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(54) Detergent particle

(57) The present invention relates to an agglomerate or extruded detergent particle, comprising perborate component, an acid source and one or more surfactants, for use in detergent compositions which are suitable for use in laundry washing methods. The invention also relates to a process for making the agglomerated or extruded detergent particle.

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Description

Technical Field

The present invention relates to an agglomerated or extruded detergent particle, comprising perborate bleach, an acid source and one or more surfactants, for use in detergent compositions which are suitable for use in laundry washing methods. The invention also relates to a process for making the agglomerated or extruded detergent particle.

Background to the Invention

There is a trend amongst commercially available granular detergents towards higher bulk densities and towards granular detergent compositions which have a higher content of detergent active ingredients, such as bleach. Such detergents offer greater convenience to the consumer and at the same time reduce the amount of packaging materials which will, ultimately, be disposed of. However, traditional detergent formulations and processes to produce the final detergent powder are not always satisfactory or suitable for these detergents, with higher active ingredient concentration.

Amongst consumers there is also a need for detergents which provide improved bleachable stain removal. Therefore, in the recent past detergents have been developed which contain various types of bleaches, which can be incorporated at high levels.

The (high density) detergents, comprising high levels of bleach and surfactant can lead to poor solubility properties, arising from low rate of dissolution or the formation of gels, and thus to poor dispensing of the product, either from the dispensing drawer of a washing machine, or from a dosing device placed with the laundry inside the machine. This poor dispensing is often caused by gelling of particles, which have high levels of surfactant and/ or bleach, upon contact with water. The gel prevents a proportion of the detergent powder from being solubilized in the wash water which reduces the effectiveness of the powder. This is a particular problem at low water pressures and/or at lower washing temperature.

EP-A-0 639 637 discloses the replacement of perborate bleach with an alkali metal percarbonate to improve the dispensing profile and dissolution rate of a detergent. Citrate or mixtures of citrate with sulphate or carbonate can be used to coat the percarbonate bleach.

EP-A-0 639 639 contains a similar disclosure in this respect.

Other ways to improve dispensing include the use of an effervescence system. If the detergent contains an effervescence system then the generation of a gas such as carbon dioxide pushes the particles of the detergent apart, and prevents them from gelling.

The use of effervescence to improve the dispensability of granular materials has been used extensively in pharmaceutical preparations. The most widely used effervescent system in this respect is citric acid in combination with bicarbonate. The use of this simple effervescent system has also been described for improving the dispersibility of pesticidal compositions for controlling water-borne pests, e.g. GB-A-2,184,946.

EP-A-0 534 525 discloses the use of citric acid with a specified particle size range of 350 to 150 microns.

US-A-5, 114,647 discloses a sanitising composition comprising granules of alkali metal carbonate and aliphatic carboxylic acid of a particle size of 150 to 2,000 microns.

EP-A-0 333 223 discloses a bathing preparation comprising fumaric acid having an average particle size of 50-500 microns.

The Applicants have found that one of the specific problems associated with poor dispensing of detergent compositions which contain bleaching agents and particularly perborate monohydrate bleach, is that localised high concentrations of bleach form which may contact the fabric and cause spot bleaching of coloured fabrics. Secondly, poorly dispensed surfactants tend to deposit on the fabric and the machine. This can lead to fabric damage. These problems can be encountered especially with detergent compositions comprising high levels of surfactants and perborate, especially perborate (monohydrate). However, these high concentrations are often required for an optimal stain/soil removal and suspension and bleachable stain removal.

The Applicants now have found that this problem can be solved or reduced when an acid source is agglomerated with or extruded along with the surfactants, or a part thereof, and the perborate bleach to form an agglomerated or extruded detergent particle. In the detergent comprising this agglomerated or extruded particle, an alkali source should be present, capable of producing a gas when reaction with the acidic source. We have found that agglomerating or extruding of such an acid source with surfactant(s) and bleach, when there is an alkali source present in the detergent composition improves the solubility and/or dispersion of the surfactant(s) and the perborate bleach in the wash water and eliminates or reduces the problems of fabric damage by high concentrate bleach and of solid detergent particles or surfactants remaining in the washing machine and on washed clothes. It is believed that the acid reacts rapidly with the alkali in the wash water to release the gas. This helps disperse the perborate bleach and the detergent in general sur-

factants and minimise the formation of high concentrations of bleach and of insoluble clumps.

The improved dispensing of the surfactant(s) and the perborate bleach can amount to an overall improved and more efficient performance.

Furthermore the detergent residues in the dispensing drawer or dispensing device are reduced.

All documents cited in the present description are, in relevant part, incorporated herein by reference.

Summary of the Invention

According to the present invention there is provided an agglomerate or extruded detergent particle comprising a perborate component, one or more surfactants and an acid source. Optionally other detergent ingredient can be present in the agglomerate or extrudate. The agglomerated or extruded detergent particle can be included in detergents comprising an alkali source capable of reacting with the acid source to produce a gas. According to the present invention there is also provided a process for making the agglomerate or extruded detergent particle.

Detailed Description of the Invention

Agglomerate or extruded particle

The agglomerate or extruded detergent particle of the present invention contains one or more surfactants and an acid source and a perborate component, which are described below.

The amount of each component in the agglomerate or extruded detergent particle can vary depending on the application of the particle and on the nature of the final detergent composition comprising the particle. For example, when the particle will be used in a detergent composition comprising one or more of the same ingredients as the particle, the level thereof in the particle can be reduced.

