

(19)



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European Patent Office
Office européen des brevets



(11)

EP 1 197 546 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

17.04.2002 Bulletin 2002/16

(51) Int Cl.7: **C11D 17/00, C11D 17/04**

(21) Application number: **01303386.5**

(22) Date of filing: **11.04.2001**

(84) Designated Contracting States:

**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**

Designated Extension States:

AL LT LV MK RO SI

(30) Priority: **12.05.2000 EP 02017101**

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(54) **Unit dose cleaning product**

(57) The invention concerns unit dose machine dish cleaning products, which are completely soluble in water, contain a detergent, are rigid and have a smooth surface. The products are preferably at least partly

translucent or transparent. Preferable the product has a rigid outer shell and a liquid core.

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DescriptionField of the invention

5 **[0001]** The invention relates to firm, water soluble unit-dose cleaning products for machine dishwashers.

Background of the invention

10 **[0002]** Cleaning products are traditionally often liquids, viscous or thin, such as known for personal cleaning (bath and shower liquids and shampoos) or for domestic cleaning (hand dish wash and other hard surface cleaning, laundry-cleaning etc.) Other products are solids, such as powders, granules, small capsules (up to 2mm diameter) or more recently tablets, for laundry and machine dish wash, and soap bars for skin cleaning. Recently, so called unit dose products are experiencing an increasing success with consumers, because they eliminate the need for manipulating, and possibly spilling, liquids or powders and simplify the use of a correct dose of the cleaning product for the required
15 purpose. Examples thereof are the laundry and machine dish wash tablets mentioned above and recently described in F.Schambil and M. Böcker, Tenside Surf. Det. 37 (2000) 1.

[0003] Such tablets have the disadvantage that they may crumble or break during transport or handling, which will still cause spillage of the cleaning product. Also, unpacking and dosing of the tablets will require the consumer to have direct skin contact with the product, which he may feel uncomfortable with because of fear that the product is aggressive
20 to the skin. Furthermore, tablets, which consist of compressed powders and are clearly recognisable as such, are rather unsightly, unpleasant to the touch and do not give the impression of a technologically advanced product. Some of these disadvantages may be overcome by providing a water-soluble coating, such as described in EP-A-0 716 144. However, such products remain recognisable as consisting primarily of a compressed powder. The look and feel of such tablets, whether or not coated, provide no assurance to the consumer that the product will completely dissolve
25 in use and be disappeared after use and will not leave any unsightly remains in the form of powder patches on cleaned dishes.

[0004] Many of the disadvantages mentioned above would be absent with a unit dose liquid product and indeed such products are known as sachets and the like. However, these have the disadvantage that a packaging of liquid has to be opened, sometimes leading to spilling or other messy situations, and that the packaging with remains of the liquid
30 has to be disposed of.

[0005] This problem has been met with round capsules made of gelatin or other soft wall material and filled with a liquid cleaning composition. They are best known for bath use, such as e.g. described in US 3,705,102, US 4,597,885, EP-A-0 261 754, WO 96/24328 and EP-A-0 573 978. Similar capsules have also been proposed for laundry cleaning products in EP-A-0 339 707 and for dish wash products in WO94/14941 and EP-A-0 879 874. These capsules have
35 the advantage that they can simply be added to a bath, bucket or bowl with hot water in which they dissolve to produce a cleaning solution. However, they are not very appealing to the consumer in that they are generally rather soft and squeezy and thereby convey to the consumer the message that they are not very strong and may be susceptible to leakage if not handled carefully. Also they have a rather dull appearance and it is impossible for the consumer to have a clue of what is inside. Furthermore, their origin as a bath product does not convey the message of a strong and
40 modern cleaning product for use for e.g. laundry or hard surface cleaning.

[0006] Therefore, there is a need for a unit-dose-cleaning product, which is agreeable to the touch, looks appealing to the consumer and provides him/her with a clue of its contents.

