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(54) **Detergent compositions**

(57) Cleaning tablet comprising a smooth phase, wherein said smooth phase is obtained by compression of a particulate mixture comprising at least 40 wt% of detergent particles, wherein said detergent particles comprise at least 50 wt% of non-soap surfactant.

EP 1 405 900 A1

Description

[0001] This invention relates to cleaning compositions in the form of tablets for example, for use in fabric washing or machine dishwashing.

[0002] Detergent compositions in tablet form have advantages over powdered products in that they do not require measuring and are thus easier to handle and dispense into the washload.

[0003] Tablets of a cleaning composition are generally made by compressing or compacting a quantity of the composition in particulate form.

[0004] Tablets comprising two or more separate regions have also been described. For example WO 01/42416 describes the production of multi-phase moulded bodies comprising a combination of core moulded bodies and a particulate premix. WO 00/61717 describes a detergent tablet which is characterised in that at least part of its outer surface is semi-solid. WO 00/04129 describes a multi-phase detergent tablet comprising a first phase in the form of a shaped body having at least one mould therein and a second phase in the form of a particulate solid compressed within said mould.

[0005] It is an object of the present invention to provide a method to produce cleaning tablet comprising a smooth phase, wherein said smooth phase comprises surfactants and wherein said cleaning tablet has good dispersing properties of the smooth phase and wherein the smooth phase has a suitable texture (between soft and hard).

[0006] A further objective of the present invention is to provide a method to produce a smooth tablet or phase thereof wherein the choice of materials and the manufacturing method allows the low cost production of tablets of good performance and of good consistency and texture.

[0007] Although the invention can relate to a single phase smooth tablet, according to a preferred embodiment of the present invention there is provided a cleaning tablet which has a plurality of discrete regions with differing compositions, characterised in that at least one first region of the tablet is a smooth region and at least one second region of the tablet is a solid region of compacted particulate material.

[0008] In a first aspect the invention relates to a method for producing a cleaning tablet comprising a smooth phase and wherein the production of the smooth phase comprises the compression of a particulate composition comprising at least 40 wt% of detergent particles, wherein said detergent particles comprise at least 50 wt% of non-soap surfactants.

[0009] Preferably tablets of the invention are of cylindrical shape wherein the two main surfaces (upper side and bottom side) are substantially flat.

[0010] As indicated above, tablets of the invention can be single phase tablets, which are predominantly constituted by the smooth phase as described above. However a preferred embodiment of the invention relates to a multiphase tablet wherein the smooth phase is present and additionally one or more other phases are present. Suitably these additional phases can be smooth or matte or rugged. Particularly suitable are solid phases composed of compacted particulate solids.

[0011] The regions of a multi-phase tablet are possibly separate layers within a tablet. However, a discrete region of a tablet could also have other forms for example one or more core(s) or insert(s). In a preferred embodiment the first region is a smooth layer and the second region is a layer of compacted particulate material. In a further advantageous embodiment the first region is a core or insert of smooth material embedded in the second region which is a layer of compacted particulate material.

[0012] If the tablet is a single phase smooth tablet, then preferably the weight of this tablet will be from 5 to 100 g, more preferably from 10 to 40 g, most preferably from 15 to 35 g.

[0013] If the tablet is a multi-phase tablet comprising the smooth phase of the invention then preferably the smooth phase is present as a distinctive region preferably having a weight of from 2 to 20 grammes, more preferred from 3 to 10 grammes. Preferably the other phases together have a weight of 10 to 50 grammes, more preferred 15 to 40 grammes.

[0014] For the purpose of this invention the term smooth phase refers to compositions which are on the one hand solid enough to retain their shape at ambient temperature and on the other hand smooth in appearance. Smooth textures are generally of low or no porosity and have -at normal viewing distance- the appearance of a continuous phase for example as opposed to porous and particulate appearance of a compacted particulate material.

[0015] Preferably the smooth phase is transparent or translucent. Preferably, this means that the composition has an optical transmissivity of at least 10%, most preferably 20%, still more preferably 30%, through a path length of 0.5 cm at 25° C. These measurements may be obtained using a Perkin Elmer UV/VIS Spectrometer Lambda 12 or a Brinkman PC801 Colorimeter at a wavelength of 520nm, using water as the 100% standard.

