	PB4	-	1.0	4.0	-	5.0	0.5
	TAED	6.0	2.0	-	2.0	1.6	2.5
	Percarbonate	-	5.0	12.5	-	-	-
	Carbonate	-	5.3	1.8	14.0	4.0	8.0
	NOBS	4.5	-	6.0	-	-	0.6
	Lipase	0.4	0.4	0.4	0.2	0.4	0.4
	Cellulase	0.1	0.2	0.2	0.2	0.2	0.2
	Amylase	0.1	0.3	0.3	0.6	0.6	1.1
	Protease	1.0	0.5	0.5	1.5	1.0	01.2
	PVPVI	-	0.5	0.5	-	-	-
	PVP	0.5	0.5	0.5	-	-	-
	PVNO	-	0.5	0.5	-	-	-
	SRP1	-	0.5	0.5	-	-	-
	SKS-6	-	-	0.5	4.5	2.0	3.5
	citric acid	-	1.0	-	1.0	1.5	2.0
	QAS	-	-	1.0	1.0	1.0	1.5
	QEA	1.0	-	-	1.0	-	-
	Silicone antifoam	-	0.2	0.2	0.3	0.2	0.2
Misc/minors to 100%							

Example 5

[0192] The following nil bleach-containing detergent formulations of particular use in the washing of colored clothing, according to the present invention were prepared:

		T	U
Spray dried particle			
	TAS	9.0	7.0
	Zeolite A	15.0	15.0
	Sulfate	-	5.0
	LAS	-	6.0
	DTPMP	0.4	0.5
	CMC	0.4	0.4
	MA/AA	4.0	4.0
	STS	2.5	1.4
Agglomerates			
	C45AS	-	-
	LAS	6.0	5.0
	TAS	3.0	2.0
	Silicate	4.0	4.0
	Zeolite A	10.0	15.0
	CMC	-	-
	MA/AA	-	-
	Carbonate	9.0	7.0
Spray On			
	Perfume	0.3	0.3
	C45E7	4.0	4.0
	C25E3	2.0	2.0
Dry additives			
	MA/AA	-	-
	NaSKS-6	- -	
	Citrate	10.0	-
	Bicarbonate	7.0	3.0
	Carbonate	8.0	5.0
	PVPVI/PVNO	0.5	0.5
	Alcalase	0.5	0.3
	Lipase	0.4	0.4
	Amylase	0.6	0.6
	Cellulase	0.6	0.6
	Silicone antifoam	5.0	5.0
Dry additives			
	Sulfate	0.0	9.0
Misc/minors to 100%		100.0	100.0
Density (g/litre)		700	700

Example 6

[0193] The following granular detergent formulations were prepared in accord with the invention.

		V	W	X
Spray dried particle				
	TAS	3.0	10.0	7.0
	Zeolite A	30.0	22.0	6.0
	Sulfate	19.0	5.0	7.0
	MA/AA	3.0	3.0	6.0
	LAS	14.0	-	8.0
	C45AS	5.0	7.0	-
	Silicate	-	1.0	5.0
	Soap	-	-	2.0
	Brightener 1	0.2	0.2	0.2
	Carbonate	8.0	16.0	20.0
	DTPMP	-	0.4	0.4
	STS	1.8	8.5	1.2
Spray On		-	1.0	5.0
	C45E7	1.0	1.0	1.0
Dry additives				
	PVPVI/PVNO	0.5	0.5	0.5
	Protease	1.0	1.0	1.0
	Lipase	0.4	0.4	0.4
	Amylase	0.1	0.1	0.1
	Cellulase	0.1	0.1	0.1
	NOBS	-	6.1	4.5
	PB1	1.0	5.0	6.0
	Sulfate	-	6.0	-
Misc/minor to 100%				

Example 7

[0194] The following granular detergent compositions in accord with the invention.