Brief description of the invention

45 **[0007]** It is an object of the present invention to provide a rigid unit-dose-cleaning product, which dissolves easily, and completely in the dishwasher and which has an attractive shape.

[0008] It is a further object of the invention to provide a unit-dose-cleaning product with a smooth surface.

50 **[0009]** It is another object of the invention to provide a unit-dose cleaning product in which at the outer layer, preferably the whole package is at least partly transparent or translucent so as to enable the consumer to obtain a visual clue of the contents of the product.

Detailed description of the invention

55 **[0010]** All percentages mentioned herein are by weight, calculated on the total product, unless specifically indicated otherwise.

[0011] For the purposes of this invention a unit-dose cleaning product is defined as a product of which a limited number of units provide the right amount of cleaning composition to perform the cleaning operation for which the product

is intended. This limited number will normally be between 1 and 10, preferably not more than 5 and typically between 1 and 3.

[0012] The unit-dose-cleaning product is water-soluble to the extent that the dose (i.e. number of units) intended for a given amount of water should be able to give a clear solution and no solid particles visible to the naked eye should remain. A suitable dose unit should quickly dissolve 2000 times its weight of water, which amounts to a dilution of 2000 fold. Thus, all components in 10g of unit dose product should be completely soluble in 20l of water. More suitably the product, and therefore all the components in it, would also allow a dilution of only 1000 times, more preferably only 500 times, even more preferably 200 times. Such solutions may be made in hot water, i.e. 100°C or below, but preferably the product is also completely soluble in less hot water, i.e. at 50°C or below, more preferably at 30°C. Quick dissolution is defined as complete dissolution within 5 minutes with slight stirring, preferably within 2 minutes, more preferably within 1 minute

[0013] Suitable unit-dose products meeting these requirements as well as being easy to handle generally have a minimum dimension in any one direction of at least 5mm, whereas the maximum dimension in any one direction should generally not exceed 100mm, preferably be below 60mm. The volume of the unit dose if for a main wash product is generally between 5ml and 35ml, preferably between 10 ml and 25 ml. If the product is a rinse aid the volume is preferably below 10ml, more preferably from 1ml to 5ml.

[0014] The property of being smooth and agreeable to the touch means that the surface of the product according to the invention does not present the porous or powdery surface structure, which is well known of tablets, made of a compressed powder or granular material.

[0015] The unit dose products according to the invention are not soft and squeezy, as is known from capsules having a wall made of gelatin or similar material, and are therefore called "rigid". This does not necessarily mean that it is hard and completely inflexible, because this may lead to brittleness and cause the products to be susceptible to breaking. However, it does mean that the unit dose product cannot be squeezed by normal hand pressure such that its dimensions in any one direction alter by more than 10% of the original value, preferably not more than 5%, more preferably not more than 2% or even 1%. Of course, exerting extreme pressure may cause the product to break. Also the products according to the invention cannot be compressed by more than 10% without breaking, preferably not more than 5%, more preferably not more than 2% or even 1%.

[0016] The unit dose products according to the invention may be substantially homogeneous, in which case the bulk of a unit consists of a solid and homogeneous mixture comprising a solid structuring material, one or more detergent surfactants and optionally other benefit agents suitable for the intended use of the product. The structuring material is easily soluble as outlined above, but not hygroscopic. The product may contain a minor fraction of discrete solid particles of one of the components as long as these do not interfere with complete dissolution and therefore do not remain as such in the solution.

[0017] Suitable structuring materials comprise synthetic or natural polymers such as starch derivatives (e.g. chemically modified starches), polyvinyl alcohol, polyvinylpyrrolidone, polyethylene glycol or polyethylene/polypropylene glycol, or mono-, di- or oligosaccharides such as sorbitol, maltitol, isomalt, glucose, or mixtures thereof. Preferred structuring materials are those which can be converted into a viscous liquid or "molten glass"-like state on heating.