The level of surfactant in the particle is preferably from 15% to 95%, more preferably from 25% to 60%, most preferably from 30% to 50% by weight of the particle.

The level of acid source in the particle is preferably from 1% to 40%, more preferably from 3% to 30%, even more preferably from 5% to 25%, most preferably from 7% to 15% by weight of the particle

The level of perborate component in the particle is preferably from 10% to 70%, more preferably from 15% to 50%, most preferably from 20% to 40% by weight of the particle.

Preferably, at least one anionic surfactant is present. In a preferred embodiment a nonionic surfactant and an anionic surfactant are present. In a further preferred embodiment an anionic and a cationic and optionally a nonionic surfactant are present When a cationic surfactant is present, preferably a silicate or alumino silicate containing material is present.

Preferably, magnesium sulphate is present in the particle, preferably at a level of from 0.1% to 8%, more preferably of from 0.2% to to 5%, most preferably from 0.3% to 3% by weight of the particle.

Preferably, the particle does not comprise a bleach activator and/ or crystalline layered silicate.

The agglomerate or extruded particle can optionally comprise additional detergent ingredients. Preferred optional ingredients in the particle can be builders (alumino silicates, polymeric carboxylates), an alkali source, bleach activators and bleach catalysts.

Surfactant

The level of surfactant in the particle is preferably from 15% to 95%, more preferably from 25% to 60%, most preferably from 30% to 50% by weight of the particle

When the particle is comprised in a detergent composition, the total level of surfactant in the detergent composition is preferably of from 1% to 90%, preferably 3% to 70%, more preferably 5% to 40%, even more preferably 10% to 30%, most preferably 12% to 25% by weight of the detergent composition.

The surfactant in the agglomerate or extruded particle is selected from anionic, nonionic and cationic surfactants and mixtures thereof.

Optionally, ampholytic, amphoteric and zwitterionic surfactants can be present in the particle.

A typical listing of 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.

Anionic surfactant

The agglomerated or extruded detergent particle in accordance with the present invention preferably comprise one or more anionic surfactants. Essentially any anionic surfactants useful for detersive purposes can be comprised in the detergent composition. These can include salts (including, for example, sodium, potassium, ammonium, and substituted ammonium salts such as mono- di- and triethanolamine salts) of the anionic sulfate, sulfonate, carboxylate and sarcosinate surfactants. Anionic sulfate surfactants are preferred.

The level of anionic surfactant is preferably from 10% to 95%, more preferably from 20% to 60%, most preferably from 25% to 50% by weight of the particle.

In detergent compositions, comprising the particle, the total level of anionic surfactant is preferably from 2% to 40%, more preferably from 4% to 30%, even more preferably from 5% to 25% most preferably from 6% to 15% by weight of the composition.

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.

Anionic sulfate surfactant

Anionic sulfate surfactants suitable for use herein include the linear and branched primary and secondary alkyl sulfates, alkyl ethoxysulfates, 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).

Alkyl sulfate surfactants are 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.

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.

A particularly preferred aspect of the invention employs mixtures of the preferred alkyl sulfate and alkyl ethoxysulfate surfactants. Such mixtures have been disclosed in PCT Patent Application No. WO 93/18124.

Anionic sulfonate surfactant

Anionic sulfonate surfactants suitable for use herein include the salts of C_5-C_{20} linear 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, fatty acyl glycerol sulfonates, fatty oleyl glycerol sulfonates, and any mixtures thereof.

Anionic carboxylate surfactant

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.

Suitable alkyl ethoxy carboxylates include those with the formula $RO(CH_2CH_20)_x\ CH_2C00^-M^+$ 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 $RO-(CHR_1-CHR_2-O)-R_3$ 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.

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

Other suitable anionic surfactants are the alkali metal sarcosinates of formula $R-CON\ (R^1)\ CH_2\ COOM$, 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

Another preferred surfactant 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.

The level of cationic surfactant is preferably from 1% to 20%, more preferably from 9% to 15%, most preferably from 4% to 10% by weight of the particle.

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

The detergent composition of the present invention preferably contains a nonionic surfactant. Essentially any nonionic surfactant can be used herein.

The level of nonionic surfactant is preferably from 5% to 60%, more preferably from 10% to 45%, most preferably from 15% to 35% by weight of the particle. 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

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

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

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

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 amination reaction; more preferably Z is a glycityl.

Nonionic fatty acid amide surfactant

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

Suitable alkylpolysaccharides for use herein are disclosed in US. 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.

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.

Optional surfactants

Amphoteric surfactant

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

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_{10-18} acylamido alkyl dimethylamine oxide

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

Zwitterionic surfactant

Optionally, zwitterionic surfactants can be incorporated into the particle or detergent compositions comprising the particle. These surfactants can be broadly described as derivatives of secondary and tertiary amines, derivatives of heterocyclic 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.

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_{12-18} dimethylammonio hexanoate and the C_{10-18} acylamidopropane (or ethane) dimethyl (or diethyl) betaines. Complex betaine surfactants are also suitable for use herein.

Acid source

In accordance with the present invention, an acid source, or source of acidity, is present in the agglomerate or extruded detergent particle. When comprised in a detergent composition, the detergent composition contains an alkali source, capable of reacting with the acid source to produce a gas. Optionally, the alkali source or part thereof can be comprised in the particle.

The level of the acid source in the particle is preferably from 1% to 40%, more preferably from 3% to 30%, even more preferably from 5% to 25%, most preferably from 7% to 15% by weight of the particle.