[0016] The transparency or translucency of the compositions according to the invention does not preclude the composition being coloured, e.g. by addition of a dye, provided that it does not detract substantially from clarity.

[0017] In an advantageous embodiment of the invention the smooth phase comprises from 20-80 wt% of non-soap surfactants (based on the total weight of said smooth phase), more preferred from 25 to 75 wt%, most preferred 30 to

70 wt%. It has been found that the combination of a separate smooth first region and these high surfactant levels provide very good dispersing and cleaning properties to the tablet.

[0018] As indicated above the non-soap surfactants originate for a significant part from the compression of detergent particles. Such detergent particles preferably comprise at least 50 wt% (based on the particles) of non-soap surfactants. Suitable detergent particles may for example be granules or other particles having high surfactant levels. For example suitably the detergent particles may be produced by a process as for example described in EP 777 719 and EP 777 720.

[0019] Preferably the level of non-soap surfactants in the detergent particles is more than 50 wt%, more preferred more than 70 wt%, especially preferred from 75 wt% to 95 wt%.

[0020] Preferably the non-soap surfactants in the first region comprise a combination of anionic surfactants and non-ionic surfactants in a weight ratio of from 5 : 1 to 1 : 1, more preferred 3 : 1 to 1 : 1, more preferred 2 : 1 to 1 : 1. Further surfactants, for example cationic surfactants may equally be present for example at a level of 0.1 to 10 wt% based on the weight of the smooth part.

[0021] In addition to the non-soap surfactants the smooth region may comprise other materials for example soluble materials such as electrolyte materials, meltable organic materials and sugars, at a level of 2 to 70 wt% based on the weight of the smooth part, more preferred from 3 to 50 wt%, most preferred 5 to 40 wt%. Examples of preferred materials are water-soluble materials such as the sodium and potassium citrates, acetates and carbonates, urea and sugar. The water solubility at 20 C of these materials is preferably at least 10 grammes per 100 ml of water, more preferred more than 15 grammes, most preferably more than 20 grammes.

[0022] It has been found that these materials provide good dissolution properties to the smooth phase, especially if this phase comprises relatively high levels of surfactants. Furthermore these materials do not negatively affect the desired firm consistency of the smooth phase but on the other hand retain the smooth nature of the phase.

[0023] The smooth region of the tablet may also contain diluent materials for example polyethyleneglycol, dipropylene glycol, isopropanol or (mono-)propyleneglycol. Preferable the level of these diluents is from 0 to 40 wt%, more preferred 1 to 20, most preferred from 4 to 15 wt% based on the weight of the smooth phase.

[0024] The smooth phase comprises no or only low levels of water. Preferably the level of water is less than 20 wt% based on the weight of the smooth phase, more preferred less than 15 wt%, most preferred from 5 to 12 wt%. Most preferably the smooth phases are substantially free from water, which means that apart from low levels of moisture (e.g. for neutralisation or as crystal water) no additional added water is present.

[0025] Preferably the total weight of surfactants in the smooth phase is from 2 to 20 grammes, more preferred from 3 to 10 grammes.

[0026] In a preferred embodiment of the invention the tablet may be a multi-phase tablet wherein the phases other than the smooth phase as described above comprise no or only low levels of surfactants. Preferably the level of surfactants in the the other phases is less than 10 wt%(based on the total weight of said phases), more preferred from 0 to 9 wt%, most preferred from 1 to 8 wt%.

[0027] In an advantageous embodiment of the invention the cleaning tablets comprise a first smooth region (as described above) in combination with a second region of the tablet which is a solid region, for example prepared by compression of a particulate composition.

[0028] Although the second region may comprise surfactant materials, this region preferably comprises ingredients of the tablet other than surfactants. Examples of these ingredients are for example builders, bleach system, enzymes etc. Preferably the builders in the tablet are predominantly present in the second region. Preferably the bleach system is predominantly present in the second region. Preferably the enzymes are predominantly present in the second region. For the purpose of this invention, unless stated otherwise, the term "predominantly present" refers to a situation wherein at least 90 wt% of an ingredient is present in the second region, more preferred more than 98 wt%, most preferred substantially 100 wt%.