[0018] Alternatively, and preferably, the product may have a rigid outer shell comprising structuring material, such as mentioned above, which surrounds a solid or liquid core comprising a cleaning composition. If the core is solid, it may have a composition which is substantially similar to the composition of the homogeneous product above, be it that in general less structuring material and more detergent surfactant and other benefit agents will be present. The shell may contain a disintegrant as outlined above.

[0019] In a further embodiment the core is a liquid. This liquid may be anything from thin to very viscous or gel-like. Alternatively it may be absorbed in a sponge-like solid structure. As outlined above for the total product, the core will dissolve quickly and easily into the amount of water for which it is intended without leaving any particles visible to the naked eye.

[0020] The product may contain a disintegrant known in the art to aid disintegration and quick dissolution of the product in a bucket or bowl of water. Suitable examples thereof are Acusol 771 (TM of Rohm & Haas), Disintex 75 (TM of ISP) or combinations of a suitable acid (e.g. citric, fumaric, maleic or tartaric) and sodium bicarbonate. The product may also contain a salt, which is able to take up any residual water as water of crystallisation (e.g. anhydrous sodium sulphate or sodium carbonate).

[0021] The core contents should not adversely interact with the shell material because this could lead to a diminishing of the shell strength during storage. Thus, the core is substantially non-aqueous, which means that the water content of the core will be such that it does not dissolve, weaken or otherwise adversely interact with the water-soluble shell. Normally the total core contents will contain at most 15% by weight of water, preferably at most 10%, more preferably at most 5% or even 2%.

[0022] Additionally, the core material compositions may comprise other benefit agents suitable for the intended end use of.

[0023] Although the unit dose products may be prepared in any shape or form, to be attractive to the consumer a symmetrical shape is highly preferred and round shapes such as ovals (egg-like), lens-like shapes, balls or bullets are very suitable. Other suitable forms may have the form of oval or round cylinders.

[0024] Even more preferred are products, which have a crystal-like shape, which for the purposes of this invention is defined as a shape completely, defined by flat surfaces, also, known as a polyhedron. The most simple shape meeting this requirement is a three-sided pyramid. Other suitable forms are: 4-8 sided pyramids, bi-pyramids, rhombohedra, blocks, cubes and similar shapes.

[0025] The visual appearance of the unit-dose products may be further improved and the appeal to the consumer increased by giving the core and the shell a different colour. Thus, the shell may be colourless or lightly coloured, whereas the core may have a bright contrasting colour.

[0026] The liquid core may further contain one or more solid particles or capsules of a size clearly visible to the naked eye. Generally these particles will make up less than 50% of the total core material. The visibility of these particles or capsules may be further enhanced by giving them a colour, which is different from that of the shell and/or the liquid core. These particles and capsules may have the same composition as the remainder of the unit-dose product or they may have a composition, which is different from that of the liquid core. Thus, such particles or capsules are a suitable vehicle for adding components which are preferably kept separate from the components of the liquid core e.g. because of physical or chemical incompatibility between the components in the particles or capsules and those in the remainder of the liquid core.

[0027] The unit dose product may be produced by suitable methods known in the art. Particularly the art of candy making provides suitable examples of processes adaptable to the production of the unit dose products. For the homogeneous products suitable processes include mixing/melting all components together and simply casting the melt in dies, or processing the mixture by injection moulding using an extruder. For the products with a liquid core a suitable process involves processing of the shell material through an extruder fitted with a co-extrusion head through which the liquid core material and the shell material are injected simultaneously in a die.

[0028] It is preferable if the cleaning compositions comprise a nonionic or anionic surfactant. The surfactant system is preferably nonionic and comprises ethoxylated and/or propoxylated nonionic surfactants, more preferably selected from nonionic ethoxylated/propoxylated fatty alcohol surfactants having a cloud point in water of 14 or less, preferably of 12 or less, most preferably 10 or less.