In detergent compositions comprising the particle, the level of the source of acidity is preferably present of from 0.1% to 50%, more preferably from 0. 5% to 25%, even more preferably from 1% to 12%, most preferably from 1% to 7% weight of the composition.

Preferably, 80% or more of the acid source has a particle size in the range of from about 150 microns to about 710 microns, with at least about 37% by weight of the acid source having a particle size of about 350 microns or less. In a preferred embodiment 100% of the acid source has a particle size of about 710 microns or less Alternatively, greater than about 38%, more preferably 38.7%, of the particulate acid source has a particle size of about 350 microns or less.

The particle size of the acid source is calculated by sieving a sample of the source of acidity on a series of Tyler sieves. For example, a Tyler sieve mesh 100 corresponds to an aperture size of 150 microns. The weight fractions thereby obtained are plotted against the aperture size of the sieves.

The acid source may be any suitable organic, mineral or inorganic acid, or a derivative thereof or a mixture thereof.

The acid source may be a mono-, bi- or tri-protonic acid. Preferred derivatives include a salt or ester of the acid. 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.

Perborate component

Another essential ingredient of the agglomerate or extruded detergent particle of the present invention is a perborate component, which is capable of bleaching.

The level of perborate component in the particle is preferably from 10% to 70%, more preferably from 15% to 50%, most preferably from 20% to 40% by weight of the particle.

In detergent compositions comprising the particle, the perborate is preferably present at a level of from 1% to 40% by weight, more preferably from 6% to 25% by weight, most preferably from 13% to 20% by weight of the compositions.

The perborate is preferably in the form of a salt, normally in the form of the alkali metal, preferably sodium salt.

The perborate bleach is preferably sodium perborate in the form of the monohydrate or tetrahydrate, which can be represented respectively with the nominal formula $NaBO_2H_2O_2$ and $NaBO_2H_2O_2.3H_2O$.

The perborate bleach may be included as the crystalline solid without additional protection. However, preferred executions of certain granular compositions utilize a coated form of the perborate bleach which provides better storage stability for the perhydrate salt in the granular product. Suitable coatings comprise inorganic salts such as alkali metal silicate, carbonate or borate salts or mixtures thereof or organic materials such as waxes, oils, or fatty soaps.

Source of Alkali

In accordance with the present invention, when the agglomerate or extruded detergent particle is present in a detergent composition, an alkali source is generally present in the detergent composition such that it has the capacity to react with the acid source to produce a gas. Preferably this gas is carbon dioxide, and therefore the alkali is a carbonate, or a suitable derivative thereof.

Optionally, the alkali source, or part thereof can he present in the particle.

The detergent composition comprising the particle of the present invention, preferably contains from about 2% to about 75%, preferably from about 5% to about 60%, most preferably from about 10% to about 30% by weight of the alkali source. When the alkali source is present in the particle, the agglomerate or extrudate preferably contains from about 5% to about 60%, more preferably from 10% to 50%, most preferably from 15% to 35% of the alkali source.

In a preferred embodiment, the alkali source is a carbonate. Examples of preferred carbonates are the alkaline earth and alkali metal carbonates, including sodium carbonate, bicarbonate and sesqui-carbonate and any mixtures thereof with ultra-fine calcium carbonate such as are disclosed in German Patent Application No 2,321,001 published on November 15, 1973. Alkali metal percarbonate salts may also be included in the detergent compositions and are also suitable sources of carbonate species and are described below in more detail.

Other suitable sources will be known to those skilled in the art.

The alkali source may also comprise other components, such as a silicate. Suitable silicates include the water soluble sodium silicates with an SiO_2: Na_2O ratio of from 1.0 to 2.8, with ratios of from 1.6 to 2.0 being preferred, and 2.0 ratio being most preferred. The silicates may be in the form of either the anhydrous salt or a hydrated salt. Sodium silicate with an SiO_2: Na_2O ratio of 2.0 is the most preferred silicate. Alkali metal persilicates are also suitable sources of silicate herein.

Process for making of the agglomerate particle

The agglomerate detergent particle can be prepared via a process comprising the steps of:

i) admixing one or more detergent surfactants, the perborate component and an acid source and optionally other detergent ingredients to form a mixture; and

ii) agglomerating the mixture to form agglomerated particles.

Typically, such a process involves mixing a effective amount of powder, including the acid source, with a high active surfactant paste in one or more agglomerators such as a pan agglomerator, a Z-blade mixer or more preferably in-line mixers, preferably two, such as those manufactured by Schugi (Holland) BV, 29 Chroomstraat 8211 AS, Lelystad, Netherlands, and Gebruder Lodige Maschinenbau GmbH, D-4790 Paderborn 1, Elsenerstrasse 7-9, Postfach 2050, Germany. Preferably a high shear mixer is used, such as a Lodige CB (Trade Name). Most preferably, a high shear mixer is used in combination with a low shear mixer, such as a Lodige CB (Trade Name) ad a Lodige KM (Trade name) or Schugi KM (Trade Name). Optionally, only one or more low shear mixer are used. Preferably, the agglomerates are

thereafter dried and/ or cooled.

An other agglomeration process involves mixing of various components of the final agglomrate in different stages, using an fluidised bed. For example, a preferred particle in accord with the present invention can be agglomerated by addition. preferably by spraying on, of nonionic, anionic surfactants and optionally a wax, or mixtures thereof to the acid source in powdered form and other optional ingredients. Then, additional components, including the perborate bleach and optinally the alkali source or part thereof can be added and agglomerated in one or more stages, thus forming the final agglomerate particle.