[0029] The above description of the tablet has been given with reference to a tablet constituted by two regions. It will however be understood that each of the regions may be composed of a limited number of discrete regions. For example the first smooth region may be a single discrete part of the tablet but may also be a limited number (say 1-5) discrete smooth parts. Preferably each of these smooth parts are at least 1 gramme, also preferably each of these smooth parts is substantially of the same composition. If reference is made to the composition or weight of the first region it is understood that this concerns the total weight and composition of these smooth parts.

[0030] Similarly the solid second region may be composed of a limited number (say 1-5) of solid parts e.g. separate layers in the tablet. Preferably each of these parts has a weight of at least 10 grammes, also preferably each of the solid parts is substantially of the same composition. If reference is made to the composition or weight of the second region it is understood that this concerns the total weight and composition of these solid parts.

[0031] In addition to the smooth first region and the solid second region the cleaning tablets of the invention may optionally comprise further regions, for example the tablet may be partly or wholly coated.

[0032] Cleaning tablets according to the invention are preferably manufactured by a process involving the application of pressure to a particulate mixture. Advantageously the preparation of the smooth phase may involve the dosing of a

particulate mixture comprising detergent particles optionally in combination with the other materials as described above, followed by the exertion of pressure, preferably above the yield stress of the detergent particles. It has been found that the exertion of pressure to a particulate mixture comprising significant levels of detergent particles leads to a certain flow behaviour of the mixture leading to the formation of a continuous, non-porous smooth phase.

5 [0033] Although applicants do not wish to be bound by any theory it is believed that the advantageous process of the invention works as follows: Typically compaction of soft solid leads to a decrease in inter-particle porosity relative to a particle bed simply due to reduced air entrainment. However at a certain compaction force (yield stress) the individual particles will deform and flow into the interparticle voids leading to a semi-continuous network of intermeshed particles with no or low porosity and a smooth appearance.

10 [0034] Detergent particles for use in the preparation of the smooth phase preferably have a relatively high surfactant level for example more than 40 wt%, more preferred more than 50 wt%, most preferred from 60 to 90 wt%.

[0035] A multi-phase tablets comprising a smooth phase may advantageously be made by a process comprising the steps of:

15 (a) inserting a first particulate composition into a tablet mould

(b) inserting a second particulate composition into said tablet mould, wherein said second particulate composition comprises at least 40 wt% of detergent particles, wherein said detergent particles comprise at least 50 wt% of non-soap surfactants;

20 (c) co-compression of the particulate compositions and the to form a compressed tablet comprising discrete regions, wherein the first region is formed by said compressed first composition and the second region is formed by said compressed second composition.

[0036] Preferably step (a) takes place before step (b).

25 [0037] In a preferred embodiment of the invention the first particulate composition is pre-compressed at a force of 0.1 to 20 kN/cm² between steps (a) and (b) In another preferred embodiment the particulate composition is flattened between steps (a) and (b).

30 [0038] Preferably the (co-)compression of the combination of the smooth and the solid region(s) takes place at a force of from 0.05 to 20 kN/cm². Especially if the solid region has been pre-compressed the co-compression in step (c) can advantageously be at a force of 0.1- 10 kN/cm², more preferred 0.5 to 5 kN/cm². If the solid region has not been pre-compressed, the co-compression preferably takes place at a force of 1- 100 kN/cm²., more preferred 2-50 kN/cm²., most preferred 2-10 kN/cm².

35 [0039] One advantage of the method of the present invention is that the co-compression step of (c) leads to good adherence of the first region to the second region and avoids the need of applying an adhesive material between the smooth and solid region. Another advantage of the method of the invention is that it can be carried out in a normal tablet press without the need of adaptation of the shape of the pressing surfaces.

[0040] A tablet of this invention may be intended for use in machine dishwashing. Such tablets will typically contain salts, such as over 60 wt% of the tablet.

40 [0041] Water soluble salts typically used in machine dishwashing compositions are phosphates (including condensed phosphates) carbonates and silicates, generally as alkali metal salts. Water soluble alkali metal salts selected from phosphates, carbonates and silicates may provide 60 wt% or more of a dishwashing composition.

