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(54) **Detergent composition**

(57) A cleaning tablet comprising

(a) surfactants comprising one or more anionic surfactants and one or more cationic surfactants, wherein the weight ratio of anionic surfactants to cationic surfactants is 50:1 to 2:1; and

(b) builders comprising a water-insoluble builder and a water-soluble builder, wherein the weight ra-

tio of water-insoluble builder to water-soluble builder is from 5 : 1 to 1 : 5.

(c) whereby the cleaning tablet is substantially free of clay.

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Description

[0001] This invention relates to detergent compositions in the form of tablets for cleaning, and in particular tablets for fabric washing. It is known to make such tablets for example by compressing or compacting a quantity of detergent composition in particulate form.

[0002] Such tablets have been marketed commercially. For use one or two tablets may for example be placed in a net bag, closed with a drawstring. The bag containing these tablets is placed in the washing machine, with fabrics to be washed.

[0003] It is desirable that tablets should have adequate mechanical strength when dry, before use, yet disintegrate and disperse/dissolve quickly when added to wash water. Also it is desirable that tablets should provide good cleaning properties. It has not proved simple to achieve these properties simultaneously. For example as more pressure is used when a tablet is compacted, so the tablet density and strength rise, but the speed of disintegration/dissolution when the tablet comes into contact with wash water goes down. Also ingredients which aid the cleaning performance of tablets can often adversely affect the cost of production and/or the strength and/or the disintegration properties of the tablet.

[0004] It is an object of the invention to provide a cleaning tablet which provides good cleaning properties while still having adequate mechanical strength and good disintegration properties.

[0005] Accordingly in a first aspect the invention relates to a cleaning tablet comprising

(a) surfactants comprising one or more anionic surfactants and one or more cationic surfactants, wherein the weight ratio of anionic surfactants to cationic surfactants is 50:1 to 2:1;

(b) builders comprising a water-insoluble builder and a water-soluble builder, wherein the weight ratio of water-insoluble builder to water-soluble builder is from 5 : 1 to 1 : 5.

(c) whereby the cleaning tablet is substantially free of clay.

[0006] Features of this invention, suitable materials and further preferences will now be described in more detail.

Tablets

[0007] Tablets of the invention preferably comprise a compressed particulate composition having the selected composition as described above.

[0008] In one embodiment of the invention the compressed particulate composition may form all or most of the cleaning tablet, say 95wt% or more.

[0009] Alternatively the compressed particulate composition may form one or more discrete regions of the tablet. Preferably each of said regions has a weight of at least 5 grammes. Furthermore preferably at least 30 wt%, more preferred at least 50 wt%, most preferred more than 75 wt% of the tablet is formed by the compressed particulate composition of the invention.

[0010] Optionally the tablet may comprise in addition to the compressed particulate composition other parts e.g. coatings, non-particulate and/or non-compressed parts e.g. melts, gelatinous materials etc.

Detergent-active compounds

[0011] In laundry detergent tablets, surfactant compounds are suitably present in an amount of from 2% or 5% up to 50 wt%, more preferably from 5% or 8% up to 40 wt% of the whole tablet. For the purpose of the invention the surfactant materials will most be anionic and cationic optionally though preferably supplemented with nonionic surfactants.

[0012] The weight ratio of anionic surfactants to cationic surfactants in the tablet is from 50 : 1 to 2 : 1, more preferred from 25 : 1 to 3 : 1, most preferred from 20 : 1 to 5 : 1.

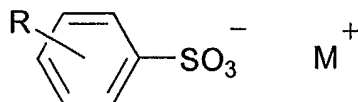
[0013] Preferably the total level of anionic surfactants in the tablet is from 2 to 30 wt%, more preferred 3 to 20 wt%, most preferred from 5 to 15 wt%.

[0014] Preferably the total level of cationic surfactants in the tablet is from 0.2 to 3 wt%, more preferred 0.3 to 2 wt%, most preferred from 0.5 to 1.5 wt%.