		Y	Z
Spray dried particle			
	TAS	6.0	-
	Zeolite A	20.0	-
	STPP	-	20.0
	LAS	6.0	6.0
	C68AS	-	2.0
	Silicate	3.0	8.0

(continued)

		Y	Z
	MA/AA	4.0	2.0
	CMC	0.6	0.6
	Brightener 1	0.2	0.2
	DTPMP	0.4	0.4
	STS	0.8	7.5
Spray on			
	C45E7	5.0	5.0
	Silicone antifoam	0.3	0.3
	Perfume	0.2	0.2
Dry additives			
	STS	0.5	0.4
	Carbonate	14.0	9.0
	PB1	1.5	2.0
	PB4	18.5	13.0
	TAED	2.0	2.0
	Photoactivated bleach	15 ppm	15 ppm
	Protease	1.0	1.0
	Lipase	0.2	0.2
	Amylase	0.4	0.4
	Cellulase	0.1	0.1
	Sulfate	10.0	20.0
Misc/minors to 100%			
	Density (g/litre)	700	700

[0195] The examples 1 to 3, 6 and 7 describe granular detergent compositions of which the examples 6 and 7 show spray-dried particles. Only the examples 4 and 5 appear to be according to the present invention because they disclose spray-dried particles together with agglomerates in a granular detergent composition.

Claims

1. A granular detergent composition comprising:

a) an anionic sulphate surfactant present at a level of from 0.01% to 95% by weight of the composition;
b) a hydrotrope present at a level of from 0.01% to 60% by weight of the composition

characterised in that the granular composition comprises (1) spray dried particles comprising the anionic sulphate and the hydrotrope and (2) agglomerate particles containing 0% to 1.8%, by weight, of the hydrotrope.

2. A granular detergent composition according to claim 1 in which the agglomerate particles contain the hydrotrope.

3. A granular detergent composition according to claim 1 wherein the anionic sulphate surfactant is present at a level of from 3% to 20% by weight of the composition.

4. A granular detergent composition according to any preceding claim wherein the hydrotrope is present at a level of from 0.3% to 10% by weight of the composition.

5. A granular detergent composition according to any preceding claim, wherein the hydrotrope is a salt of benzene sulphonate, toluene sulphonate, xylene sulphonate or cumene sulphonate.

6. A granular detergent composition according to claim 5 wherein the hydrotrope is a sodium toluene sulphonate.

7. A granular detergent composition according to any preceding claim wherein the ratio of anionic- sulphate surfactant to hydrotrope is from 50:1 to 1:1.

8. A granular detergent composition according to any preceding claim wherein the ratio of anionic sulphate surfactant to hydrotrope is from 20:1 to 2:1.

9. A granular detergent composition according to claim 8 wherein the anionic sulphonate surfactant is a linear alkyl benzene sulphonate.

10. Use of a hydrotrope in a granular detergent composition to improve dispensing of the composition, wherein the composition comprises spray dried particles and agglomerated particles, the composition comprises an anionic sulphate surfactant, and the hydrotrope is included in the spray dried particles and is present in the agglomerated particles in an amount of 0% to 1.8% by weight.

Revendications

1. Composition détergente granulaire comprenant :

   a) un tensioactif sulfate anionique présent en une quantité de 0,01 % à 95 % en poids de la composition ;
   b) un hydrotrope présent en une quantité de 0,01 % à 60 % en poids de la composition,

   caractérisée en ce que la composition granulaire comprend (1) des particules séchées par pulvérisation comprenant le sulfate anionique et l'hydrotrope et (2) des particules d'agglomérat contenant 0 % à 1,8 %, en poids, de l'hydrotrope.

2. Composition détergente granulaire selon la revendication 1, dans laquelle les particules d'agglomérat contiennent l'hydrotrope.

3. Composition détergente granulaire selon la revendication 1, dans laquelle le tensioactif sulfate anionique est présent en une quantité de 3% à 20 % en poids de la composition.

4. Composition détergente granulaire selon l'une quelconque des revendications précédentes, dans laquelle l'hydrotrope est présent en une quantité de 0,3 % à 10 % en poids de la composition.

5. Composition détergente granulaire selon l'une quelconque des revendications précédentes, dans laquelle l'hydrotrope est un sel de benzènesulfonate, toluènesulfonate, xylènesulfonate ou cumènesulfonate.