Preferably, no bleach activator and/ or crystalline layered silicate is added to the agglomerate mix in the agglomeration process for making the particle of the invention.

The agglomerate particles may take the form of flakes, prills, marumes, noodles, ribbons, but preferably take the form of granules. A preferred way to process the particles is by agglomerating powders (e.g. aluminosilicate, carbonate) with high active surfactant pastes and to control the particle size of the resulting agglomerates within specified limits. Typical particle sizes are from 0.10 mm to 5.0 mm in diameter, preferably from 0.25 mm to 3.0 mm in diameter, most preferably from 0.40 mm to 1.00 mm in diameter.

A high active surfactant paste comprising a mix of, typically, from 50% by weight to 95% by weight, preferably 70% by weight to 85% by weight of surfactant, and optionally it can contain an appropriate acid source. The paste may be pumped into the agglomerator at a temperature high enough to maintain a pumpable viscosity, but low enough to avoid degradation of the anionic surfactants used. An operating temperature of the paste of 50°C to 80°C is typical. Such pastes and methods for making and processing such pastes is for example described in WO 93/03 128.

In a especially preferred embodiment of the present invention, the detergent composition has a density of greater than about 600 g/l and is in the form of powder or a granulate.

Process for making the extruded particle

Extruded particles can generally be prepared by mixing the various components, optionally addition of powdered components and/or slip additives, forcing the obtained mixture by pressure through the extruder holes or the required diameter or less, cutting of the extruded paste into extrudates (granules) of the required length and rounding the extrudates. WO 91/13678 and WO 91/02047 describe such processes.

In more detail the extruded particles can be made as follows. The detergent ingredients can be mixed into one paste. Preferably, the various detergent components are pre-mixed in different pastes, preferably two, whereby the acid source preferably is present in a different pre-mixed past than the alkali source if present in the particle, especially when the alkaline source is a carbonate or bicarbonate.

In a highly preferred embodiment, one pre-mixed paste comprises the perborate component and part of the surfactant, preferably the anionic surfactant if present, and additional components such as zeolite and cationic surfactant, and one pre-mixed paste comprises the acid source and part of the surfactant, preferably the nonionic surfactant. The premixed pastes will then be mixed to form one paste.

Optionally, water and additional detergent components, such as slip additives, additional bleach, enzymes, optionally bleach activators, stabilisers and soap can be added to the pre-mixed paste or pastes or to the paste as a whole, simultaneously with or shortly after the mixing process has started.

Preferably the paste obtained is coated with a slip material prior to or simultaneously with the introduction of the paste in the extruder. A variety of compounds are known to be useful herein as slip additives. Preferred slip additives are those compounds which also have a secondary detergent function, such as certain anionic and nonionic surfactants, polymeric polycarboxylates, polyvinyl alcohols.

Under pressure (20 bar or more) the paste or coated paste is then passed through the holes (of the extruder) of the required diameter or less, whereafter the extruded granules are cut in to granules of the required length (about 0.1 mm to 2.0 mm, preferably about 0.4 mm to 1.0 mm).

Typical particle diameter sizes (width) are from 0.10 mm to 5.0 mm, preferably from 0.25 mm to 3.0mm, most preferably from 1.00 mm to 2.50.

The viscosity of the paste should be controlled to avoid cacking of the paste in the extruder or during mixing and to avoid the paste from blocking the extruder. By constant pressure, the viscosity is best controlled by heating and cooling the paste and/ or the extruder.

Optionally, the obtained extrudates are rounded, to obtain round or spherical particles.

Preferably, the thus obtained particles are dusted with a powder, preferably zeolite, and dried, to form equally shaped granules, and to avoid agglomeration of the granules.

Additional ingredients

The agglomerate or extruded detergent particle and/ or the detergent compositions, comprising 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.

The detergent particle preferably comprises as an additional ingredient one or more builders, preferably alumino silicates and/ or organic polycarboxylate polymers, alkali sources, bleach activators or bleach catalysts, or mixtures thereof.

The detergent compositions, comprising the particle of the invention, preferably contain one or more additional detergent components selected from surfactants as described above, additional acid sources, additional bleaches, builders, organic polymeric compounds, enzymes, suds suppressors, lime soap dispersants, soil suspension and anti-redeposition agents and corrosion inhibitors.

Water-soluble builder compound

The particle and/ or 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.

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.

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

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.

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.

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.

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

The particle and/ or the detergent compositions 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.

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.

Examples of largely water insoluble builders include the sodium aluminosilicates.

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.

The aluminosilicate zeolites can he 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 $Na_{86}[(AlO_2)_{86}(SiO_2)_{106}].\ 276\ H_2O$.

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-$Na_2Si_20_5$, available from Hoechst AG as NaSKS-6.

Additional perhydrate bleaches

In addition to the perborate bleach, metal percarbonates, particularly sodium percarbonate is an optional perhydrate which can be incorporated into the particle or detergent composition of the invention. Sodium percarbonate is an addition compound having a formula corresponding to $2Na_2CO_3.3H_2O_2$, and is available commercially as a crystalline solid.

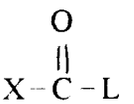
Potassium peroxymonopersulfate, sodium per is another optional inorganic perhydrate salt of use in the detergent compositions herein.

