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(54) **Detergent tablet with non-compressed portion**

(57) The present invention refers to a detergent shaped body without any cavity comprising a compressed portion and at least one non-compressed portion in form of at least one strand(s), stripe(s), extruded line(s), dot(s) or a pattern.

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Description

[0001] The present invention provides a detergent tablet comprising a compressed/compacted portion and a meltable and/or dissolvable non-compressed portion.

[0002] Detergent compositions in tablet form are known in the art. It is understood that detergent compositions in tablet form hold several advantages over detergent compositions in particulate form, such as ease of handling, transportation and storage. To ease the use for the consumer and/or to improve the stability detergents are often applied in the form of a shaped body. Commonly this is a single or multi layer tablet. However, to make a composition for detergents suitable for pressing tablets some restrictions concerning the composition have to be regarded.

[0003] Detergent tablets are most commonly prepared by pre-mixing particular components of a detergent composition and forming the pre-mixed detergent components into a tablet using a tablet press. Tablets are typically formed by compression of the particular components of the detergent composition into a tablet.

[0004] Further, a tablet should disintegrate quickly but should also have a firm body that does not break easily during the whole route from tableting-machine up to washing machine. Also some (performance) ingredients are limited in use in the composition in order not to disturb the tableting/compressing process.

[0005] Furthermore as the components of the detergent composition are compressed, the components are brought into close proximity with each other. A result of the close proximity of the components can be that certain of the components react with each other, becoming unstable, inactive or exhausted. A solution to this problem, as seen in the prior art, has been to separate components of the detergent composition that may potentially react with each other when the detergent composition is compressed into tablet form. Separation of the components has been achieved in the art by, for example, preparing multiple-layer tablets wherein the components that may potentially react with each other are contained in different layers of the tablet.

[0006] Multiple-layer tablets are commonly prepared using multiple compression steps. Layers of the tablet that are subjected to more than one compression step are subjected to a cumulative and potentially greater overall compression pressure. An increase in compression pressure of the tableting press is known to decrease the rate of dissolution of the tablet with the effect that such multiple layer may not dissolve satisfactorily in use.

[0007] Other methods of achieving separation of detergent components have been described. One way to partly overcome the restrictions concerning the detergent composition is to provide a so called 'tab in tabs'. In EP0979865 is described that a compressed body is attached inside the cavity of another compressed body. In another embodiment a cavity of a compressed body can also be filled with an uncompressed body as described in EP1184450. Producing a 'tab in tab' to increase the freedom in the detergent composition however requires a significant change in the common production process when compared to the process of standard single or multi layer detergent tablet.

[0008] Another approach for example is described in EP-A 0,224,135 disclosing a dishwashing detergent in a form which comprises a warm water-soluble melt, into which a cold water-soluble tablet is pressed.

[0009] The object of the present application is to provide a detergent shaped body which is stabile during handling and dissolvable in a liquid. The compressed part of the shaped body can contain a smaller amount of ingredients that disturb the compressing step in production. The non-compressed part of the shaped body does contain atleast one ingredient that should disturb in the compressing step in production.

[0010] Said object is met by a detergent shaped body without any cavity comprising a compressed portion and at least one non-compressed portion in form of at least one strand(s), stripe(s), extruded line(s), dot(s), a pattern or at least one layer and a process for preparing same.

[0011] According to the present invention "any cavity" comprises any depression on the surface of the shaped body provided intentionally during pressing of the body or any mould or hole in the shaped body.

[0012] Thus, in accordance with the present invention it has been found that active detergent components of a detergent tablet which impair processability of the detergent composition for example due to high mechanical action inside the tableting machine the component can melt or become waxy and thus leave a solid deposit on the inside of the tableting machine that increases over the time and disturb the mechanical movement in the machine. Therefore there is a restriction to the detergent composition concerning the ingredients and therefore the composition may only contain limited amounts of those ingredients that do impair with the processability. Examples of these components include several types of surfactants impairing the ability of a particulate detergent composition to be compressed without leaving deposits inside of the tableting machine if included in a high amount. Examples are listed below as well as sensitive compounds like for example bleaching agents and enzymes.

[0013] In addition, in accordance with the present invention, it has been found that active detergent components of a detergent tablet may be separated from one another by having one or more compatible components contained in a compressed portion and one or more compatible components contained in a non-compressed portion of the tablet. Examples for components restricting processability of the detergent composition, e.g. ability to be compressed are surfactants shown below as suitable raw materials for the non-compressed portion or polyalkylene glycols. Examples of components that may interact and therefore preferably are separated include bleaching agents, bleach activators or

catalyst and enzymes; bleaching agents and bleach catalysts or activators; bleaching agents and surfactants; alkalinity sources and enzymes.

[0014] Separating at least a part of the ingredients impairing processability of the detergent composition by including at least a part of them in a non-compressed portion allows that part of the composition not containing or only partly containing such ingredients to be easily formed into a tablet and thereafter to be combined with the remainder of the desired composition by applying the non-compressed portion including the remaining desired ingredients e.g. on the surface of the formed tablet.

[0015] Furthermore, it may be advantageous to provide the compressed and the non-compressed portions such that they dissolve in wash water with different dissolution rates. Therefore the compressed and the non-compressed portions might be formulated in a way that the ingredients are released or dissolved at different time ranges in a washing or cleaning process. By controlling the rate of dissolution of each portion relative to one another, and by selection of the active detergent components in the respective portions, their order of release into the wash water can be controlled and the cleaning performance of the detergent tablet may be improved. For example it is often preferred that enzymes are delivered to the wash prior to bleaching agent and/or bleach activator, or different types of surfactants are provided in a determined order.

[0016] It may also be preferred that a source of alkalinity is released into the wash water more rapidly than other components of the detergent tablet. It is also envisaged that it may be advantageous to prepare a detergent tablet according to the present invention wherein the release of certain components of the tablet is delayed relative to other components.

[0017] It is also possible that the tablet may comprise a plurality of compressed and/or non-compressed portions. For example, a plurality of compressed portions may be arranged in layers and/or a plurality of non-compressed portions may be present as discrete stripes/strands/extruded lines/dots or layers on the tablet. Thus, there may be a first and a second and optional subsequent compressed layers and/or non-compressed portions, each comprising an active detergent component and where at least the first and second portions may comprise different active detergent components or mixtures of components. Such a plurality of compressed and/or non-compressed portions may be advantageous, enabling a tablet to be produced which has for example, a first and second and optional subsequent portions so that they have different rates of dissolution. Such performance benefits might be achieved by selectively delivering active detergent components into the wash water at different times.

[0018] The detergent tablets described herein are preferably between 6g and 80g in weight, more preferably between 7g and 60g in weight, even more preferably between 8g and 50g in weight.

The detergent tablet described herein that are suitable for use in automatic dishwashing methods are most preferably between 8g and 30g in weight.

Detergent tablets suitable for use in fabric laundering methods are most preferably between 30g and 50g. The weight ratio of compressed portion to non-compressed portion is generally greater than 0.5: 1, preferably greater than 1: 1, more preferably greater than 2: 1, even more preferably greater than 3: 1 or even 4: 1, most preferably at least 5: 1.

Compressed portion

[0019] The compressed portion of the detergent tablet comprises at least one active detergent component but may comprise a mixture of more than one active detergent components, which are compressed. Any detergent tablet component conventionally used in known detergent tablets is suitable for incorporation into the compressed portion of the detergent tablets of this invention. Suitable active detergent components are described hereinafter. Preferred active detergent components include builder compound(s), surfactant(s), bleaching agent(s), bleach activator(s), bleach catalyst(s), enzyme(s) and an alkalinity source(s).

[0020] Active detergent component(s) present in the compressed layer may optionally be prepared in combination with a carrier and/or a binder for example water, polymer (e. g. PEG), liquid silicate. The active detergent components are preferably prepared in particulate form (i. e. powder or granular form) and may be prepared by any known method, for example conventional spray drying, granulation, pelleting or agglomeration. The particulate active detergent component(s) are then compressed using any suitable equipment suitable for forming compressed tablets, blocks, bricks or briquettes. The form of the compressed portion is not limiting the invention, however, according to the invention the form should be one which can be easily pressed and doesn't include any cavity provided to be filled with a further portion of a detergent composition.

Non-Compressed Portion

[0021] The non-compressed portion comprises at least one active detergent component, but may comprise a mixture of more than one active detergent components.