[0029] Examples of suitable nonionic surfactants having the required cloud points for use in the invention are found in the low- to non-foaming ethoxylated straight-chain alcohols of the Plurafac® LF series, supplied by the BASF Company; Synperonic RA series supplied by ICI Triton® DF series, supplied by the Rohm & Haas Company.

[0030] The ethoxylated and/or propoxylated nonionic surfactants in a main wash product are present at levels from 0.5 to 10-wt%, preferably 2-8wt%, of the total composition. In a rinse aid the level of nonionic surfactant is preferably 10 to 60-wt%, more preferably 20 to 50-wt%.

[0031] An antifoam to suppress foaming is preferably present

[0032] If an anionic surfactant is used it is advantageously present at levels of 2 wt% or below.

[0033] An antiscaling agent is present in the composition as a preferred feature. It is preferable if the level antiscaling agent is present from 0.2 to 10-wt% of the total composition, preferably from 0.5 to 5-wt%.

[0034] Suitable antiscaling agents include organic phosphonates, amino carboxylates, polyfunctionally-substituted compounds, and mixtures thereof.

[0035] Particularly preferred antiscaling agents are organic phosphonates such as α -hydroxy-2 phenyl ethyl diphosphonate, ethylene diphosphonate, hydroxy 1,1-hexylidene, vinylidene 1,1 diphosphonate, 1,2 dihydroxyethane 1,1-diphosphonate and hydroxy-ethylene 1,1 diphosphonate. Most preferred is hydroxy-ethylene 1,1 diphosphonate (EDHP) and 2 phosphonobutane, 1,2,4 tricarboxylic acid (Bayhibit).

[0036] As an alternative polymers and co-polymers of acrylic acid having a molecular weight between 500 and 20,000 can also be used, such as homo-polymeric polycarboxylic acid compounds with acrylic acid as the monomeric unit. The average weight of such homo-polymers in the acid form preferably ranges from 1,000 to 100,000 particularly from 3,000 to 10,000.

[0037] Also suitable are polymeric polycarboxylates are co-polymers derived from monomers of acrylic acid and maleic acid. The average molecular weight of these polymers in the acid form preferably ranges from 4,000 to 70,000.

[0038] Mixture of antiscaling agents may be used, particularly useful are a mixture of organic phosphonates and a polymers having as monomer units acrylic acid, methyl methacrylic acid, 4-sulfophenyl methylallyl ether and sodium methallyl sulfonate,

[0039] Preferred ratios of antiscaling agent to nonionic surfactant are 1:3 to 3:1, more preferably 1:1 to 1:2

[0040] The compositions of the invention may contain a builder.

The builder may be a phosphate or non-phosphate builder.

[0041] Compositions of the invention preferably comprise a water-soluble phosphate builder.

[0042] Phosphate builders are particularly preferred. Specific examples of water-soluble phosphate builders are the

alkali metal tripolyphosphates, sodium, potassium and ammonium pyrophosphate, sodium and potassium orthophosphate, sodium polymeta/phosphate in which the degree of polymerisation ranges from about 6 to 21, and salts of phytic acid. Sodium or potassium tripolyphosphate is most preferred.

[0043] The level of builder is preferably from 5 to 60% by weight, preferably from 10% to 40% by weight.

[0044] The compositions of the present invention may comprise a water-soluble nonphosphate builder. Suitable examples of non-phosphorus-containing inorganic builders include water-soluble alkali metal carbonates, bicarbonates, sesquicarbonates, borates, silicates, including layered silicates such as SKS-6 ex. Clarent, metasilicates, and crystalline and amorphous aluminosilicates. Specific examples include sodium carbonate (with or without calcite seeds), potassium carbonate, sodium and potassium bicarbonates, silicates including layered silicates and zeolites.