Organic peroxyacid bleaching system

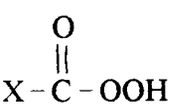
A preferred feature of detergent compositions of the invention is an organic peroxyacid bleaching system. In one preferred execution the bleaching system contains a hydrogen peroxide source and an organic peroxyacid bleach precursor compound. The production of the organic peroxyacid occurs by an in situ 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

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 functionality, such that on perhydroloysis the structure of the peroxyacid produced is



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.

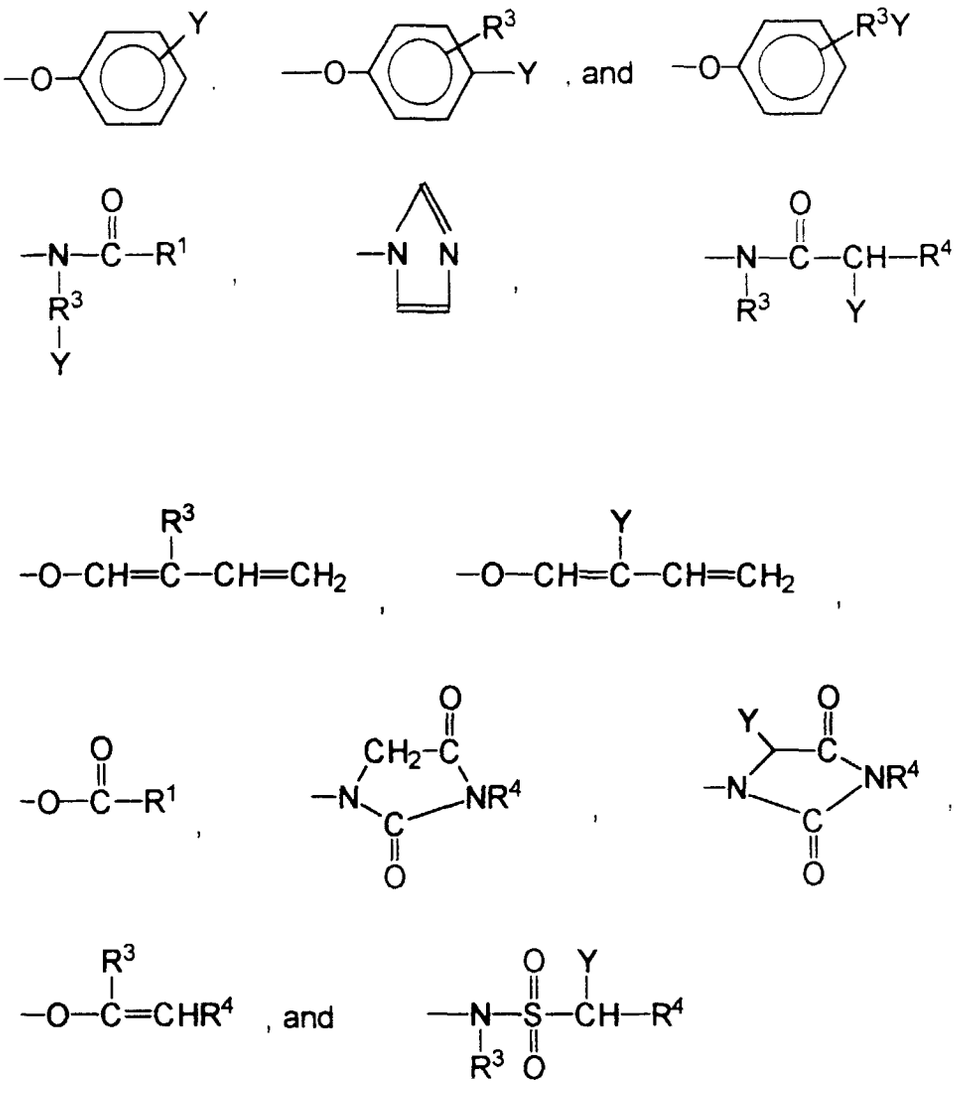
Suitable peroxyacid bleach precursor compounds typically contain one or more N- or O-acyl groups, which precursors can be selected from a wide range of classes. Suitable classes include anhydrides, esters, imides, lactams and acylated derivatives of imidazoles and oximes. Examples of useful materials 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

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.

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 ammonium groups.

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

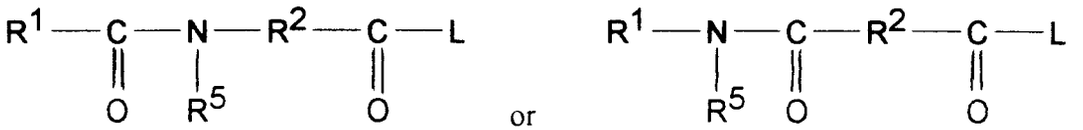
Alkyl percarboxylic acid bleach precursors form percarboxylic acids on perhydrolysis. Preferred precursors of this type provide peracetic acid on perhydrolysis.

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.

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

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

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

Cationic peroxyacid precursor compounds produce cationic peroxyacids on perhydrolysis.

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 ammonium 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.

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.

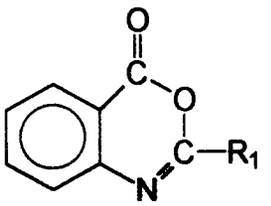
Cationic peroxyacid precursors are described in U.S. Patents 4,904,406; 4,751,015; 4,988,451; 4,397,757; 5,269,962; 5,127,852; 5,093,022; 5,106,528; U.K 1,382,594; EP 475,512, 458,396 and 284,292; and JP 87-318,332.