[0022] Active detergent components suitable for incorporation into the non-compressed portion include components

that either give restrictions to the formulation of the detergent composition of the tablet, for example due to high mechanical action inside of the tableting machine the component can melt or become waxy and thus leave a solid deposit on the inside of the tableting machine that increases over time and impairs the mechanical movement in the machine or they might interact with one or more of the detergent components present in the compressed portion.

[0023] In particular, preferred components of the non-compressed portion are some types of surfactants, which are mentioned below as preferably included at least partially into the non-compressed portion or those that are adversely affected by the mechanical forces on detergent powder or tablets that are present inside of a tableting machine. Examples of the later mentioned active detergent components include, but are not limited to, bleaching agent(s), bleach activator(s), bleach catalyst(s), enzyme(s), corrosion inhibitor(s), perfume and an alkalinity source(s). These components are described in more detail below. The active detergent component(s) may be in any form for example particulate (i. e. powder or granular), gel or liquid form.

[0024] The non-compressed portion either comprises an active detergent compound which itself is solid at room temperature (about 15 to 30°C) but becomes liquid at increased temperature (above ca. 40°C). Preferably the component(s) melt(s) in a temperature range of 35°C to 150°C. Such materials are called "hot melt materials".

[0025] Or the non-compressed portion in addition to comprising any active detergent component might comprise at least one carrier component or a mixture of carrier components. The active detergent component may be present in the form of a solid, gel or liquid, prior to combination with said carrier component(s). In a preferred embodiment the carrier component (composition) is solid at room temperature (about 15 to 30°C) but becomes liquid or flowable at increased temperature (above ca. 40°C). Preferably the component(s) melt(s) in a temperature range of 35°C to 150°C. Such materials as well are "hot melt materials". Preferably the hot melt material(s) are water soluble or water dispersible.

[0026] Examples of active detergent raw materials suitable to be used as or in a hot melt and having according physical properties are

- non-ionic surfactants with ethylene oxide and/or propylene oxide and/or butylene oxide groups,
- anionic surfactants, with carboxylate, sulphonate, sulphate or phosphate end groups.
- cationic surfactants,
- amphoteric surfactants, like betaines, glycinate, amino propionates,
- polyalkene glycols, like polyethylene glycol.

Such types of surfactants according to any of the present groups usable as or in a hot melt are described below as optional active ingredients in more detail.

[0027] Further all these materials can be used as carrier for any (further) active detergent compound which preferably is included into the non-compressed portion of the shaped body. Further as carriers preferably can be used waxes of any origin, like Fischer-Tropsch, paraffin and microcrystalline waxes. However, the carriers are not restricted to these materials, but any hot melt material according to the definition above can be included as carrier material into the non-compressed portion of the detergent shaped body.

[0028] The non-compressed portion of the detergent tablet may be in solid, gel or paste form. In a preferred embodiment the non-compressed portion is solid or pasty at room/ambient temperature, more preferred it is solid at room/ambient temperature.

[0029] According to the present invention the non-compressed portion be delivered to the compressed portion such that the compressed portion and non-compressed portion contact each other. The non-compressed portion may be delivered to the compressed portion in flowable, solid, gelly or pasty form. Where the non-compressed portion is in solid form, it is pre-prepared, optionally shaped and then delivered to the compressed portion. The non-compressed portion is then affixed to a pre-formed compressed portion, for example by adhesion of the non-compressed portion to a co-operating surface of the compressed portion. In a particularly preferred embodiment the non-compressed portion is delivered or extruded from at least one nozzle or gun or dye in form of at least one strand, extruded line, dot or stripe(s) onto the surface of the shaped body.

[0030] Preferably the compressed portion doesn't comprise a pre-prepared depression or mould into which the non-compressed portion is delivered, but the non-compressed portion is delivered onto the surface of the compressed portion.

[0031] The non-compressed portion is preferably delivered to the compressed portion in flowable or pasty extrudable form, and solidifies by cooling. The non-compressed portion is affixed to the compressed portion for example by adhesion, by forming a coating over the non-compressed layer to secure it to the compressed portion, or by hardening, for example

- (i) by cooling to below the melting point where the flowable composition becomes a solidified melt;
- (ii) by evaporation of a solvent;
- (iii) by crystallisation;
- (iv) by polymerisation of a polymeric component of the flowable non-compressed portion;
- (v) through pseudo-plastic properties where the flowable non-compressed portion comprises a polymer and shear

forces are applied to the non-compressed portion;

(vi) combining a binding agent with the flowable non-compressed portion.

[0032] In a preferred embodiment the flowable non-compressed portion may be an extrudate that is affixed to the compressed portion by for example any of the mechanism described above or by expansion of the extrudate.

[0033] Further a coating material can also be applied on the non-compressed portion to make the not yet hardened surface less sticky. The powder or granular shaped coating material is preferably provided on the not yet solidified non-compressed part of the detergent tablet.

The remainder of the powder or granular shaped coating material that does not stick to the non-compressed part is preferably removed from the detergent tablet. Possibilities for said remove is by means of air, pressure or vacuum.

In case that such a coating material is used the following production steps do not have to be postponed until the non-compressed portion is hardened. The powder or granular shaped coating material that can be used is any suitable material, e.g. a detergent ingredient, a mixture of various detergent ingredients or a detergent composition.

[0034] Preferably the compressed portion doesn't comprise any pre-prepared depression, cavity, hole or mould into which the non-compressed portion is delivered.

[0035] The non-compressed portion may comprise particulates. The particulates may be prepared by any known method, for example conventional spray drying, granulation, encapsulation or agglomeration. Particulates may be affixed to the compressed portion by incorporating a binding/fixing agent or by forming a coating layer over the non-compressed portion.

[0036] Where the detergent tablet comprises more than one non-compressed portion, the first and second and optional further non-compressed portions may comprise the same or different ingredients of the detergent composition.

[0037] Tablets in which one or more of the non-compressed portions comprise different ingredients are as well an embodiment according to the invention, where the first and second and optionally subsequent non-compressed portions are desired to have different rates of dissolution.

[0038] Preferably the non-compressed portion comprises a solidified melt. The melt is prepared by heating at least a part of an active detergent composition which preferably should not be included into the portion to be compressed, like e.g. the hot melt raw materials mentioned above, or by heating a composition comprising a detergent active component and (an) optional carrier component(s) to above its melting point to form a pasty, flowable or extrudable melt. The melt preferably is extruded from at least one nozzle or gun or die onto at least one surface of the shaped body and allowed to cool. As the melt cools it becomes preferably solid at ambient temperature. Where the composition comprises one or more carrier components, the carrier component(s) may be heated to above their melting point, and then an active detergent component may be added. Carrier components suitable for preparing a solidified melt can be active detergent components, e.g. the components cited above as hot melt material, or non-active components that can be heated to above melting point to form a liquid and cooled to form an intermolecular matrix that can effectively trap active detergent components. One preferred non-active carrier component is an organic polymer that is solid at ambient temperature. Preferably the non-active detergent component is polyethylene glycol (PEG) or any of the waxes mentioned above.

[0039] Further the flowable/pasty non-compressed portion may be in a form (additionally) comprising a dissolved or suspended active detergent component. The non-compressed portion may harden over time to form a solid non-compressed portion by any of the methods described above. In particular, the flowable/pasty non-compressed portion may harden by evaporation of a solvent. Solvents suitable for use herein may include any known solvent in which a binding agent is soluble.

[0040] Preferred solvents may be polar or non-polar and may include water, alcohol, (for example ethanol, acetone) and alcohol derivatives. In an alternative embodiment more than one solvent may be used.

[0041] The non-compressed portion may comprise one or more binding agents.

[0042] Any binding agent that has the effect of causing the composition to become solid over time and preferably to attach the non-compressed portion to the compressed portion is envisaged for use herein. Although not wishing to be bound by theory, it is believed that mechanisms by which the binding agent causes a non-solid composition to become solid include: chemical reaction (such as chemical cross linking), or effect interaction between two or more components of the compositions or portions either; chemical or physical interaction of the binding agent with a component of the composition.

[0043] Preferred binding agents include a sugar/gelatine combination, starch, glycerol and organic polymers. The sugar may be any monosaccharide (e. g. glucose), disaccharide (e. g. sucrose or maltose) or polysaccharide (e.g. xanthan gum). The most preferred sugar is commonly available sucrose. For the purposes of the present invention type A or B gelatine may be used, available for example from Sigma. Type A gelatine is preferred since it has greater stability in alkaline conditions in comparison to type B.