[0042] Another preferred possibility is that a tablet of this invention will be intended for fabric washing. In this event the tablet will be likely to contain at least 2 wt%, probably at least 5 wt%, up to 40 or 50 wt% non-soap surfactant based on the whole tablet, and from 5 to 80 wt% detergency builder, based on the whole tablet.

45 [0043] Materials which may be used in tablets of this invention will now be discussed in more detail.

Surfactant Compounds

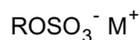
50 [0044] Compositions which are used in tablets of the invention will contain one or more detergent surfactants. In a fabric washing composition, these preferably provide from 5 to 50% by weight of the overall tablet composition, more preferably from 8 or 9% by weight of the overall composition up to 40% or 50% by weight. Surfactant may be anionic (soap or non-soap), cationic, zwitterionic, amphoteric, nonionic or a combination of these.

[0045] Anionic surfactant may be present in an amount from 0.5 to 50% by weight, preferably from 2% or 4% up to 30% or 40% by weight of the tablet composition.

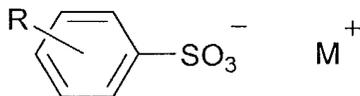
55 [0046] Synthetic (i.e. non-soap) anionic surfactants are well known to those skilled in the art. Examples include alkylbenzene sulphonates, particularly sodium linear alkylbenzene sulphonates having an alkyl chain length of C₈-C₁₅; olefin sulphonates; alkane sulphonates; dialkyl sulphosuccinates; and fatty acid ester sulphonates.

[0047] Primary alkyl sulphate having the formula

EP 1 405 900 A1



in which R is an alkyl or alkenyl chain of 8 to 18 carbon atoms especially 10 to 14 carbon atoms and M⁺ is a solubilising cation, is commercially significant as an anionic surfactant. Linear alkyl benzene sulphonate of the formula



where R is linear alkyl of 8 to 15 carbon atoms and M⁺ is a solubilising cation, especially sodium, is also a commercially significant anionic surfactant.

[0048] Frequently, such linear alkyl benzene sulphonate or primary alkyl sulphate of the formula above, or a mixture thereof will be the desired anionic surfactant and may provide 75 to 100 wt% of any anionic non-soap surfactant in the composition.

[0049] In some forms of this invention the amount of non-soap anionic surfactant lies in a range from 5 to 20 wt% of the tablet composition.

[0050] Soaps for use in accordance to the invention are preferably sodium soaps derived from naturally occurring fatty acids, for example, the fatty acids from coconut oil, beef tallow, sunflower or hardened rapeseed oil. Especially preferably soaps are selected from C₁₀ to C₂₀ soaps for example from C₁₆ to C₁₈ or C₁₂ soaps.

[0051] Suitable nonionic surfactant compounds which may be used include in particular the reaction products of compounds having a hydrophobic group and a reactive hydrogen atom, for example, aliphatic alcohols, acids, amides or alkyl phenols with alkylene oxides, especially ethylene oxide.

[0052] Specific nonionic surfactant compounds are alkyl (C₈₋₂₂) phenol-ethylene oxide condensates, the condensation products of linear or branched aliphatic C₈₋₂₀ primary or secondary alcohols with ethylene oxide, and products made by condensation of ethylene oxide with the reaction products of propylene oxide and ethylene-diamine.

[0053] Especially preferred are the primary and secondary alcohol ethoxylates, especially the C₉₋₁₁ and C₁₂₋₁₅ primary and secondary alcohols ethoxylated with an average of from 5 to 20 moles of ethylene oxide per mole of alcohol.

[0054] In some fabric washing tablets of this invention, the amount of nonionic surfactant lies in a range from 4 to 40%, better 4 or 5 to 30% by weight of the whole tablet.

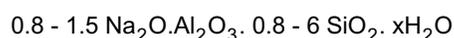
[0055] Many nonionic surfactants are liquids. These may be absorbed onto particles of the composition.

[0056] In a machine dishwashing tablet the surfactant may be wholly nonionic, in an amount below 5 wt% of the whole tablet although it is known to include some anionic surfactant and to use up to 10 wt% surfactant in total.