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.

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

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:

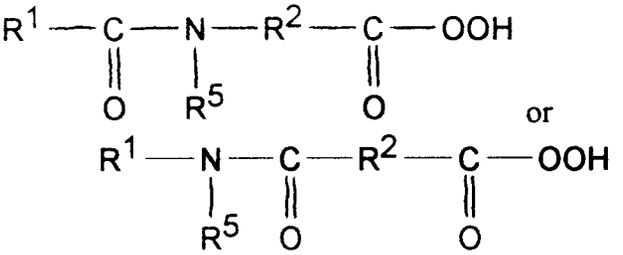


wherein R_1 is H, alkyl, alkaryl, aryl, or arylalkyl.

Preformed organic peroxyacid

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.

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



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.

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.

Bleach catalyst

The particle and/ or 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.

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 $Mn^{IV}_2(u\text{-}O)_3(1,4,7\text{-trimethyl-}1,4,7\text{-triazacyclononane})_2\text{-}(PF_6)_2$, $Mn^{III}_2(u\text{-}O)_1(u\text{-}OAc)_2(1,4,7\text{-trimethyl-}1,4,7\text{-triazacyclonane})_2\text{-}(ClO_4)_2$, $Mn^{IV}_4(u\text{-}O)_6(1,4,7\text{-triazacyclononane})_4\text{-}(ClO_4)_2$, $Mn^{III}Mn^{IV}_4(u\text{-}O)_1(u\text{-}OAc)_2\text{-}(1,4,7\text{-trimethyl-}1,4,7\text{-triazacyclononane})_2\text{-}(ClO_4)_3$, and mixtures thereof. Others are described in European patent application 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-triazyaclononane, 1,2,4,7-tetramethyl-1,4,7-triazacyclononane, and mixtures thereof.

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 $[Bipy_2Mn^{III}(u\text{-}O)_2Mn^{IV}bipy_2]$-$(ClO_4)_3$.

Further suitable bleach catalysts are described, for example, in European patent application No. 408,131 (cobalt complex catalysts), European patent applications, 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 application, 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

The particle and or the detergent compositions, comprising the 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.

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.

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.

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.

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.

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.

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

Another preferred ingredient useful in the detergent compositions, comprising the particle, is one or more additional enzymes. Optionally, the enzymes or part thereof cam be present in the agglomerated or ended particle of the invention.

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

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.

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.

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.

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.

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

Organic polymeric compounds are preferred additional components of the particle and/ or the detergent compositions, comprising 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.

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.

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.

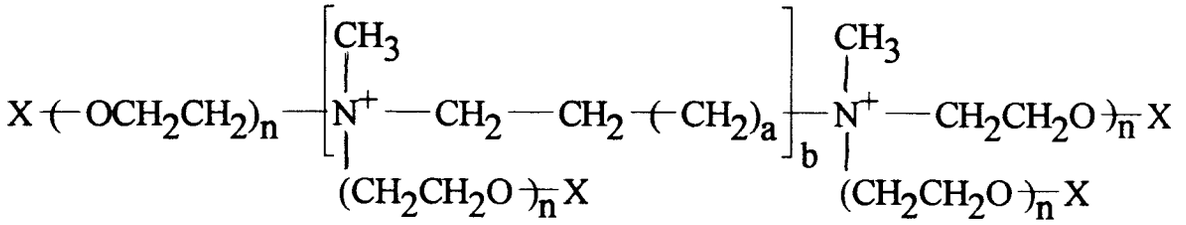
The polyamino compounds are useful herein including those derived from aspartic acid such as those disclosed in EP-A-305282, EP-A-305283 and EP-A-351629.

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.

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

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.

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.

Other dispersant/ 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

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.

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.

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.

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.

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.

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 hexaalkylmelamines 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.

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;

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

The particle and/ or the detergent compositions may contain a clay softening system comprising a clay mineral

compound and optionally a clay flocculating agent.

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.

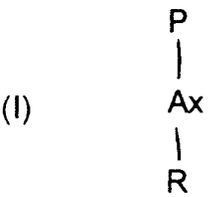
Polymeric dye transfer inhibiting agents

The particle, but preferably 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.

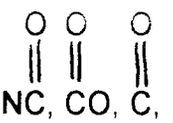
The polymeric dye transfer inhibiting agents are preferably selected from polyamine N-oxide polymers, copolymers of N-vinylpyrrolidone ad N-vinylimidazole, polyvinylpyrrolidonepolymers or combinations thereof.

a) Polyamine N-oxide polymers

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

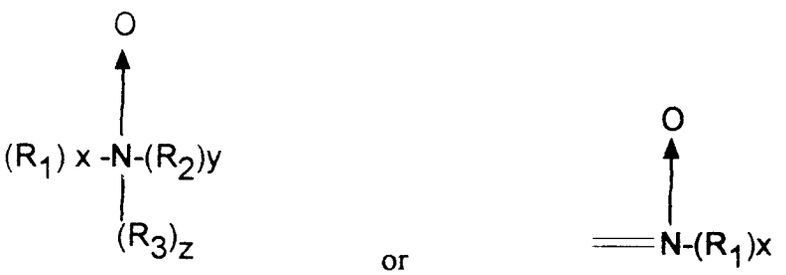


wherein P is a polymerisable unit, and
A is



-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.

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.

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 pyrridine, pyrrole, imidazole, pyrrolidine, piperidine, quinoline, acridine and derivatives thereof.