[0044] Preferred organic polymers include polyethylene glycol (PEG) of molecular weight from 600 to 12,000 preferably from 1000 to 12,000 (e.g. available from BASF).

[0045] Where the non-compressed portion is an extrudate, the extrudate is prepared by premixing the active detergent

components with optional carrier components to form a viscous paste. The viscous paste is then extruded using any suitable commonly available extrusion equipment such as for example a single or twin screw extruder available from for example APV Baker, Peterborough, U. K.

[0046] The non-compressed portion applied can be a suitable raw material or a blend of 2 or more suitable materials. Optionally a dye or pigment can be used to give any desired colour.

[0047] The applied amount of hot melt material might have a height of 0.1 mm up to 10mm and a weight of 0.025% to 10% of the weight of the total tablet.

[0048] The non-compressed portion of the detergent composition preferably is provided on at least one surface of the compressed portion in form of for example at least one strand, (extruded) line, dot, stripe or combinations thereof, e.g. as well in form of a pattern like e.g. a lattice parallel stripes or lines or similar or as at least one layer, wherein it is preferred that the non-compressed part is delivered as at least one strand, (extruded) line, dot or stripe.

In a preferred embodiment the non-compressed portion is solid at ambient temperature (about 15 to 35°C) but becomes liquid at increased temperature (higher than about at least 40°C).

The application of a non-compressed portion in form of at least one strand, line, dot or stripe, preferably in form of a pattern, provides the possibility to prepare a detergent shaped body with less restrictions with regard to all the desired ingredients, even in case that some of the ingredients cannot be included in their full amount into the particular part of the composition without providing some restrictions to said composition, e.g. impairing their further processability like shaping. By the present inventions the ingredients restricting the formulation of the detergent composition can be easily added by applying them in an "on-line" process after pressing the compressed portion.

[0049] Additionally the application of the non-compressed portion in form of at least one strand, line, dot or stripe, preferably in form of a pattern increases the stability to the shaped body, particularly in case that these strand(s), line(s), dot(s) or stripes(s) (e.g. as a pattern) is/are provided on more than one side of the shaped body. In a preferred embodiment the strand(s), line(s) or stripes(s) are delivered to the shaped bodies after pressing the bodies (e.g. in form of tablets) by passing the bodies under at least one nozzle or gun or dye or extruding device delivering the non-compressed portion continuously, e.g. on a conveyor belt, thereby applying the non-compressed portion during the passage of the bodies under the nozzle or gun or dye /extruding device. Of course a skilled person understands that as well the nozzle(s)/dye(s)/device(s) can be passed over the shaped bodies. By this method typically at least three surfaces of the bodies are applied with the non-compressed portion, which are at least two side surfaces and the upper surface passing under the nozzle/dye/device. In case in a further step the bodies are turned by 90° and thereafter are passed a second time under a delivering nozzle/dye/device (e.g. resulting in a lattice pattern on the upper surface) at least the other two side surfaces can be provided with the non-compressed portion. After solidification of the non-compressed portion the shaped body is somehow protected by the non-compressed portion and stability of the whole body is increased. On the other hand the strand(s), line(s) or stripes(s) or the pattern provide enough uncovered areas allowing the fast disrapture/dissolution of the shaped body after contact with water, resulting (at least nearly) the same dissolution time as a conventional pressed detergent shaped body.

[0050] The non-compressed portion may be coated with a coating layer. The coating may support attachment of the non-compressed portion to the compressed portion. This may be particularly advantageous where the non-compressed portion comprises flowable particulates, a paste or gel.

[0051] The coating layer preferably comprises a material that becomes solid on contacting the compressed and/or the non-compressed portions within preferably less than 15 minutes, more preferably less than 10 minutes, even more preferably less than 5 minutes, most preferably less than 60 seconds. Preferably the coating layer is water-soluble. Preferred coating layers comprise materials selected from the group consisting of fatty acids, alcohols, diols, esters and ethers, adipic acid, carboxylic acid, dicarboxylic acid, polyvinyl acetate (PVA), polyvinyl pyrrolidone (PVP), polyacetic acid (PLA), polyethylene glycol (PEG), gelatine and mixtures thereof. Preferred carboxylic or dicarboxylic acids comprise an even number of carbon atoms. Preferably carboxylic or dicarboxylic acids comprise at least 4, more preferably at least 6, even more preferably at least 8 carbon atoms, most preferably between 8 and 13 carbon atoms. Preferred dicarboxylic acids include adipic acid, suberic acid, azelaic acid, subacic acid, undecanedioic acid, dodecandioic acid, tridecanedioic and mixtures thereof. Preferred fatty acids are those having a carbon chain length of from C 12 to C22, most preferably from C 18 to C22. The coating layer may also preferably comprise a disrupting agent. Where present the coating layer generally present at a level of at least 0.05%, preferably at least 0.1 %, more preferably at least 1%, most preferably at least 2% or even at least 5% of the detergent tablet.

[0052] As an alternative embodiment the coating layer may encapsulate the whole detergent tablet.

[0053] If present, the coating layer is at a level of at least 1 %, preferably 3%, more preferably at least 5%, most preferably at least 10% of the detergent tablet.

[0054] In a preferred embodiment, but not necessarily, the compressed and/or non-compressed portions and/or coating layer additionally comprise a disrupting agent. The disrupting agent may be a disintegrating or effervescent agent. Suitable disintegrating agents include agents that swell on contact with water or facilitated water influx and/or efflux by forming channels in compressed and/or non-compressed portions. Any known disintegrating or effervescent agent suit-

able for use in laundry or dishwashing applications is envisaged for use herein. Suitable disintegrating agent include starch, starch derivatives, alginates, carboxymethylcellulose (CMC), CMC-based polymers, sodium acetate, aluminium oxide. Suitable effervescent agents are those that produce a gas on contact with water. Suitable effervescent agents may be oxygen, nitrogen dioxide or carbon dioxide evolving species. Examples of preferred effervescent agents may be selected from the group consisting of perborate, percarbonate, carbonate, bicarbonate and carboxylic acids such as citric or maleic acid. Preferably at least the compressed portion comprises a disintegrating agent.

Process

[0055] According to the present invention there is also provided a process for preparing a detergent shaped body comprising the steps of : a) compressing a composition comprising at least an active detergent component to form a compressed portion in form of a shaped body without any cavity; and b) delivering a non-compressed portion comprising at least one active detergent component to the compressed portion.

[0056] As described above, the detergent tablets described herein are prepared by separately preparing the composition of active detergent components and forming the respective compressed portion and thereafter applying the non-compressed portion onto at least one surface of the compressed portion.

[0057] The compressed portion is prepared by providing at least one active detergent component and optionally premixing with other detergent composition ingredients and/or carrier components. Any pre-mixing can be carried out in a suitable mixer; for example a pan mixer, rotary drum, vertical blender or high shear mixer. Preferably dry particulate components are admixed in a mixer, as described above, and liquid components are applied to the dry particulate components, for example by spraying the liquid components directly onto the dry particulate components. The resulting composition is then formed into a compressed portion in a compression step using any known suitable equipment. Preferably the composition is formed into a compressed portion using a tablet press, wherein the tablet is prepared by compression of the composition between an upper and a lower punch. According to the present invention it is not necessary to provide any modified punch, since in none of the surfaces of the produced shaped body any cavity has to be contained.

[0058] The non-compressed portion preferably comprises at least another active detergent component and preferably at least one carrier material as described above, preferably a "hot melt" material. In case that the active ingredient itself is such a hot melt material no further carrier is necessary.

[0059] The components of the non-compressed portion can be pre-mixed using any known suitable mixing equipment. In addition the non-compressed portion may optionally comprise any further carrier with which the active detergent components are combined. The blend of the non-compressed portion may be prepared in solid form, like, flakes, granulates, powders or in a pasty, gelly or flowable form or in a combination thereof.

[0060] The temperature which is necessary to provide the melt depends on the hot melt material and the other used ingredients, but is preferably above from 30°C, more preferred above 40°C and usually below 150°C, preferably below 100°C. Once prepared the composition is delivered to the compressed portion. The non-compressed portion may be delivered to the compressed portion by manual delivery or using a nozzle feeder, dye, gun or extruder.

[0061] Where the applied non-compressed portion is affixed to the compressed portion by hardening, the process comprises a delivery step in which the pasty/gelly/flowable non-compressed portion is delivered to the compressed portion and an optional subsequent conditioning step, wherein the non-compressed portion hardens. Such a conditioning step may comprise drying, cooling, binding, polymerisation etc. of the non-compressed portion, during which the non-compressed portion becomes solid, semi-solid or pasty. Heat may be used in a drying step. Heat, or exposure to radiation may be used to effect polymerisation in a polymerisation step. In a preferred embodiment the non-compressed portion comprises a hot-melt material which hardens by cooling.