[0015] Advantageously the tablet may also comprise nonionic surfactants. Preferably the weight ratio of nonionic surfactants to anionic surfactants is from 5 : 1 to 1 : 5. Preferably the total level of nonionic surfactants in the tablet is from 1 to 15 wt%, more preferred 1.5 to 10 wt%, most preferred from 2 to 7.5 wt%.

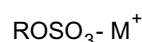
Anionic Surfactant Compounds

[0016] Synthetic (i.e. non-soap) anionic surfactants are well known to those skilled in the art. The anionic surfactant may comprise, wholly or predominantly, 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.

[0017] Primary alkyl sulphate having the formula



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 also commercially significant as an anionic surfactant and may be used in this invention.

[0018] Frequently, such linear alkyl benzene sulphonate or primary alkyl sulphate of the formula above, or a mixture thereof will be the desired non-soap anionic surfactant and may provide 75 to 100 wt% of any anionic non-soap surfactant in the composition.

[0019] Examples of other non-soap anionic surfactants include olefin sulphonates; alkane sulphonates; dialkyl sulphosuccinates; and fatty acid ester sulphonates.

[0020] One or more soaps of fatty acids may also be included in addition to non-soap anionic surfactant. Examples are sodium soaps derived from the fatty acids from coconut oil, beef tallow, sunflower or hardened rapeseed oil.

Nonionic surfactant compounds

[0021] Nonionic surfactant compounds 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.

[0022] Specific nonionic surfactant compounds are alkyl (C_{8-22}) phenol-ethylene oxide condensates, the condensation products of linear or branched aliphatic C_{8-20} 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.

[0023] Especially preferred are the primary and secondary alcohol ethoxylates, especially the C_{9-11} and C_{12-15} primary and secondary alcohols ethoxylated with an average of from 3 to 20 moles of ethylene oxide per mole of alcohol.

Cationic surfactant compounds

[0024] Preferred cationic surfactants are quaternary ammonium salts of the general formula $\text{R}_1\text{R}_2\text{R}_3\text{R}_4\text{N}^+\text{X}^-$, wherein all of the R-substituents are hydrocarbons with or without hydroxy substitution, at least one of the substituents $\text{R}_1\text{-R}_4$ is a $\text{C}_6\text{-C}_{22}$ alkyl, alkaryl or hydroxyalkyl, at least one of the substituents $\text{R}_1\text{-R}_4$ is a $\text{C}_1\text{-C}_4$ alkyl or hydroxy alkyl and X is a monovalent anion equivalent.

[0025] The cationic surfactants are preferably the quaternary nitrogen compounds wherein R_1 and R_2 are the same or different $\text{C}_1\text{-C}_4$ alkyl or hydroxy alkyl, R_3 is a $\text{C}_6\text{-C}_{22}$ alkyl, alkaryl or hydroxyalkyl, R_4 is a $\text{C}_1\text{-C}_{22}$ alkyl, alkaryl or hydroxyalkyl and X is a monovalent anion equivalent. Preferably X is a halogen, most preferably chloride or bromide.

[0026] Preferably R_1 and R_2 are methyl. In embodiments of the invention R_3 is preferably $\text{C}_8\text{-C}_{18}$ alkyl, more preferably $\text{C}_{10}\text{-C}_{16}$ alkyl. In embodiments of the invention R_4 is preferably methyl, $\text{C}_8\text{-C}_{18}$ alkyl or benzyl. Thus, the cationic surfactants used can have three 'short chain' radicals such as methyl and one fatty-soluble 'long chain' radical or two 'short' chains and two fatty-soluble 'long chains', wherein the 'long chains' can be either linear or branched hydrocarbons or contain aromatic rings.

[0027] Particularly suitable cationic detergent-active compounds include Praepagen HY ex Clariant.

Builders

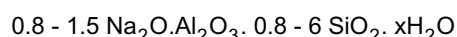
[0028] The detergent tablets of the invention contain a mixture of a water-insoluble and a water soluble detergency builders.