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.

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

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

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

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.

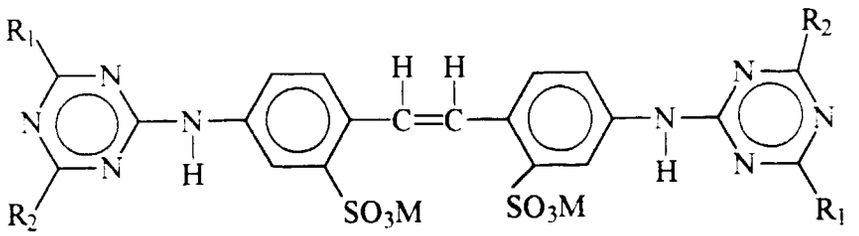
e) Polyvinylimidazole

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

Optical brightener

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

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.

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.

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.

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.

Cationic fabric softening agents

Cationic fabric softening agents can also be incorporated into the particle and/or the compositions. Suitable cationic fabric softening agents include the water insoluble tertiary amines or dilong chain amide materials as disclosed in GB-A-1 514 276 and EP-B-0 011 340.

Cationic fabric softening agents are typically incorporated at total levels of from 0.5% to 15% by weight, normally from 1% to 5% by weight.

Other optional ingredients

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

pH of the compositions

The final detergent compositions 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 agglomerated or extruded particle and detergent compositions thereof

Surfactant agglomerate particles

The particles may take the form of flakes, prills, marumes, noodles, ribbons, but preferably take the form of granules. The most preferred way to process the particles, as described above, is by agglomerating or mixing and extruding powders (e.g. aluminosilicate, optionally carbonate) with high active surfactant pastes and to control the particle size of the resultant particles within specified limits.

Form of the compositions

The compositions, comprising the particle, can take a variety of physical forms including granular, tablet and bar. The compositions can be of the form of 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.

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.

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.

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.

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

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.

In a preferred use aspect a dispensing device is employed in the washing method. The dispensing device is charged with the detergent product, and is used to introduce the product directly into the drum of the washing machine before the commencement of the wash cycle. Its volume capacity should be such as to be able to contain sufficient detergent product as would normally be used in the washing method.

Once the washing machine has been loaded with laundry the dispensing device containing the detergent product is placed inside the drum. At the commencement of the wash cycle of the washing machine water is introduced into the drum and the drum periodically rotates. The design of the dispensing device should be such that it permits containment of the dry detergent product but then allows release of this product during the wash cycle in response to its agitation as the drum rotates and also as a result of its contact with the wash water.

To allow for release of the detergent product during the wash the device may possess a number of openings through which the product may pass. Alternatively, the device may be made of a material which is permeable to liquid but impermeable to the solid product, which will allow release of dissolved product. Preferably, the detergent product will be rapidly released at the start of the wash cycle thereby providing transient localised high concentrations of product in the drum of the washing machine at this stage of the wash cycle.

Preferred dispensing devices are reusable and are designed in such a way that container integrity is maintained in both the dry state and during the wash cycle. Especially preferred dispensing devices for use with the composition of the invention have been described in the following patents; GB-B-2, 157, 717, GB-B-2, 157, 718, EP-A-0201376, EP-A-0288345 and EP-A-0288346. An article by J.Bland published in Manufacturing Chemist, November 1989, pages 41-46 also describes especially preferred dispensing devices for use with granular laundry products which are of a type commonly know as the "granulette". Another preferred dispensing device for use with the compositions of this invention is disclosed in PCT Patent Application No. WO94/11562.

Especially preferred dispensing devices are disclosed in European Patent Application Publication Nos. 0343069 & 0343070. The latter Application discloses a device comprising a flexible sheath in the form of a bag extending from a support ring defining an orifice, the orifice being adapted to admit to the bag sufficient product for one washing cycle in a washing process. A portion of the washing medium flows through the orifice into the bag, dissolves the product, and the solution then passes outwardly through the orifice into the washing medium. The support ring is provided with a masking arrangement to prevent egress of wetted, undissolved, product, this arrangement typically comprising radially extending walls extending from a central boss in a spoked wheel configuration or a similar structure in which the walls have a helical form.

Alternatively, the dispensing device may be a flexible container, such as a bag or pouch. The bag may be of fibrous construction coated with a water impermeable protective material so as to retain the contents, such as is disclosed in European published Patent Application No. 0018678. Alternatively it may be formed of a water-insoluble synthetic polymeric material provided with an edge seal or closure designed to rupture in aqueous media as disclosed in European published Patent Application Nos. 0011500, 0011501, 0011502, and 0011968. A convenient form of water frangible closure comprises a water soluble adhesive disposed along and sealing one edge of a pouch formed of a water impermeable polymeric film such as polyethylene or polypropylene.

Packaging for the compositions

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

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 $R_2 = C_{12}$ - C_{14}
Soap :	Sodium linear alkyl carboxylate derived from an 80/20 mixture of tallow and coconut oils.
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 $Na_{12}(AlO_2SiO_2)_{12}.\ 27H_2O$ having a primary particle size in the age 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 425μm and 850μm
MA/AA :	Copolymer of 1:4 maleic/acrylic acid, average molecular weight about 70,000.
CMC :	Sodium carboxymethyl cellulose
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 :	Endoglunase 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.
TAED :	Tetraacetylethylenediamine
DTPMP :	Diethylene triamine penta (methylene phosphonate), marketed by Monsanto under the Trade name Dequest 2060
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 diphosphoric 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.