[0062] In another optional subsequent conditioning step the stickiness of non-compressed portion is neutralized or reduced. This can be obtained by providing a powder or granular shaped coating material on the non-compressed portion of the detergent tablet. Said coating material sticks to the not hardened non-compressed part of the detergent tablet and remains its surface less sticky.

[0063] The following described detergent components are commonly used detergent ingredients. These ingredients are examples of preferably used ingredients according to the invention, however, should neither be considered as limiting the invention, nor as an exhausting list of possible ingredients usable in the inventive detergent shaped bodies. Particularly adaption of the detergent composition to new ingredients or to national rules in a special country might result in replacement or deletion of some of the ingredients listed below. Such a replacement or deletion is not intervening with the invention as long as the resulting detergent shaped body has a compressed and a non-compressed part as described above and claimed in the claims.

Active Detergent Components

OPTIONAL INGREDIENTS

[0064] The detergent composition(s) of the present invention may also comprise optional ingredients like e.g. builders, surfactants, enzymes, dyes, perfume, polymers, complexing agents, bleaching agents, bleach activators, bleach catalysts, dispersing agents, optical brighteners, process aids and anti corrosion agents, without any restriction.

[0065] All of the optional active ingredients known in the state of the art to be effective or usable in detergents might be included. Highly preferred active detergent components include a builder compound, a surfactant, an enzyme and a bleaching agent.

BUILDERS

[0066] The composition of the present invention may optionally comprise one or more builders, typically present at a level of from 1 % to 80% by weight.

[0067] The main functions of the builders are to soften the washing water, to provide alkalinity and a buffering capacity to the washing liquid and to have an anti redeposition or dispersing function in the detergent composition. The physical properties of the detergent composition are also depending on the builders that are used.

[0068] Inorganic non-phosphate builders include, but are not limited to, phosphonates, silicates, carbonates, sulphates, citrate, citric acid and aluminosilicates.

[0069] Organic builders include, but are not limited to, a wide variety of (poly)carboxylated compounds. As used herein polycarboxylate refers to compounds having a plurality of carboxylate groups, preferably at least three carboxylates. Polycarboxylates can generally be added to the composition in acid form, but can also be added in the form of neutralized salt or in a partly neutralized form. When used in a partly or completely neutralized form alkali metals like sodium, potassium and lithium or alkanolammonium salts are preferred.

[0070] Phosphoric builders include, but are not limited to, various alkali metal phosphates such as tripolyphosphate, pyrophosphate, orthophosphate, etc.

SURFACTANTS

[0071] The composition of the present invention may optionally comprise one or more surfactant(s).

[0072] The main functions of surfactants are: changing the surface tension, dispersing, foam controlling and surface modification. A special type of surfactants used in ADD compositions is the 'carry over' surfactant. The 'carry over' surfactant has the property that some amount of the surfactant used remains in the machine after the rinsing cycles to give a performance during the final rinsing cycle and the (optional) drying phase of the whole washing cycle of the dishwashing machine. This type of surfactant is described in EP-A 1 524 313 in more detail.

[0073] For ADD compositions alkoxylated nonionic surfactants and Gemini surfactants are commonly used. The alkoxy groups mostly exist of ethyleneoxide, propyleneoxide and/or butyleneoxide. Also amphoteric surfactants are known to be used in ADD compositions.

Nonionic surfactant

[0074] Essentially any nonionic surfactants useful for deterative purposes can be included in the detergent tablet. Preferred, non-limiting classes of useful nonionic surfactants are listed below.

Nonionic ethoxylated alcohol surfactant

[0075] The alkyl ethoxylate condensation products of aliphatic alcohols with from 1 to 25 moles of ethylene 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.

End-capped alkylalkoxylate surfactant

[0076] A suitable endcapped alkyl alkoxylate surfactant is the epoxy-capped poly (oxyalkylated) alcohols represented by the formula:

$$R_1 O [CH_2CH (CH_3)O]_x [CH_2CH_2O]_y [CH_2CH (OH) R_2](I)$$

wherein R₁ is a linear or branched, aliphatic hydrocarbon

radical having from 4 to 18 carbon atoms; R₂ is a linear or branched aliphatic hydrocarbon radical having from 2 to 26 carbon atoms; x is an integer having an average value of from 0.5 to 1.5, more preferably 1; and y is an integer having a value of at least 15, more preferably at least 20.

[0077] Preferably, the surfactant of formula I, at least 10 carbon atoms in the terminal epoxide unit [CH₂CH (OH) R₂]. Suitable surfactants of formula I, according to the present invention, are Olin Corporation's POLY-TERGENTO SLF-18B nonionic surfactants, as described, for example, in WO 94/22800, published October 13, 1994 by Olin Corporation.

Ether-capped poly (oxyalkylated) alcohols

[0078] Preferred surfactants for use herein include ether-capped poly (oxyalkylated) alcohols having the formula:

$R_1 O [CH_2CH (R_3) O]_x [CH_2]_k CH(OH) [CH_2]_j OR_2$ wherein R₁ and R₂ are linear or branched, saturated or unsaturated, aliphatic or aromatic hydrocarbon radicals having from 1 to 30 carbon atoms; R₃ is H, or a linear aliphatic hydrocarbon radical having from 1 to 4 carbon atoms; x is an integer having an average value from 1 to 30, wherein when x is 2 or greater R₃ may be the same or different and k and j are integers having an average value of from 1 to 12, and more preferably 1 to 5.

R₁ and R₂ are preferably linear or branched, saturated or unsaturated, aliphatic or aromatic hydrocarbon radicals having from 6 to 22 carbon atoms with 8 to 18 carbon atoms being most preferred. H or a linear aliphatic hydrocarbon radical having from 1 to 2 carbon atoms is most preferred for R₃. Preferably, x is an integer having an average value of from 1 to 20, more preferably from 6 to 15.

[0079] As described above, when, in the preferred embodiments, and x is greater than 2, R₃ may be the same or different. That is, R₃ may vary between any of the alkyleneoxy units as described above. For instance, if x is 3, R₃ may be selected to form ethyleneoxy (EO) or propyleneoxy (PO) and may vary in order of (EO) (PO) (EO), (EO) (EO) (PO); (EO) (EO) (EO); (PO) (EO) (PO); (PO) (PO) (EO) and (PO) (PO) (PO).

[0080] Of course, the integer three is chosen for example only and the variation may be much larger with a higher integer value for x and include, for example, multiple (EO) units and a much small number of (PO) units.

[0081] Particularly preferred surfactants as described above include those that have a low cloud point of less than 20 C. These low cloud point surfactants may then be employed in conjunction with a high cloud point surfactant as described in detail below for superior grease cleaning benefits.

[0082] Most preferred ether-capped poly (oxyalkylated) alcohol surfactants are those wherein k is 1 and j is 1 so that the surfactants have the formula:

$R_1 O [CH_2CH (R_3) O]_x CH_2CH(OH)CH_2OR_2$ where R₁, R₂ and R₃ are defined as above and x is an integer with an average value of from 1 to 30, preferably from 1 to 20, and even more preferably from 6 to 18.

[0083] Most preferred are surfactants wherein R₁ and R₂ range from 9 to 14, R₃ is H forming ethyleneoxy and x ranges from 6 to 15.

[0084] The ether-capped poly (oxyalkylated) alcohol surfactants comprise three general components, namely a linear or branched alcohol, an alkylene oxide and an alkyl ether end cap. The alkyl ether end cap and the alcohol serve as a hydrophobic, oil soluble portion of the molecule while the alkylene oxide group forms the hydrophilic, water-soluble portion of the molecule.

[0085] These surfactants exhibit significant improvements in spotting and filming characteristics and removal of greasy soils, when used in conjunction with high cloud point surfactants, relative to conventional surfactants.