6. Composition détergente granulaire selon la revendication 5, dans laquelle l'hydrotrope est un toluènesulfonate de sodium.

7. Composition détergente granulaire selon l'une quelconque des revendications précédentes, dans laquelle le rapport du tensioactif sulfate anionique à l'hydrotrope est de 50:1 à 1:1.

8. Composition détergente granulaire selon l'une quelconque des revendications précédentes, dans laquelle le rapport du tensioactif sulfate anionique à l'hydrotrope est de 20:1 à 2:1.

9. Composition détergente granulaire selon la revendication 8, dans laquelle le tensioactif sulfonate anionique est un alkylbenzènesulfonate linéaire.

10. Utilisation d'un hydrotrope dans une composition détergente granulaire pour améliorer la délivrance de la composition, dans laquelle la composition comprend des particules séchées par pulvérisation et des particules agglomérées, la composition comprend un tensioactif sulfate anionique, et l'hydrotrope est compris dans les particules séchées par pulvérisation et est présent dans les particules agglomérées en une quantité de 0 % à 1,8 % en poids.

Patentansprüche

1. Granuläre Reinigungsmittelzusammensetzung, umfassend:

a) ein anionisches Sulfat-Tensid, das in einem Anteil von 0,01 bis 95 Gew.-% der Zusammensetzung vorliegt;
b) ein Hydrotrop, das in einem Anteil von 0.01 bis 60 Gew.-% der Zusammensetzung vorliegt,

dadurch gekennzeichnet, dass die granuläre Zusammensetzung (1) sprühgetrocknete Teilchen, umfassend das anionische Sulfat und das Hydrotrop, und (2) Agglomeratteilchen, enthaltend 0 bis 1,8 Gew.-% des Hydrotrops, umfasst.

2. Granuläre Reinigungsmittelzusammensetzung nach Anspruch 1, wobei die Agglomeratteilchen das Hydrotrop enthalten.

3. Granuläre Reinigungsmittelzusammensetzung nach Anspruch 1, wobei das anionische Sulfat-Tensid in einem Anteil von 3 bis 20 Gew.-% der Zusammensetzung vorliegt.

4. Granuläre Reinigungsmittelzusammensetzung nach mindestens einem vorangehenden Anspruch, wobei das Hydrotrop in einem Anteil von 0,3 bis 10 Gew.-% der Zusammensetzung vorliegt.

5. Granuläre Reinigungsmittelzusammensetzung nach mindestens einem vorangehenden Anspruch, wobei das Hydrotrop ein Salz von Benzolsulfonat, Toluolsulfonat, Xylolsulfonat oder Cumolsulfonat ist.

6. Granuläre Reinigungsmittelzusammensetzung nach Anspruch 5, wobei das Hydrotrop Natriumtoluolsulfonat ist.

7. Granuläre Reinigungsmittelzusammensetzung nach mindestens einem vorangehenden Anspruch, wobei das Verhältnis von anionischem Sulfat-Tensid zu Hydrotrop 50:1 bis 1:1 beträgt.

8. Granuläre Reinigungsmittelzusammensetzung nach mindestens einem vorangehenden Anspruch, wobei das Verhältnis von anionischem Sulfat-Tensid zu Hydrotrop 20:1 bis 2:1 beträgt.

9. Granuläre Reinigungsmittelzusammensetzung nach Anspruch 8, wobei das anionische Sulfat-Tensid ein lineares Alkylbenzolsulfonat ist.

10. Verwendung eines Hydrotrops in einer granulären Reinigungsmittelzusammensetzung, um das Dispensieren der Zusammensetzung zu verbessern, wobei die Zusammensetzung sprühgetrocknete Teilchen und agglomerierte Teilchen umfasst, die Zusammensetzung ein anionisches Sulfat-Tensid umfasst und das Hydrotrop in den sprühgetrockneten Teilchen beinhaltet ist und in den agglomerierten Teilchen in einer Menge von 0 bis 1,8 Gew.-% vorliegt.