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

Example 1

The following detergent formulations according to the present invention were prepared:

	A	B
Blown Powder		
Zeolite A	15.0	-
Sodium sulfate	-	-
LAS	3.0	-
CEQ	2.0	1.3
DTPMP	0.4	-
CMC	0.4	-
MA/AA	4.0	-
Agglomerates		
PB1	15.0	10.0
C45AS	-	11.0
LAS	6.0	-
TAS	3.0	-
Silicate	4.0	-
Zeolite A	10.0	13.0
CMC	-	0.5
MA/AA	-	2.0
Citric Acid	4.0	3.0
Spray On		
Perfume	0.3	0.5
C45E7	4.0	4.0
C25E3	2.0	2.0
Dry additives		
TAED	4.0	2.0
MA/AA	-	3.0
NaSKS-6	-	12.0
Bicarbonate	7.0	5.0
Carbonate	17.0	14.0
PVPVI/PVNO	0.5	0.5
Alcalase	0.5	0.9
Lipase	0.4	0.4
Amylase	0.6	0.6
Cellulase	0.6	0.6
Silicone antifoam	5.0	5.0

(continued)

Dry additives		
Sodium sulfate	0.0	2.0
Balance (Moisture and Miscellaneous)	100.0	100.0
Density (g/litre)	700	700

Example 2

The following high density and bleach-containing detergent formulations, according to the present invention were prepared:

	C	D
Blown Powder		
Zeolite A	15.0	15.0
Sodium sulfate	0.0	0.0
LAS	3.0	3.0
QAS	-	1.5
CEQ	2.0	2.0
DTPMP	0.4	0.4
CMC	0.4	0.4
MA/AA	4.0	2.0
Agglomerates		
PB1	15.0	15.0
LAS	4.0	4.0
TAS	2.0	1.0
C24E5	2.0	2.0
Silicate	3.0	4.0
Citric Acid	2.0	3.0
Zeolite A	8.0	8.0
Carbonate	-	6.0
Magnesium sulphate	0.3	0.4
Spray on		
Perfume	0.3	0.3
C45E7	2.0	2.0
Dry additives		
Citrate	5.0	2.0
Bicarbonate	-	-
Carbonate	16.0	10.0
TAED	6.0	5.0
Polyethylene oxide of MW 5,000,000	-	0.2

(continued)

Dry additives		
Bentonite clay	-	10.0
Protease	1.0	1.0
Lipase	0.4	0.4
Amylase	0.6	0.6
Cellulase	0.6	0.6
Silicone antifoam	5.0	5.0
Dry additives		
Sodium sulfate	0.0	0.0
Balance (Moisture and Miscellaneous)	100.0	100.0
Density (g/litre)	850	850

Example 3

The following high density detergent formulations, according to the present invention were prepared:

	E	F
Agglomerate		
LAS	7.5	-
PB1	12.0	-
PB4	-	15.0
C45AS	-	14.0
CEQ	-	3.5
Zeolite A	15.0	-
citric acid	1.5	2.0
Carbonate	4.0	-
MA/AA	4.0	2.0
CMC	0.5	0.5
DTPMP	0.4	0.4
C24E5	5.0	5.0
Spray On		
Perfume	0.5	0.5
Dry Additives		
Zeolite	-	6.0
HEDP	0.5	0.3
SKS 6	13.0	10.0
Citrate	3.0	1.0
TAED	5.0	7.0
Percarbonate	20.0	20.0

(continued)

Dry Additives		
SRP 1	0.3	0.3
Protease	1.4	1.4
Lipase	0.4	0.4
Cellulase	0.6	0.6
Amylase	0.6	0.6
Silicone antifoam	5.0	5.0
Brightener 1	0.2	0.2
Brightener 2	0.2	-
Balance (Moisture and Miscellaneous)	100	100
Density (g/litre)	850	850

Claims

1. An agglomerate or extruded detergent particle comprising one or more surfactants, an acid source and a perborate component.

2. A detergent particle according to claim 1 wherein said acid source comprises an organic acid and is present at a level of from 3% to 30% by weight of the particle.

3. A detergent particle according to any preceding claim wherein said perborate bleach is present at a level of from 15% to 50% by weight of the particle.

4. A detergent particle according to any preceding claim wherein said perborate bleach is in the form of a monohydrate or tetrahydrate.

5. A detergent particle according to any preceding claim wherein the surfactant comprises one or more anionic and nonionic surfactants.

6. A detergent particle according to any of claims 2 to 5 wherein the acid source is citric acid.

7. A detergent particle according to any preceding claim which is substantially free from bleach activator and which contains alkaline crystalline layered silicate.

8. A detergent composition comprising the detergent particle according to any preceding claim and from 2% to 25% by weight of an alkali source, preferably selected from an alkali metal or alkaline earth metal carbonate, bicarbonate or sesqui-carbonate.

9. A process for making an agglomerated detergent particle according to any of claim 1 comprising the steps of:

   i) admixing one or more detergent surfactants, the perborate bleach and an acid source to form a mixture; and

   ii) agglomerating the mixture to form agglomerated particles.

10. A process for making the extruded detergent particle according to any of claim 1 by extrusion, the process comprising forcing a paste, comprising the acid source, surfactant and perborate component whereby a first pre-mixed paste comprises the acid source and a second pre-mixed paste comprises the perborate component, under pressure through holes of an extruder, whereafter the extruded paste is cut into particles.