[0086] Generally speaking, the ether-capped poly (oxyalkylene) alcohol surfactants of the present invention may be produced by reacting an aliphatic alcohol with an epoxide to form an ether which is then reacted with a base to form a second epoxide. The second epoxide is then reacted with an alkoxyated alcohol to form the novel compounds of the present invention. Examples of methods of preparing the ethercapped poly (oxyalkylated) alcohol surfactants are described below: Preparation of C₁₂/I/I alkyl glycidyl ether AC₁₂/14 fatty alcohol (100.00 g, 0.515 mol.) and tin (IV) chloride (0.58 g, 2.23 mmol, available from Aldrich) are combined in a 500 mL three-necked roundbottomed flask fitted with a condenser, argon inlet, addition funnel, magnetic stirrer and internal temperature probe. The mixture is heated to 60 C. Epichlorhydrin (47.70 g, 0.515 mol, available from Aldrich) is added dropwise so as to keep the temperature between 60-65 C. After stirring an additional hour at 60 C, the mixture is cooled to room temperature. The mixture is treated with a 50% solution of sodium hydroxide (61.80 g, 0.773 mol, 50%) while being stirred mechanically.

[0087] After addition is completed, the mixture is heated to 90 C for 1.5 h, cooled, and filtered with the aid of ethanol. The filtrate is separated and the organic phase is washed with water (100 mL), dried over MgSO₄, filtered, and concen-

trated.

[0088] Distillation of the oil at 100-120 C (0.1 mm Hg) providing the glycidyl ether as an oil.

Preparation of C12/14 alkyl-Cg/1 I ether capped alcohol surfactant

[0089] Neodol 91-8 (20.60 g, 0.0393 mol ethoxylated alcohol available from the Shell chemical Co.) and tin (IV) chloride (0.58 g, 2.23 mmol) are combined in a 250 mL three-necked round-bottomed flask fitted with a condenser, argon inlet, addition funnel, magnetic stirrer and internal temperature probe. The mixture is heated to 60 C at which point C12/14 alkyl glycidyl ether (11.00 g, 0.0393 mol) is added dropwise over 15 min. After stirring for 18 h at 60 C, the mixture is cooled to room temperature and dissolved in an equal portion of dichloromethane. The solution is passed through a 1 inch pad of silica gel while eluting with dichloromethane. The filtrate is concentrated by rotary evaporation and then stripped in a Kugelrohr oven (100 C, 0.5 mm Hg) to yield the surfactant as an oil.

Nonionic ethoxylated/propoxylated fatty alcohol surfactant

[0090] The ethoxylated C6-C 18 fatty alcohols and C6-C 18 mixed ethoxylated/propoxylated fatty alcohols are suitable surfactants for use herein, particularly where water soluble. Preferably the ethoxylated fatty alcohols are the C 1 o-C 18 ethoxylated fatty alcohols with a degree of ethoxylation of from 3 to 50, most preferably these are the C 12-c 18 ethoxylated fatty alcohols with a degree of ethoxylation from 3 to 40.

[0091] Preferably the mixed ethoxylated/propoxylated fatty alcohols have an alkyl chain length of from 10 to 18 carbon atoms, a degree of ethoxylation of from 3 to 30 and a degree of propoxylation of from 1 to 10.

Nonionic EO/PO condensates with propylene glycol

[0092] The condensation products of ethylene oxide with a hydrophobic base formed by the condensation of propylene oxide with propylene glycol are suitable for use herein.

[0093] The hydrophobic portion of these compounds preferably has a molecular weight of from 1500 to 1800 and exhibits water insolubility. Examples of compounds of this type include certain of the commercially-available PluronicTM surfactants, marketed by BASF.

[0094] Nonionic EO condensation products with propylene oxide/ethylene diamine adducts The condensation products of ethylene oxide with the product resulting from the reaction of propylene oxide and ethylenediamine are suitable for use herein. The hydrophobic moiety of these products consists of the reaction product of ethylenediamine and excess propylene oxide, and generally has a molecular weight of from 2500 to 3000. Examples of this type of nonionic surfactant include certain of the commercially available Tetronic compounds, marketed by BASF.

Mixed Nonionic Surfactant System

[0095] In a preferred embodiment of the present invention the detergent tablet comprises a mixed nonionic surfactant system comprising at least one low cloud point nonionic surfactant and at least one high cloud point nonionic surfactant.

[0096] "Cloud point", as used herein, is a well known property of nonionic surfactants which is the result of the surfactant becoming less soluble with increasing temperature, the temperature at which the appearance of a second phase is observable is referred to as the "cloud point" (See Kirk Othmer's Encyclopedia of Chemical Technology, 3rd Ed. Vol. 22, pp. 360-379).

[0097] As used herein, a "low cloud point" nonionic surfactant is defined as a nonionic surfactant system ingredient having a cloud point of less than 30 C, preferably less than 20 C, and most preferably less than 10 C. Typical low cloud point nonionic surfactants include nonionic alkoxylated surfactants, especially ethoxylates derived from primary alcohol, and polyoxypropylene/polyoxyethylene/polyoxypropylene (PO/EO/PO) reverse block polymers. Also, such low cloud point nonionic surfactants include, for example, ethoxylated-propoxylated alcohol (e. g., Olin Corporation's Poly-Tergent SLF 18), epoxy-capped poly (oxyalkylated) alcohols (e. g., Olin Corporation's Poly-Tergent O SLF 18B series of nonionics, as described, for example, in WO 94/22800, published October 13, 1994 by Olin Corporation) and the ether-capped poly (oxyalkylated) alcohol surfactants.

[0098] Nonionic surfactants can optionally contain propylene oxide in an amount up to 15% by weight. Other preferred nonionic surfactants can be prepared by the processes described in U. S. Patent 4,223,163, issued September 16, 1980, Buillot, incorporated herein by reference.

[0099] Low cloud point nonionic surfactants additionally comprise a polyoxyethylene, polyoxypropylene block polymeric compound. Block polyoxyethylene-polyoxypropylene polymeric compounds include those based on ethylene glycol, propylene glycol, glycerol, trimethylolpropane and ethylenediamine as initiator reactive hydrogen compound. Certain of the block polymer surfactant compounds designated PLURONIC[®], REVERSED PLURONIC[®], and TETRO-

NICO by the BASF-Wyandotte Corp., Wyandotte, Michigan, are suitable in ADD compositions of the invention. Preferred examples include REVERSEDPLURONIC[®]; 25R2 and TETRONICO 702, Such surfactants are typically useful herein as low cloud point nonionic surfactants.

[0100] As used herein, a "high cloud point" nonionic surfactant is defined as a nonionic surfactant system ingredient having a cloud point of greater than 40 C, preferably greater than 50 C, and more preferably greater than 60 C. Preferably the nonionic surfactant system comprises an ethoxylated surfactant derived from the reaction of a monohydroxy alcohol or alkylphenol containing from 8 to 20 carbon atoms, with from 6 to 15 moles of ethylene oxide per mole of alcohol or alkyl phenol on an average basis. Such high cloud point nonionic surfactants include, for example, Tergitol 15S9 (supplied by Union Carbide), Rhodasurf TMD 8.5 (supplied by Rhone Poulenc), and Neodol 91-8 (supplied by Shell).

[0101] It is also preferred for purposes of the present invention that the high cloud point nonionic surfactant further have a hydrophile-lipophile balance ("HLB" ; see Kirk Othmer hereinbefore) value within the range of from 9 to 15, preferably 11 to 15.

[0102] Such materials include, for example, Tergitol 15S9 (supplied by Union Carbide), Rhodasurf TMD 8.5 (supplied by Rhone Poulenc), and Neodol 91-8 (supplied by Shell).

[0103] Another preferred high cloud point nonionic surfactant is derived from a straight or preferably branched chain or secondary fatty alcohol containing from 6 to 20 carbon atoms (C₆-C₂₀ alcohol), including secondary alcohols and branched chain primary alcohols. Preferably, high cloud point nonionic surfactants are branched or secondary alcohol ethoxylates, more preferably mixed C₉/11 or C₁₁/15 branched alcohol ethoxylates, condensed with an average of from 6 to 15 moles, preferably from 6 to 12 moles, and most preferably from 6 to 9 moles of ethylene oxide per mole of alcohol. Preferably the ethoxylated nonionic surfactant so derived has a narrow ethoxylate distribution relative to the average.

[0104] Preferably the low cloud point surfactant is present in the compressed portion and the high cloud point surfactant is present in the non-compressed portion of the detergent tablet of the present invention.

Anionic surfactant

[0105] Essentially any anionic surfactants useful for deterative purposes are suitable. 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.