[0029] The weight ratio of water-insoluble builder material to water-soluble builder material in the tablet is from 5 : 1 to 1 : 5, more preferred from 2 : 1 to 1 : 4, most preferred from 1 : 1 to 1 : 3.

[0030] Preferably the level of water-insoluble builder in the tablet is from 5 to 40 wt%, more preferred from 10 to 30 wt%, most preferred from 12 to 24 wt%. Preferably the level of water-soluble builder in the tablet is from 10 to 70 wt%, more preferred 20 to 50 wt%, most preferred from 30 to 40 wt%.

Water-insoluble builders

[0031] 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:



[0032] 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.

[0033] 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 zeolite P described and claimed in EP 384070 (Unilever) which is also referred to as zeolite MAP and mixtures thereof. Zeolite MAP is available from Ineos Chemicals under their designation Zeolite A24.

[0034] Conceivably, water-insoluble detergency builder could be a crystalline layered sodium silicate as described in US 4664839.

[0035] Crystalline layered silicate may be used in the form of granules which also contain citric acid.

[0036] Preferably the water-insoluble builder is zeolite.

Water-soluble builders

[0037] Suitable organic builders include the carboxylate or polycarboxylate builders containing from one to four carboxy groups, particularly selected from monomeric polycarboxylates or their acid forms, homo or copolymeric polycarboxylic acids or their salts in which the polycarboxylate comprises at least two carboxylic radicals selected from each other by not more than two carbon atoms. Preferred carboxylates include the polycarboxylate materials described in US-A-2,264,103, including the water-soluble alkali metal salts of mellitic acid and citric acid (citrate), gluconic acid, dipicolinic acid, oxydisuccinic acid and alkenyl succinates, glycerol mono- di- and trisuccinates, carboxymethyloxysuccinates, carboxymethyloxymalonates, dipicolinates and hydroxyethyliminodiacetates.

[0038] The water-soluble salts of polycarboxylate polymers and copolymers, such as are described in US-A-3,308,067 are also be suitable for use with the invention. Of the builder materials listed in the above paragraph, the preferred polycarboxylates are hydroxycarboxylates containing up to three carboxy groups per molecule, especially citric acid or its salt, particularly sodium citrate.

[0039] Further soluble detergency builder salts which can be used with the present invention are poly-valent inorganic and poly-valent organic builders, or mixtures thereof. Non-limiting examples of suitable water-soluble, inorganic alkaline detergency builder salts include the alkali metal (generally sodium) carbonates (see above), bicarbonates, borates, phosphates, and polyphosphates, phosphono carboxylates. Specific examples of such salts include the sodium and potassium tetraborates, carbonates, bicarbonates, orthophosphates and hexametaphosphates.

Other suitable detergency builders include organic alkaline compounds such as water-soluble amino polyacetates, e. g. nitrilotriacetates and N-(2-hydroxyethyl)nitrilodiacetates; and water-soluble salts of phytic acid, e.g. sodium and potassium phytates.

[0040] Preferably, the water-soluble builder is a phosphate containing builder especially a sodium tripolyphosphate especially a sodium tripolyphosphate which is predominantly (e.g. more than 50 %) in Phase I.

Substantially free of clay

[0041] Cleaning tablets of the invention are substantially free from clay. In particular the level of clay is less than 2.5 wt%, more preferred less than 1 wt%, most preferred less than 0.5 wt%. Clay levels of 0 wt% are especially preferred. Surprisingly it has been found that the substantial absence of clay in tablets comprising anionic and cationic surfactants in combination with water-insoluble and water soluble builders leads to an improved storage stability for the tablet.

Optional further ingredients

[0042] Bleach material may preferably be incorporated in composition for use according to the present invention. These materials may be incorporated in solid form or in the form of encapsulates and less preferably in dissolved form.