Detergency Builder

[0057] A composition which is used in tablets of the invention will usually contain from 5 to 80%, more usually 15 to 60% by weight of detergency builder. This may be provided wholly by water soluble materials, or may be provided in large part or even entirely by water-insoluble material with water-softening properties. Water-insoluble detergency builder may be present as 5 to 80 wt%, better 5 to 60 wt% of the composition.

[0058] Alkali metal aluminosilicates are strongly favoured as environmentally acceptable water-insoluble builders for fabric washing. Alkali metal (preferably sodium) aluminosilicates may be either crystalline or amorphous or mixtures thereof, having the general formula:



[0059] These materials contain some bound water (indicated as "xH₂O") and are required to have a calcium ion exchange capacity of at least 50 mg CaO/g. The preferred sodium aluminosilicates contain 1.5-3.5 SiO₂ units (in the formula above). Both the amorphous and the crystalline materials can be prepared readily by reaction between sodium silicate and sodium aluminate, as amply described in the literature.

[0060] Suitable crystalline sodium aluminosilicate ion-exchange detergency builders are described, for example, in GB 1429143 (Procter & Gamble). The preferred sodium aluminosilicates of this type are the well known commercially available zeolites A and X, the novel zeolite P described and claimed in EP 384070 (Unilever) and mixtures thereof.

[0061] Conceivably a water-insoluble detergency builder could be a layered sodium silicate as described in US 4664839.

NaSKS-6 is the trademark for a crystalline layered silicate marketed by Hoechst (commonly abbreviated as "SKS-6"). NaSKS-6 has the delta- Na_2SiO_5 morphology form of layered silicate. It can be prepared by methods such as described in DE-A-3,417,649 and DE-A-3,742,043. Other such layered silicates, such as those having the general formula $\text{NaMSi}_x\text{O}_{2x+1} \cdot y\text{H}_2\text{O}$ wherein M is sodium or hydrogen, x is a number from 1.9 to 4, preferably 2, and y is a number from 0 to 20, preferably 0 can be used.

[0062] Water-soluble phosphorous-containing inorganic detergency builders, include the alkali-metal orthophosphates, metaphosphates, pyrophosphates and polyphosphates. Specific examples of inorganic phosphate builders include sodium and potassium tripolyphosphates, orthophosphates and hexametaphosphates.

[0063] Non-phosphorous water-soluble builders may be organic or inorganic. Inorganic builders that may be present include alkali metal (generally sodium) carbonate; while organic builders include polycarboxylate polymers, such as polyacrylates, acrylic/maleic copolymers, and acrylic phosphonates, monomeric polycarboxylates such as citrates, gluconates, oxydisuccinates, glycerol mono- di- and trisuccinates, carboxymethyloxysuccinates, carboxymethyloxymalonates, dipicolinates and hydroxyethyliminodiacetates.

[0064] At least one region (preferably the second region) of a fabric washing tablet preferably include polycarboxylate polymers, more especially polyacrylates and acrylic/maleic copolymers which can function as builders and also inhibit unwanted deposition onto fabric from the wash liquor.

Bleach System

[0065] Tablets according to the invention may contain a bleach system in at least one region of a tablet, preferably in the second region. This preferably comprises one or more peroxy bleach compounds, for example, inorganic persalts or organic peroxyacids, which may be employed in conjunction with activators to improve bleaching action at low wash temperatures. If any peroxygen compound is present, the amount is likely to lie in a range from 10 to 25% by weight of the composition.

[0066] Preferred inorganic persalts are sodium perborate monohydrate and tetrahydrate, and sodium percarbonate, advantageously employed together with an activator. Bleach activators, also referred to as bleach precursors, have been widely disclosed in the art. Preferred examples include peracetic acid precursors, for example, tetraacetylethylene diamine (TAED), now in widespread commercial use in conjunction with sodium perborate; and perbenzoic acid precursors. The quaternary ammonium and phosphonium bleach activators disclosed in US 4751015 and US 4818426 (Lever Brothers Company) are also of interest. Another type of bleach activator which may be used, but which is not a bleach precursor, is a transition metal catalyst as disclosed in EP-A-458397, EP-A-458398 and EP-A-549272. A bleach system may also include a bleach stabiliser (heavy metal sequestrant) such as ethylenediamine tetramethylene phosphonate and diethylenetriamine pentamethylene phosphonate.