[0106] Other anionic surfactants include the isethionates such as the acyl isethionates, Nacyl taurates, fatty acid amides of methyl tauride, alkyl succinates and sulfosuccinates, monoesters of sulfosuccinate (especially saturated and unsaturated C₁₂-C₁₈ monoesters) diesters of sulfosuccinate (especially saturated and unsaturated C₆-C₁₄ 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

[0107] 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 C₅-C₁₇ acyl-N-(C₁-C₄ alkyl)- and N-(C₁-C₂ hydroxyalkyl) glucamine sulfates, and sulfates of alkylpolysaccharides such as the sulfates of alkylpolyglucoside (the nonionic nonsulfated compounds being described herein).

[0108] Alkyl sulfate surfactants are preferably selected from the linear and branched primary C₁₀-C₁₈ alkyl sulfates, more preferably the C₁₁-C₁₅ branched chain alkyl sulfates and the C₁₂-C₁₄ linear chain alkyl sulfates.

[0109] Alkyl ethoxysulfate surfactants are preferably selected from the group consisting of the C₁₀-C₁₈ 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 C₁₁-C₁₈, most preferably C₁₁-C₁₅ alkyl sulfate which has been ethoxylated with from 0.5 to 7, preferably from 1 to 5, moles of ethylene oxide per molecule.

[0110] 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

[0111] Anionic sulfonate surfactants suitable for use herein include the salts of C₈-C₂₀ linear alkylbenzene sulfonates, alkyl ester sulfonates, C₆-C₂₂ primary or secondary alkane sulfonates, C₆-C₂₄ olefin sulfonates, sulfonated polycarboxylic acids, alkyl glycerol sulfonates, fatty acyl glycerol sulfonates, fatty oleyl glycerol sulfonates, and any mixtures thereof.

Anionic carboxylate surfactant

[0112] 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.

[0113] Suitable alkyl ethoxy carboxylates include those with the formula $RO(CH_2CH_2O)_xCH_2COO-M^+$ wherein R is a C₆ to C₁₈ alkyl group, x ranges from 0 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 C₆ to C₁₈ alkyl group, x is from 1 to 25, R₁ and R₂ are selected from the group consisting of hydrogen, methyl acid radical, succinic acid radical, hydroxysuccinic acid radical, and mixtures thereof, and R₃ is selected from the group consisting of hydrogen, substituted or unsubstituted hydrocarbon having between 1 and 8 carbon atoms, and mixtures thereof.

[0114] 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, propyl-1-nonanoic acid, 2-butyl-1-octanoic acid and 2-pentyl-1-heptanoic acid.

[0115] Certain soaps may also be included as suds suppressors.

Alkali metal sarcosinate surfactant

[0116] Other suitable anionic surfactants are the alkali metal sarcosinates of formula $RCON(R_1)CH_2COOM$, wherein R is a C₈-C₁₇ linear or branched alkyl or alkenyl group, R₁ is a C₁-C₄ 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.

Amphoteric surfactant

[0117] Suitable amphoteric surfactants for use herein include the amine oxide surfactants and the alkyl amphocarboxylic acids.

Suitable amine oxides include those compounds having the formula

[0118] $R_3(OR_4)_xN^+(R_5)_2$ wherein R₃ is selected from an alkyl, hydroxyalkyl, acylamidopropyl and alkyl phenyl group, or mixtures thereof, containing from 8 to 26 carbon atoms; R₄ 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 R₅ 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 C₁₂-C₁₈ alkyl dimethylamine oxide, and C₁₀-C₁₈ acylamido alkyl dimethylamine oxide.

[0119] A suitable example of an alkyl amphocarboxylic acid is Miranol (TM) C₁₂MConc. manufactured by Miranol, Inc., Dayton, NJ.

Zwitterionic surfactant

[0120] Zwitterionic surfactants can also be incorporated into the detergent compositions hereof. 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.

[0121] Suitable betaines are those compounds having the formula $R(R_1)_2N^+R_2COO^-$ wherein R is a C₆-C₁₈ hydrocarbyl group, each R₁ is typically C₁-C₃ alkyl, and R₂ is a C₁-C₅ hydrocarbyl group. Preferred betaines are C₁₂-C₁₈ dimethylammonio hexanoate and the C₁₀-C₁₈ acylamidopropane (or ethane) dimethyl (or diethyl) betaines. Complex betaine surfactants are also suitable for use herein.

Cationic surfactants

[0122] Cationic ester surfactants used in this invention are preferably water dispersible compound having surfactant properties comprising at least one ester (i. e. -COO-) linkage and at least one cationically charged group. Other suitable cationic ester surfactants, including choline ester surfactants, have for example been disclosed in US Patents No. 4,228,042, 4,239,660 and 4,260,529.

[0123] Suitable cationic surfactants include the quaternary ammonium surfactants selected from mono C₆-C₁₆, preferably C₆-C₁₂ N-alkyl or alkenyl ammonium surfactants wherein the remaining N positions are substituted by methyl, hydroxyethyl or hydroxypropyl groups.

[0124] Further all surfactants commonly known to be used in detergent compositions can be part of the composition, this includes all anionic, non-ionic, cationic and amphoteric surfactants known in the art.

ENZYMES

[0125] The composition of the present invention may optionally comprise one or more enzymes.

[0126] Enzymes are often used to aid the removal of stains. Enzymes react with the soiling and "break it down" into (smaller) particles that have increased water solubility or are easier to disperse in the washing liquid.

[0127] The enzymes that can be used in detergent compositions include, but are not limited to, proteases, amylases, lipases, cellulases, mannanase, peroxidase, oxidase, xylanase, pullulanase, glucanase, pectinase, cutinase, hemicellulases, glucoamylases, phospholipases, esterases, keratanases, reductases, phenoloxidases, lipoxygenases, ligninases, tannases, pentosanases, malanases, arabinosidases, hyaluronidase, chondroitinase, laccase or mixtures thereof. These enzymes are known to the skilled artisans and can be used in common amounts.

ANTI CORROSION AGENTS

[0128] The detergent composition of the present invention may optionally comprise one or more anticorrosion agents.

[0129] The main function of anticorrosion agents is to minimize the amount of material damage caused on glass and metal during automatic dishwashing.

[0130] Glass corrosion occurs because metal ions are dissolved out of the glass surface. This happens more intensively when few hardness ions are present in the water to be bound by the builders or complexing agents present in the ADD composition that is used. Also of influence are the washing temperature, the quality of the glassware and the duration of the cleaning program.

[0131] Glass corrosion becomes visible in white lines or white clouds on the glass surface. The glass corrosion damage can be "repaired" or the glassware can be protected, in both cases by anti corrosion agents. The amount of the corrosion can be reduced by using less strong builders and/or complexing agents.

[0132] Metal corrosion occurs mainly when oxide, sulfide and/or chlorides are present in the washing liquid (which normally is a mixture of tap water, soil and a detergent composition) and do react with the metal surface of items that are in the dishwashing machine. In the case of silver the silver metal salts that occur give a discoloration of the silver metal surface that becomes visible after one or more cleaning cycles in an automatic dishwashing machine.

[0133] The occurrence of metal corrosion can be slowed down by use of detergent ingredients that give the metal a protective layer or ingredients that binds with the oxide, sulfide and/or chlorides to prevent them from reacting with the metal surface. The metals can be silver, copper, stainless steel, iron, brass, etc.

[0134] The types of anti corrosion agents that often are used in detergent compositions or are described in literature include, but are not limited to, triazole-based compounds (like 1,2,3-benzotriazole), polymers with an affinity to attach to glass surfaces, strong oxidizers (like permanganate), silicates, organic or inorganic metal salts, or metal salts of biopolymers. The metal can be selected e.g. from the group aluminum, strontium, barium, titanium, zirconium, manganese, lanthanum, bismuth, zinc, wherein the latter is most commonly applied for the prevention of glass corrosion. Further compounds to be added e.g. are manganese compounds as described in WO 2005/095570.

POLYMERS

[0135] The composition of the present invention may optionally comprise one or more polymers.

[0136] The main function of polymers are acting as a dispersing agent or builder. As a dispersing agent the polymer disperses (inorganic) insoluble particles, like calciumphosphate.

[0137] The polymers that often are used in detergent compositions include, but are not limited to, homo-, co- or terpolymers of or based on acrylic acid, methacrylic acid or maleic acid. Such polymers are often combined with monomers that give the polymer a special function. Such polymers are commonly known and are described e.g. in EP-A 1 363 986, EP-A 1 268 729, EP-A1 299 513 and EP-A 0 877 002.

COMPLEXING AGENTS

[0138] The composition of the present invention may optionally comprise one or more complexing agent(s).