[0045] Organic detergent builders can also be used as nonphosphate builders in the present invention. Examples of organic builders include alkali metal citrates, succinates, malonates, fatty acid sulfonates, fatty acid carboxylates, nitrilotriacetates, oxydisuccinates, alkyl and alkenyl disuccinates, oxydiacetates, carboxymethyloxy succinates, ethylenediamine tetraacetates, tartrate monosuccinates, tartrate disuccinates, tartrate monoacetates, tartrate diacetates, oxidised starches, oxidised heteropolymeric polysaccharides, polyhydroxysulfonates, polycarboxylates such as polyacrylates, polymaleates, polyacetates, polyhydroxyacrylates, polyacrylate/polymaleate and polyacrylate/polymethacrylate copolymers, acrylate/maleate/vinyl alcohol terpolymers, aminopolycarboxylates and polyacetal carboxylates, and polyaspartates and mixtures thereof. Such carboxylates are described in U.S. Patent Nos. 4,144,226, 4,146,495 and 4,686,062., nitrilotriacetates, oxydisuccinates, acrylate/maleate copolymers and acrylate/maleate/vinyl alcohol terpolymers are especially preferred nonphosphate builders. Alkali metal citrates are especially preferred for use in this invention.

[0046] Silica material may be included in the composition.

Suitable forms of silica include amorphous silica, such as precipitated silica, pyrogenic silica and silica gels, such as hydrogels, xerogels and aerogels, or the pure crystal forms quartz, tridymite or cristobalite, but the amorphous forms of silica are preferred. Suitable silicas may readily be obtained commercially. They are sold, for example under the Registered Trade Name Gasil 200 (ex Crosfield, UK).

[0047] Preferably, the silica is in the product in such a form that it can dissolve when added to the wash liquor. Therefore, addition of silica by way of addition anti-foam particles of silica and silicone oil is not preferred.

[0048] Preferably, the silica material is present in the cleaning composition at a level of at least 0.1%, more preferably at least 0.5%, most preferably at least 1% by weight of the cleaning composition and preferably at most 10%, more preferably at most 8%, most preferably at most 5% by weight of the cleaning composition.

[0049] The composition optionally comprises alkali metal silicates.

[0050] When silicates are present, the SiO_2 level should be from 1% to 35%, preferably from 2% to 20%, more preferably from 3% to 10%, based on the weight of the ADD. The ratio of SiO_2 to the alkali metal oxide (M_2O , where M=alkali metal) is typically from 1 to 3.5, preferably from 1.6 to 3, more preferably from 2 to 2.8. Preferably, the alkali metal silicate is hydrous, having from 15% to 25% water, more preferably, from 17% to 20%.

[0051] The highly alkali metasilicates can in general be employed, although the less alkaline hydrous alkali metal silicates having a $\text{SiO}_2:\text{M}_2\text{O}$ ratio of from 2.0 to 2.4 are, as noted, greatly preferred. Anhydrous forms of the alkali metal silicates with a $\text{SiO}_2:\text{M}_2\text{O}$ ratio of 2.0 or more are also less preferred because they tend to be significantly less soluble than the hydrous alkali metal silicates having the same ratio.

[0052] Sodium and potassium, and especially sodium, silicates are preferred. A particularly preferred alkali metal silicate is a granular hydrous sodium silicate having a $\text{SiO}_2:\text{Na}_2\text{O}$ ratio of from 2.0 to 2.4 available from PQ Corporation, named Britesil H20 and Britesil H24. Most preferred is a granular hydrous sodium silicate having a $\text{SiO}_2:\text{Na}_2\text{O}$ ratio of 2.0. While typical forms, i.e. powder and granular, of hydrous silicate particles are suitable, preferred silicate particles having a mean particle size between 300 and 900 microns and less than 40% smaller than 150 microns and less than 5% larger than 1700 microns. Particularly preferred is a silicate particle with a mean particle size between 400 and 700 microns with less than 20% smaller than 150 microns and less than 1% larger than 1700 microns. Compositions of the present invention having a pH of 9 or less preferably will be substantially free of alkali metal silicate.