[0043] The bleach material may be a chlorine- or bromine-releasing agent or a peroxygen compound. Peroxygen based bleach materials are however preferred for use in detergent tablets of the invention, especially preferred are perborate and percarbonate bleaches.

Bleach activator

[0044] Detergent tablets of the present invention which contain an inorganic peroxygen bleaching material such as sodium percarbonate or sodium perborate preferably also may contain a bleach activator. Bleach activators have been widely disclosed in the art. Preferred examples include peracetic acid precursors, for example tetraacetyethylene diamine (TAED), SNOBS and perbenzoic acid precursors

Heavy Metal Chelating Agent

[0045] A detergent tablet of the invention may also include a heavy metal chelating agent, which may act as a bleach stabiliser. Such components will also chelate non-heavy metals to a limited extent, and similarly builders such as tripolyphosphate will chelate heavy metals to a limited extent.

[0046] Preferred chelating agents include organic phosphonates, amino carboxylates, polyfunctionally-substituted compounds, and mixtures thereof.

Disintegrant Systems

[0047] The tablet may contain a disintegrant system. This is particularly preferred in discrete regions which contain more than 5% detergent active compounds, which is generally the case for laundry detergent tablets. The further disintegrant system helps such regions to disperse quickly, which counters the binding effect of the detergent active compound.

[0048] Suitable disintegrants may be grouped into the following classes: swelling (physical) disintegrants; effervescent disintegrants; and materials of high solubility.

Enzymes

[0049] The detergent tablets of the invention may also contain 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 and dishes. Examples of suitable proteases are Maxatase (Trade Mark) and Alcalase (Trade Mark), and Savinase (Trade Mark). Detergency enzymes are commonly employed in the form of granules or marumes, optionally with a protective coating, in amount of from about 0.05% 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.

Other Laundry Detergent Ingredients

[0050] The laundry detergent tablets of the invention may also contain 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.

[0051] An antifoam material is advantageously included, especially if the 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, sorbed 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.

[0052] Further ingredients which can optionally be employed in the laundry detergent tablet of the invention 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; soil release polymers; bleach catalysts; dye fixative polymers; perfumes; and colorants or coloured speckles.

Particle Size and Distribution

[0053] The detergent tablet of this invention preferably comprises compacted particles. Preferably the particulate composition has an average particle size in the range from 10 μ m to 2000 μ m, more preferably from 250 μ m to 1400 μ m. Fine particles, smaller than 180 μ m or 200 μ m may be eliminated by sieving before tableting, if desired.

[0054] 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. 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.

[0055] Thus the starting particulate composition may suitably have a bulk density of at least 400g/litre, preferably at least 500g/litre, and advantageously at least 700g/litre.

Tablet Size and Density

[0056] 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 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.

[0057] Embodiments of the present invention will now be described by way of example only.

Example 1

[0058] Composition of base powder A:

Ingredient	% activity	Parts by weight
Na-LAS	100	8.31
C13-15 7EO nonionic	100	3.64
Stearate soap	100	0.65
Zeolite A24	90	18.57
Sodium acetate 3aq	99	2.38
Sodium carbonate	99	2.76
SCMC	68	0.37
Non detergent organic matter		Up to 40
Total		40

[0059] Composition of base Powder B

Ingredient	% activity	Parts by weight
Na-LAS	100	9.26
C13-15 7EO nonionic	100	2.65
C13-15 3EO nonionic	100	1.42
Stearate soap	100	0.72
Zeolite A24	90	20.71

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(continued)

Ingredient	% activity	Parts by weight
Sodium acetate 3aq	99	2.65
Sodium carbonate	99	3.07
SCMC	68	0.41
Non detergent organic matter		Up to 44.6
Total		44.6

[0060] Base powders were produced by dry mixing in a high shear mixer and subsequently mixing with the other ingredients to prepare a particulate composition as follows:

Ingredient	% activity	EX 1 (Comp) Weight parts	Ex 2 (Comp) Weight parts	Ex 3 (Comp) Weight parts	Ex 4 Weight parts
Base powder A		40			40
Base powder B			44.6	44.6	
Antifoam	17	2.1	1.79	1.79	2.1
Fluorescer	15	1.45	1.24	1.24	1.45
PVP polymer	95	0.15	0.10	0.10	0.15
Soil release polymer	63	0.17	0.32	0.32	0.17
STPP	96.5	34.32			34.32
Na-disilicate	80	2.5	2.5	2.5	2.5
Cocodimethylethyl- hydroxyammonium- chloride on zeolite carrier	33			2.5	2.5
Sodium acetate 3aq	99		24.21	24.21	
Sodium citrate 2aq	100		2.5	2.5	
TAED	83	2.8	5.06	5.06	2.8
Percarbonate coated	89	14	15	15	14
Dequest 2047	34	1.25	0.74	0.74	1.25
EHDP	60		0.60	0.6	
Savinase 12.0 T	3250 GU/mg	0.39	0.776	0.776	0.39
Lipolase 100T	187 LU/mg		0.10	0.10	
Cellulase Carezyme		0.39			0.39
Perfume		0.45	0.45	0.45	0.45
Total					

[0061] Tablets were produced by compressing 40 grammes of each composition in a tablet press using 4 kN/cm² compression force.

[0062] Resulting tablets had good mechanical strengths and dispersing properties

Example 2

[0063] The performance of tablets of Examples 2 and 3 were compared in a tergometer at 60°C.

[0064] The washing performance on various stains was determined by measuring Delta R460.

[0065] No significant effects were observed between the two comparative tablet formulations.

Example 3

[0066] The tablets of Examples 1 (comparison) and 4 (invention) were compared in a normal washing cycle in a Zanussi washing machine at 60 C using water of 16 degree FH.

[0067] Tablets in accordance to example 4 showed statistically significant better cleaning (as measured by Delta R460) on fatty stains especially lipstick, shoepolish, make-up, mascara.

Claims

1. A cleaning tablet comprising

(a) surfactants comprising one or more anionic surfactants and one or more cationic surfactants, wherein the weight ratio of anionic surfactants to cationic surfactants is 50:1 to 2:1; and

(b) builders comprising a water-insoluble builder and a water-soluble builder, wherein the weight ratio of water-insoluble builder to water-soluble builder is from 5 : 1 to 1 : 5.

(c) whereby the cleaning tablet is substantially free of clay.

2. A cleaning tablet according to claim 1, wherein the water-soluble builder comprises a phosphate builder material.

3. A cleaning tablet according to claim 2, wherein the water-soluble builder comprises sodium tripolyphosphate.

4. A cleaning tablet according to claim 1 also comprising nonionic surfactants.

5. A cleaning tablet according to claim 4, wherein the weight ratio between anionic and nonionic surfactant is between 5 : 1 and 1 : 5.

6. A cleaning tablet according to claim 1, wherein the water-insoluble builder is a zeolite.

7. A cleaning tablet according to claim 1, comprising less than 2.5 wt%, more preferred less than 1 wt%, most preferred less than 0.5 to 0.0 wt% of clay.

8. A cleaning tablet according to claim 1, comprising 2 to 30 wt% of anionic surfactant, 0.2 to 3 wt% of cationic surfactant, 5-40 wt% of water-insoluble builder and 10-70 wt% of water-soluble builder.

9. A cleaning tablet according to claim 8 further comprising from 1 to 15 wt% of nonionic surfactant.

10. A cleaning tablet according to claim 8 comprising 2 to 30 wt% of anionic surfactant, 0.2 to 3 wt% of cationic surfactant, 1 to 15 wt% of nonionic surfactant, 5 to 40 wt% of a zeolite as water-insoluble builder and 10 to 70 wt% of sodium tripolyphosphate as water-soluble builder.



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EUROPEAN SEARCH REPORT

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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 17 February 2004	Examiner Serbetsoglou, A
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EUROPEAN SEARCH REPORT

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CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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