[0139] The main function of complexing agents is to capture trace metal ions like, Cu(II), Fe(II), Fe(III), Mn(II), Cd(II), Co(II), Cr(III), Hg(II), Ni(II), Pb(II), Pd(II), Zn(II). These ions can interfere with or disturb certain processes of the detergent in the washing machine, like e.g. the bleach performance.

[0140] The complexing agent(s) that are known to be used in detergent compositions include, but are not limited to, S,S-ethylenediamine-N,N'-disuccinic acid (S,S-EDDS), ethylenediaminetetraacetic acid (EDTA), diethylenedi-

aminepentamethylene phosphonate (DETPMP), nitrilotriacetic acid (NTA), iminodisuccinic acid (IDS), methylglycine-diacetic acid (MGDA), diethylenetriaminepentaacetic acid (DTPA), ethylenediaminedihydroxyacetic acid (EDDHA), N (hydroxyethyl)ethylenediaminetriacetic acid (HEDTA), diethylenetriaminepentamethylene phosphonic acid (DTPMPA), hydroxyethylidene-1,1-diphosphonic acid (HEDP), phytic acid, triethylenetetramine (TETA), tetraethylenepentamine (TEPA), aminoethylethanolamine (AEEA), diethylenetriamine (DETA), dipicolinic acid, ethylene diamine tetra (methylene phosphonic) acid or the salts thereof.

DISPERSING AGENTS

[0141] The composition of the present invention may optionally comprise one or more dispersing agents.

[0142] The main functions of dispersing agents are to inhibit crystal growth and disperse insoluble materials in the washing liquor, this can be a (fatty) soil, inorganic or organic salts, etc. Dispersing agents often have a polymeric character and are at least partly hydrophilic.

[0143] For dispersing a fatty soil surfactants are commonly used. Due to their hydrophilic and hydrophobic parts they can form micelles with the fatty soil and thus keep it dispersed in the washing liquor.

[0144] Polymers most commonly based on acrylic acid, methacrylic acid and/or maleic acid can be used to prevent crystal growth from water insoluble salts and aid for the salts to be dispersed. These polymers often also contain monomers with various properties, like sulphonated styrene, styrene, 2-acrylamido-2-methyl propane sulponic acid (AMPS), methallyl sulponic acid, acryl amide, etc.

ANTIREDEPOSITION AGENTS

[0145] The composition of the present invention may optionally comprise one or more antiredeposition agents.

[0146] The main functions of antiredeposition agents is that when a washing liquor shows insufficient soil antiredeposition capacity it aids to prevent the soil from redepositioning on the washing substrate.

[0147] The antiredeposition agent can exercise their effect by becoming adsorbed irreversibly to the soil particles and/or to the substrate. This way the soil becomes better dispersed in the washing liquor and/or the substrate is occupied with antiredeposition agent on those places the soil could redeposit.

[0148] The antiredeposition agent(s) that are known to be used in detergent compositions include, but are not limited to, carboxymethyl cellulose, polyester-PEG co-polymer, etc.

BLEACHING AGENTS

[0149] The composition of the present invention may optionally comprise one or more bleaching agents.

[0150] Bleaching agents can be used in a detergent either alone or in combination with a bleach activator and/or a bleach catalyst. The function of the bleaching agent is the removal of bleachable stains and to achieve an antibacterial effect on the load and inside of the (dish)washing machine.

[0151] The bleaching agents used as a sole bleaching ingredient in detergents react with the substrate that should be cleaned.

[0152] When an inorganic oxygen based bleaching agent is used in combination with a bleach activator it does react with the bleach activator. One of the reaction products provides the actual performance.

[0153] When an inorganic oxygen based bleaching agent is used in combination with a bleach catalyst it does react with the bleach catalyst. A bleach activator can optionally be present. The oxidized bleach catalyst provides the actual bleach performance.

[0154] Bleaching agents that can be used in detergent compositions include, but are not limited to,

- active chlor compounds
- inorganic peroxygen compounds
- organic peracids.

Examples are sodium percarbonate, sodium perborate monohydrate, sodium perborate tetrahydrate, hydrogen peroxide, hydrogen peroxide based compounds, peroxymonosulphate, e-phthalimid-peroxo-capronic acid, benzoyl peroxide, sodium hypochlorite, sodium dichloroisocyanurate, etc.

[0155] Bleaching agents are often applied in a way that separates them from the chemically fragile ingredients of the composition that can be deactivated. This can be obtained by coating the material, dose the material in separate layers in a compressed body or separated chambers in pouches in a water soluble sachet or form, or separate chambers in a bottle, complexing the bleaching agent with cyclodextrin, etc.

BLEACH ACTIVATORS

[0156] The composition of the present invention may optionally comprise one or more bleach activators.

[0157] When inorganic peroxygen based bleaching agents are applied a bleach activator provides the possibility to use a reduced temperature to achieve the desired bleaching performance.

The bleach activator reacts with the peroxygen to form an organic peracid. Depending from the used bleach activator these peracids can have a hydrophobic or a hydrophilic character.

[0158] Bleaching agents that can be used in detergent compositions include, but are not limited to, tetraacetylenediamine (TAED), sodium nonanoyloxybenzene sulphonate (NOBS), acetyl caprolactone, and N-methyl morpholinium acetonitrile and salts thereof (such as Sokalan BMG from BASF).

BLEACH CATALYSTS

[0159] The composition of the present invention may optionally comprise one or more bleach catalysts.

[0160] A bleaching catalyst can be used besides to or instead of a bleach activator. Most activators used are complexes with transition metal ions with organic ligands. Some metal ions that are applied in catalysts are Mn, Fe, Cu, CO, Mo. Complexes with these metals can interact with inorganic and organic peroxygen compounds to form reactive intermediates.

[0161] Use of bleach catalyst can result in achieving the desired bleaching performance at an even lower temperature than needed for bleach activators.

[0162] Bleaching catalysts that can be used in detergent compositions are intensively described in the state of the art. These include, but are not limited to, a complex of manganese(IV) with 1,4,7-trimethyl-1,4,7-triazacyclononane (MnMeTACN), tris[2-(salicylideneamino)ethyl]amine manganese(III), etc.

OPTICAL BRIGHTENERS

[0163] The composition of the present invention may optionally comprise one or more optical brighteners.

[0164] An optical brightener do via the washing liquor attach to the substrate to be cleaned. An optical brightener does convert invisible ultraviolet radiation into visible radiation with a longer wave length. Most commonly this becomes visible as a blue light that make the substrate appear to be whiter.

[0165] For different substrate there are different optical brighteners available. Optical brighteners that can be used in detergent compositions are intensively described in the state of the art and include, but are not limited to, stilbene-, pyrazolin-, cumarin-, benzoxazol-, naphthalimide-, distyrylbiphenyl sulphonate-, pyren-, methyl umbelliferon- and dihydroxyquinolin-derivates.

DYES

[0166] The composition of the present invention may optionally comprise one or more dyes.

[0167] The dye is used to color the detergent, parts of the detergent or speckles in the detergent. This will make the product more attractive to the consumer.

[0168] Dyes that can be used in detergent compositions include, but are not limited to, Nylosan yellow N-7GL, Sanolin brilliant flavine 8GZ, Sanolin yellow BG, Vitasyn quinoline yellow 70, Vitasyn tartrazine X90, Puricolor yellow AYE23, Basacid yellow 232, Vibracolor yellow AYE17, Simacid Eosine Y, Puricolor red ARE27, Puricolor red ARE14, Vibracolor red ARE18, Vibracolor red ARE52, Vibracolor red SRE3, Basacid red 316, Ponceau SX, Iragon blue DBL86, Sanolin blue EHRL, Sanolin turquoise blue FBL, Basacid blue 750, Iragon blue ABL80, Vitasyn blue AE90, Basacid blue755, Vitasyn patentblue V 8501, Vibracolor green AGR25. These dyes are available at the firms Clariant, Basf, Ciba.

PERFUME

[0169] The composition of the present invention may optionally comprise one or more perfumes.

[0170] The perfume(s) is added to the detergent to improve the sensorial properties of the product or of the machine load after cleaning.

[0171] The perfume can be added to the detergent as a liquid, paste or as a co-granulate with a carrier material. To improve the stability of the perfume it can be e.g. used in an encapsulated form or as a complex like for example a perfume-cyclodextrine complex.

[0172] Also perfumes that have a deodorizing effect can be applied. These perfumes encapsulate malodors by binding to their sulfur groups.

PROCESS AIDS

[0173] The composition of the present invention may optionally comprise one or more process aids. Process aids are used to improve certain product properties.