[0053] Enzymes may be present in the compositions of the invention. Examples of enzymes suitable for use in the cleaning compositions of this invention include lipases, peptidases, amylases (amylolytic enzymes) and others which degrade, alter or facilitate the degradation or alteration of biochemical soils and stains encountered in cleansing situations so as to remove more easily the soil or stain from the object being washed to make the soil or stain more removable in a subsequent cleansing step. Both degradation and alteration can improve soil removal.

[0054] Bleach material is optionally incorporated in the composition.

[0055] The bleach material may be a chlorine- or bromine-releasing agent or a peroxygen compound. Peroxygen based bleach materials are however preferred.

[0056] Organic peroxy acids or the precursors therefor are typically utilized as the bleach material. The peroxyacids usable in the present invention are solid and, preferably, substantially water-insoluble compounds. By "substantially water-insoluble" is meant herein a water-solubility of less than about 1% by weight at ambient temperature. In general,

peroxyacids containing at least about 7 carbon atoms are sufficiently insoluble in water for use herein.

[0057] Inorganic peroxygen-generating compounds are also typically used as the bleaching material of the present invention. Examples of these materials are salts of monopersulphate, perborate monohydrate, perborate tetrahydrate, and percarbonate.

[0058] Monoperoxy acids useful herein include alkyl peroxy acids and aryl peroxyacids such as peroxybenzoic acid and ring-substituted peroxybenzoic acids (e.g. peroxy- α -naphthoic acid); aliphatic and substituted aliphatic monoperoxy acids (e.g. peroxy lauric acid and peroxy stearic acid); and phthaloyl amido peroxy caproic acid (PAP).

[0059] Typical diperoxy acids useful herein include alkyl diperoxy acids and aryldiperoxy acids, such as 1,12-diperoxydodecanedioic acid (DPDA); 1,9-diperoxyazelaic acid, diperoxybrassylic acid, diperoxysebacic acid and diperoxyisophthalic acid; and 2-decyldiperoxybutane-1,4-dioic acid.

[0060] Peroxyacid bleach precursors are well known in the art. As non-limiting examples can be named N,N,N',N'-tetraacetyl ethylene diamine (TAED), sodium nonanoyloxybenzene sulphonate (SNOBS), sodium benzoyloxybenzene sulphonate (SBOBS) and the cationic peroxyacid precursor (SPCC) as described in US-A-4,751,015.

[0061] If desirably a bleach catalyst, such as the manganese complex, e.g. Mn-Me TACN, as described in EP-A-0458397, or the sulphonimines of US-A-5,041,232 and US-A-5,047,163, is to be incorporated, this may be presented in the form of a second encapsulate separately from the bleach capsule or granule. Cobalt catalysts can also be used.

[0062] For peroxygen bleaching agents a suitable range are also from 0.5% to 3% avO (available Oxygen). Preferably, the amount of bleach material in the wash liquor is at least $12.5 \times 10^{-4}\%$ and at most 0.03% avO by weight of the liquor.

[0063] Anti-tarnishing agents such as benzotriazole and those described in EP 723 577 (Unilever) may also be included.

[0064] Further optional ingredients are, for example, buffering agents, reducing agents, e.g., borates, alkali metal hydroxide and the well-known enzyme stabilisers such as the polyalcohols, e.g. glycerol and borax; crystal-growth inhibitors, threshold agents; perfumes and dyestuffs and the like.

[0065] The invention relates to washing processes in mechanical dish washing machines wherein the wash liquor has a low pH. By "low pH" is meant here that the pH of the wash liquor is preferably higher than about 6.5, more preferably 7.5 or higher, most preferably 8.5 or higher. Preferably the pH is lower than about 11, more preferably lower than about 10.5, more preferably lower than about 9.5. The most advantageous pH range is from 8.5 to 10.5.