[0067] As indicated above, if a bleach is present and is a water-soluble inorganic peroxygen bleach, the amount may well be from 10% to 25% by weight of the composition.

Other Detergent Ingredients

[0068] The detergent tablets of the invention may also contain (preferably in the second region) one of the detergency enzymes well known in the art for their ability to degrade and aid in the removal of various soils and stains. Suitable enzymes include the various proteases, cellulases, lipases, amylases, and mixtures thereof, which are designed to remove a variety of soils and stains from fabrics. Examples of suitable proteases are Maxatase (Trade Mark), as supplied by Gist-Brocades N.V., Delft, Holland, and Alcalase (Trade Mark), and Savinase (Trade Mark), as supplied by Novo Industri A/S, Copenhagen, Denmark. Detergency enzymes are commonly employed in the form of granules or marumes, optionally with a protective coating, in amount of from about 0.1% to about 3.0% by weight of the composition; and these granules or marumes present no problems with respect to compaction to form a tablet.

[0069] The detergent tablets of the invention may also contain (preferably in the second region) a fluorescer (optical brightener), for example, Tinopal (Trade Mark) DMS or Tinopal CBS available from Ciba-Geigy AG, Basel, Switzerland. Tinopal DMS is disodium 4,4'-bis-(2-morpholino-4-anilino-s-triazin-6-ylamino) stilbene disulphonate; and Tinopal CBS is disodium 2,2'-bis-(phenyl-styryl) disulphonate.

[0070] An antifoam material is advantageously included (preferably in the second region), especially if a detergent tablet is primarily intended for use in front-loading drum-type automatic washing machines. Suitable antifoam materials are usually in granular form, such as those described in EP 266863A (Unilever). Such antifoam granules typically comprise a mixture of silicone oil, petroleum jelly, hydrophobic silica and alkyl phosphate as antifoam active material, absorbed onto a porous absorbed water-soluble carbonate-based inorganic carrier material. Antifoam granules may be present in an amount up to 5% by weight of the composition.

[0071] It may also be desirable that a detergent tablet of the invention includes an amount of an alkali metal silicate, particularly sodium ortho-, meta- or disilicate. The presence of such alkali metal silicates at levels, for example, of 0.1

to 10 wt%, may be advantageous in providing protection against the corrosion of metal parts in washing machines, besides providing some measure of building and giving processing benefits in manufacture of the particulate material which is compacted into tablets.

[0072] A tablet for fabric washing will generally not contain more than 15 wt% silicate. A tablet for machine dish-washing will often contain more than 20 wt% silicate. Preferably the silicate is present in the second region of the tablet.

[0073] Further ingredients which can optionally be employed in a region of a fabric washing detergent of the invention tablet (preferably the second region) include anti-redeposition agents such as sodium carboxymethylcellulose, straight-chain polyvinyl pyrrolidone and the cellulose ethers such as methyl cellulose and ethyl hydroxyethyl cellulose, fabric-softening agents; heavy metal sequestrants such as EDTA; perfumes; and colorants or coloured speckles.

[0074] Further ingredients which can optionally be used in tablets of the invention, preferably in the second region are dispersing aids. Examples of suitable dispersing aids are water-swallowable polymers (e.g. SCMC) highly soluble materials (e.g. sodium citrate, potassium carbonate or sodium acetate) or sodium tripolyphosphate with preferably at least 40% of the anhydrous phase I form.

Particle Size and Distribution

[0075] The second region of a detergent tablet of this invention, is preferably a matrix of compacted particles.

[0076] Preferably the particulate composition has an average particle size in the range from 200 to 2000 µm, more preferably from 250 to 1400 µm. Fine particles, smaller than 180 µm or 200 µm may be eliminated by sieving before tableting, if desired, although we have observed that this is not always essential.

[0077] While the starting particulate composition may in principle have any bulk density, the present invention is especially relevant to tablets made by compacting powders of relatively high bulk density, because of their greater tendency to exhibit disintegration and dispersion problems. Such tablets have the advantage that, as compared with a tablet derived from a low bulk density powder, a given dose of composition can be presented as a smaller tablet.