[0174] The process aids used in detergent compositions commonly are used for various purposes often depending of the physical form of the final product. Process aids for example can optimize compressibility, friability, toughness, disintegration speed, hygroscopicity, density, free flowing properties, stickiness, etc. of an detergent product in a certain physical shape.

[0175] Process aids that can be used in detergent compositions include, but are not limited to, polyalkylene glycols, sorbitol, starch derivates, disintegration agents (e.g. polyvinylpyrrolidone derivates, cellulose derivates, etc.), acetate salts, soda ash, sodium sulphate, talc, silicates, glycerin, water, stearates, etc.

PHYSICAL SHAPES

Pre-dose

[0176] In the pre-dosed system the consumer has more convenience since he/she only has to dose (one) unit(s) of a pre-dosed detergent composition. There can be any limitations due to the conditions the dose functions most optimal. These are usually communicated via the package of the detergent. The pre-dosed detergent unit can be provided e.g. in the form of a tablet, a bar, a pouch or a container. The pre-dosed detergent unit can have a weight that most commonly varies between 5 and 80 grams.

Tablet

[0177] A tablet can have various shapes where droplet, rectangular, rhomboidal, circular, cylindrical, round, cubic, square and oval are examples of the possibilities. Tablets can be provided as mono layer or as multilayer tablets. The tablets can also be cored, e.g. a tablet within a tablet. For example Linotech Mercury tableting presses can be provided with a system to produce cored tablets.

[0178] Tablets are often wrapped in a foil. This foil can be water soluble like polyvinyl alcohol or copolymers based on it. The foil can also be not water soluble. Than the base of the most commonly used foils is (bi)oriented polypropylene or high density polyethylene.

Mixture of self-dose and pre-dosed

[0179] When detergent compositions are provided as a mixture of self-dose and pre-dosed systems one should self dose a number of pre-dosed units. The dosing advise is often provided on the package of the detergent. Dependent from the conditions (like amount of soil, water hardness, etc.) the consumer should decide to dose one, two, three or more of the pre-dosed units in the (dish)washing machine.

Example 1

[0180] Onto the surface of at least 50 pressed detergent tablets several compositions as shown in the table below were delivered.

Apparatus

[0181] An apparatus used to provide the hot melt material in a desired way on the surface of the tablet consists at least of the following parts;

- Melter or container with heating
- Hose with heating
- Nozzle or gun with heating and a valve
- Pump

[0182] Such types of apparatus are available as "hot melt systems", for example offered by the following companies: Nordson, ITW Dynatec, Axco Adhesive Systems Company, Slautterback, Hot Melt Technologies or Melton.

Applying

[0183] The hot melt material composition is provided in the container of the apparatus. The container and its content is heated to the desired temperature.

[0184] Detergent tablets are transported on a conveyor belt. The nozzle or gun of the apparatus is located above this conveyor belt oriented towards the tablets on the belt. The nozzle is heated to the desired temperature, that is above the melting point/traject of the hot melt material composition, so that the composition to be applied is flowable/pasty/liquid.

[0185] A pump transports the fluid hot melt material composition from the container through a heated hose to the nozzle and keeps the molten hot melt under pressure. A valve is used to close or open the nozzle.

[0186] A detector detects a tablet coming in the direction of the nozzle. At the desired moment the valve opens and closes the nozzle in order to put the desired amount of hot melt material in the desired shape or pattern on the detected tablet. This shape or pattern can for example be one or more lines, stripes or areas that are situated for example straight, diagonal, S-shaped, etc on the tablet.

[0187] The described system can be applied with one or more nozzles or one or more hot melt systems to give the tablet the desired amount of hot melt material.

Solidification

[0188] After the hot melt material is provided on the tablet it is still flowable/pasty/liquid and should solidify before the tablet continues the steps in the production process. In this test the hot melt was solidified by cooling with dried and cooled air.

Table 1: Examples of different hot melt compositions

Composition	1	2	3	4	5
PEG200	4.75%	2.9%	3.6%	3.8%	3.8%
Dye	0.25%	0.1 %	0.4%	0.2%	0.2%
PEG9000	95%	-	48%	32%	70%
PEG6000	-	-	-	16%	-
Dipropionate	-	-	-	-	26%
C16-18 +25EO	-	-	-	16%	-
C16-18+80EO	-	97%	48%	32%	-
Total	100%	100%	100%	100%	100%
Composition	6	7	8	9	10
PEG200	-	2.9%	3.6%	2.9%	2.7%
Dye	-	0.1 %	0.4%	0.1 %	0.3%
PEG9000	-	-	66%	-	-
Sodiumcitrate	-	10%	30%	-	-
Dipropionate	-	4%	-	-	25%
pAA/AMPS copolymer	-	-	-	30%	-
C16-18 +80EO	100%	83%	-	67%	72%
Total	100%	100%	100%	100%	100%

[0189] PEG200, PEG 6000, PEG9000 are polyethylene glycols with an avarage molairweight of respectively 200, 6000 and 9000 and is available at BASF in the Pluriol product range.

Dipropionate is for example available at Lakeland Laboratories as AMA100.

C16-18+25EO and +80EO are fatty alcohol ethoxylates with a carbon chain of 16 to 18 carbon atoms and respectively averagely 25 and 80 ethylene oxide groups. Such products are available at BASF in the Lutensol AT product range.

pAA/AMPS copolymer is copolymer of acrylic acid and AMPS. Such a product is for example available at Alco Chemicals as Alcoguard4100.

Example 2

[0190] Onto the surface of at least 50 pressed detergent tablets a hot melt composition is applied in a way and with an apparatus as described in example 1. The hot melt compositions used in this test are the compositions 1, 3 and 6 as described in table 1.

[0191] Onto the not yet cooled hot melt surface on the tablet an excessive amount of powder or granulate was provided. The remaining amount not contacting the non-compressed portion was removed by means of pressurized air or by suction of a vacuum. The portion of the powder or granulate contacting the hot melt surface remained on the sticky hot melt surface.

The powders/granulates used in this test were soda, sodium citrate and a state-of-art dishwashing detergent powder composition.

[0192] After this treatment stickiness of the coated surface of the hot melt was lowered in amount that it was possible to continue with the following steps of the production process without any delay due to the solidification of the hot melt material.

Claims

1. Detergent shaped body without any cavity comprising a compressed portion and at least one non-compressed portion in form of at least one strand(s), stripe(s), extruded line(s), dot(s) or a pattern.
2. Detergent shaped body according to claim 1, wherein the non-compressed portion comprises at least one active detergent component.
3. Detergent shaped body according to claim 1 or 2, wherein the non-compressed portion comprises a hot melt material, which is a material which is solid at ambient temperature and melts in a temperature range from 35°C to 150°C.
4. Detergent shaped body according to any of claims 1 to 3, wherein the hot melt material is selected from non-ionic surfactants with ethylene oxide and/or propylene oxide and/or butylene oxide groups, anionic surfactants with carboxylate, sulphonate, sulphate or phosphate end groups, cationic surfactants, amphoteric surfactants, polyalkylene glycols, gelatine or waxes.
5. Process for preparing a detergent shaped body according to any of claims 1 to 4 comprising a step of delivering a non-compressed portion to a compressed portion of a detergent composition in form of at least one strand(s), stripe(s), extruded line(s), dot(s) or a pattern.
6. Process according to claim 5 comprising a further step of cooling the non-compressed portion.
7. Use of a hot melt material for providing a non-compressed portion on the surface of a compressed portion of a detergent tablet for increasing the amount of at least one ingredient in the shaped body which impairs processability of the compressed portion of said shaped body.
8. Use of a hot melt material for providing a non-compressed portion on the surface of a compressed portion of a detergent tablet for protecting the tablet against breakage.
9. A process for delivering a non compressed portion on a compressed detergent body comprising the use of a hot melt system.
10. A process according to claim 9 wherein the hot melt system comprises a heatable container, pump, hose and piston and is placed in-line with a conveyor belt on which compressed detergent bodies are transported.
11. A non compressed portion that is provided on a compressed detergent body in form of at least one strand(s), stripe(s), extruded line(s), dot(s) or a pattern, where the non compressed portion contains at least a detergent active ingredient and a hot melt material which is solid at ambient temperature and melts in a temperature range from 35°C to 150°C where the non compressed portion can be a homogeneous or inhomogeneous blend that becomes fluid in a temperature range from 35°C to 150°C but is solid at ambient temperature.



European Patent
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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 February 2008	Examiner CULMANN, J
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 07 02 3612

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