[0078] Thus the starting particulate composition may suitably have a bulk density of at least 400 g/litre, preferably at least 500 g/litre, and perhaps at least 600 g/litre.

[0079] Tableting machinery able to carry out the manufacture of tablets of the invention is known, for example suitable tablet presses are available from Fette and from Korch.

[0080] Tableting may be carried out at ambient temperature or at a temperature above ambient which may allow adequate strength to be achieved with less applied pressure during compaction. In order to carry out the tableting at a temperature which is above ambient, the particulate composition is preferably supplied to the tableting machinery at an elevated temperature. This will of course supply heat to the tableting machinery, but the machinery may be heated in some other way also.

[0081] The size of a tablet will suitably range from 10 to 160 grams, preferably from 15 to 60 g, depending on the conditions of intended use, and whether it represents a dose for an average load in a fabric washing or dishwashing machine or a fractional part of such a dose. The tablets may be of any shape. However, for ease of packaging they are preferably blocks of substantially uniform cross-section, such as cylinders or cuboids. The overall density of a tablet preferably lies in a range from 1040 or 1050gm/litre up to 1600gm/litre.

Example 1

I: first particulate composition

[0082] A powder was made of the following composition by pregranulating the granule ingredients, followed by post-dosing the rest of the ingredients

<i>Ingredient</i>	<i>Parts by weight</i>
Granules	
Na-las	1.1
Nonionic 7EO	0.5
C12 soap	0.1
NaAc.3aq	0.3
Zeolite A24	2.4
Light soda ash	0.4
Moisture/minors	0.4

EP 1 405 900 A1

(continued)

<i>Ingredient</i>	<i>Parts by weight</i>
Post-dose	
EAG (17% silicone)	3.0
Fluorescer (15%)	2.2
STP	62.4
Na-disilicate (80%)	3.8
TAED (83%)	4.3
Percarbonate	16.9
Dequest 2047	1.9
Minors/ enzymes/colour	to 100

II. Preparation of detergent particles for use in the second particulate composition:

[0083]

A: Detergent (LAS based) particles were made in a VRV machine by dosing 68 weight parts of anionic detergent (LAS) at elevated temperature of 150 C. In the final section water-cooling was used to reduce the temperature and 16.5 weight parts of Zeolite (4A), 12 weight parts of sodium carbonate and 3.5 weight parts of sodium sulphate were added in the final section. Tip speed was about 30 m/sec. The resulting anionic rich granules had a weight average mean particle diameter (D (4,3)) of about 600 micrometer.

B: Detergent (LAS/NI based) particles were made by pre-preparing LAS based particles as under A followed by mixing 8 weight parts of these particles with 5 weight parts of nonionic (alcohol ethoxylate type with an alkyl chain-length distribution in the range 11-14 units and an ethoxylate chain with an average of 7 ethoxylate units).

C: Detergent (LAS/NI based) particles were made of 39.6 weight parts of Sodium LAS, 16.8 weight parts of Nonionic (see above), 2 weight parts of C12 soap, 23.8 weight parts of zeolite (4A), 6.2 weight parts of sodium sulphate and 11.6 weight parts of sodium carbonate. The method of preparation was substantially as under A wherein the LAS/NI mixture was heated and the remaining ingredients were added in the final section.

D: Detergent (C12-C14 PAS based) particles were made by replacing in formulation A LAS by C12-C14 PAS.

III: tablet preparation

[0084] 20 grammes of the of the first particulate composition are inserted into a 45 mm die of a tableting machine, optionally followed by a flattening step, followed by addition of 5 grammes of the second particulate compositions (A, B, C or D) as indicated above. The whole material is compressed at 30kN into a single tablet, followed by ejection of the tablet. This results in a tablet with a smooth part on top of a layer of compacted particulate composition. The density of the powdered region is 1.5 kg/litre, the density of smoothpart is 1.0 kg/litre. The height of the smooth part after compression is 3.4 mm, of the powdered part 11 mm.

Example 2

[0085] Example 1 was repeated by using the same composition of the bottom layer.

[0086] The composition of the smooth top layer is as indicated below. Each smooth layer comprises one of the detergent particles optionally in combination with an electrolyte material.

[0087] Na-sulphate and Na-carbonate had a D_{4,3} particle size of 400 micrometer; K-carbonate had particle size of about 200 micrometer.

[0088] T₉₀ was measured by immersing one tablet into 9 litres of tapwater at 20 C which is stirred at 200 rpm. The relative conductivity of the water is measured over time. As the tablet dissolves the conductivity increases until complete dissolution (at 100% of maximum conductivity). T₉₀ is the time at which 90% of the maximum conductivity is reached.

EP 1 405 900 A1

Example/ Wt pts	1	2	3	4	5	6
Particles A	100	70	60	60	40	40
Na-sulphate	-	-	-	-	60	-
Na-carbonate	-	-	-	40	-	-
K-carbonate	-	30	40	-	-	60
KNewton	8.6	7.3	7.1	11.3	18.0	6.8
T90	>30 min	2 min	1.5 min	15 min	20 min	0.3 min

Example 3

[0089] The results in Table 3 are for 40g smooth tablets comprised of 70% of a detergent granule (made in accordance to method A described above) containing 70% sodium-LAS surfactant and 30% of a range of electrolytes or sugar (sorbitol).

Table 3:

Example/ Wt pts	7	8	9	10	11
Particles A	70	70	70	70	70
Na-chloride	30	-	-	-	-
Na-TPP	-	30	-	-	-
K-acetate	-	-	30	-	-
Na-acetate	-	-	-	30	-
Sorbitol	-	-	-	-	30
Knewton	10	10	3	7	7
T90	7 min	15min	15 min	15 min	11 min

Example 4

[0090] The results in Table 4 are for 40g tablets comprised of 70% of a detergent particle containing 70% sodium-LAS surfactant and 30% of potassium carbonate with particle size of <100 micron or 200 micron.

Table 4:

Example/ Wt pts	12	13
Particles A	40	40
K ₂ CO ₃ - <100microns	60	-
K ₂ CO ₃ - 200 microns	-	60
Knewton	12.5	6.8
T90	1.5min	0.3min

Example 5

[0091] The results in Table 5 are for detergent granules (prepared as under B) containing LAS and nonionic surfactant in ratios of 9/4 and 8/5. The total anionic surfactant in these granules is 57 and 45% respectively. These granules are combined with one or more electrolytes in a ratio of Granule/electrolyte = 55/45 ratio as 40g tablets. In all cases the T90 is improved in the presence of electrolytes.

Table 5

Example/ Wt pts	14	15	16	17	18	19
LAS/NI = 9/4	100	-	55	55	55	-
LAS/NI = 8/5	-	100	-	-	-	55
K-carbonate	-	-	30	22.5	15	45
Na-carbonate	-	-	15	22.5	30	-
Knewton	-	-	3.6	3.9	4.3	3.3
T90	>30min	>30min	6.5min	10min	15min	8min

Claims

1. A method for producing a cleaning tablet comprising a smooth phase comprising the compression of a particulate composition comprising at least 40 wt% of detergent particles, wherein said detergent particles comprise at least 50 wt% of non-soap surfactants.
2. A method according to claim 1, wherein said particulate composition comprises from 10 to 60 wt% of electrolyte materials.
3. A method according to claim 2, wherein the electrolyte is selected from water-soluble carbonates, citrates, acetates and sulphates.
4. A method according to claim 1 comprising the steps of
 - (a) inserting a first particulate composition into a tablet mould
 - (b) inserting a second particulate composition into said tablet mould, wherein said second particulate composition comprises at least 40 wt% of detergent particles, wherein said detergent particles comprise at least 50 wt% of non-soap surfactants;
 - (c) compression of the particulate compositions to form a compressed tablet comprising discrete regions, wherein the first region is formed by said compressed first composition and the second region is formed by said compressed second composition.
5. A method according to claim 4 wherein step (a) takes place before step (b).
6. A method according to claim 4 wherein the (co-)compression of the combination of the smooth and the solid region (s) takes place at a force of from 0.05 to 20 kN/cm².
7. Cleaning tablet comprising a smooth phase, wherein said smooth phase is obtained by compression of a particulate mixture comprising at least 40 wt% of detergent particles, wherein said detergent particles comprise at least 50 wt% of non-soap surfactant.



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