[0066] The rinse aid for use in the invention comprises a water soluble acid builder or salt, preferably organic acids including, for example, carboxylic acids, such as citric and succinic acids, polycarboxylic acids, such as polyacrylic acid, and also acetic acid, boric acid, malonic acid, adipic acid, fumaric acid, lactic acid, glycolic acid, tartaric acid, tartronic acid, malonic acid, their derivatives and any mixtures of the foregoing.

[0067] The compositions of the invention may contain organic solvents, particularly when formulated as liquids or gels. The compositions in accord with the invention preferably contain a solvent system present at levels of from 1% to 30% by weight, preferably from 3% to 25% by weight, more preferably from 5% to 20% by weight of the composition. The solvent system may be a mono or mixed solvent system. Preferably, at least the major component of the solvent system is of low volatility.

[0068] Suitable organic solvent for use herein has the general formula $\text{RO}(\text{CH}_2\text{C}(\text{Me})\text{HO})_n\text{H}$, wherein R is an alkyl, alkenyl, or alkyl aryl group having from 1 to 8 carbon atoms, and n is an integer from 1 to 4. Preferably, R is an alkyl group containing 1 to 4 carbon atoms, and n is 1 or 2. Especially preferred R groups are n-butyl or isobutyl. Preferred solvents of this type are 1-n-butoxypropane-2-ol (n = 1); and 1(2-n-butoxy-1-methylethoxy)propane-2-ol (n = 2), and mixtures thereof.

[0069] Other solvents useful herein include the water-soluble CARBITOL⁷ solvents or water-soluble CELLOSOLVE⁷ solvents. Water-soluble CARBITOL⁷ solvents are compounds of the 2-(2-alkoxyethoxy) ethanol class wherein the alkoxy group is derived from ethyl, propyl or butyl; a preferred water-soluble carbitol is 2(2-butoxyethoxy) ethanol also known as butyl carbitol. Water-soluble CELLOSOLVE⁷ solvents are compounds of the 2-alkoxyethoxy ethanol class, with 2-butoxyethoxyethanol being preferred.

[0070] Other suitable solvents are benzyl alcohol, and diols such as 2-ethyl-1,3-hexanediol and 2,2,4-trimethyl-1,3-pentanediol.

[0071] An especially preferred solvent is glycerol triacetate.

Examples

[0072] Shell material was prepared according to the formulae given in the table below:

Component (%)	1	2	3	4	5
Sorbitol	57	57	60	70	39.5
Sodium Acetate	25	25			20
PEG 400 to 6000	10	10	10	10	
PVA		5	5		
PVP	5				
Glycerol/Tri-acetone	3	3		3	
Citric acid			10	10	
Sodium bicarbonate				7	
Soluble pre-gelatinised starch			14.8		40
Disintegration Polymers			0.2		0.5

[0073] The shell material and shell shape was prepared using one of the routes described below:

1) Wet preparation and extrusion:

[0074] An intimate mixture is prepared of all compatible ingredients by dissolving/slurrying them in water and spray drying the concentrated slurry under vacuum at 120-140°C. The incompatible ingredients are added thereafter. This mixture was extruded through a co-extrusion head simultaneously with a coloured liquid detergent core material into rectangular dies producing blocks having a hard translucent shell through which the coloured liquid core was visible.

2) Dry preparation and extrusion:

[0075] All shell materials were intimately mixed in the dry state and extruded as above.

3) Moulding of sheet material:

[0076] All shell ingredients were mixed and heated to 80-90°C with addition of about 20% water. After a homogeneous liquid was obtained water was removed under vacuum at a temperature of between 130-150°C to a level of about 0.5% or less. The viscous liquid was poured on a flat surface and rolled to a flexible sheet of about 2mm thickness, which was shaped, into a multitude of hollow pyramids of the desired shape by pressing it into a suitable mould. The pyramids were filled with the core material covered with a second sheet of the same (or different) shell material, which was fixed to the pyramid walls, while still hot, by applying sufficient pressure on the sheet. The filled pyramids were cut out of the sheet and left to cool and age for several hours during which the flexible walls became rigid while remaining translucent.

[0077] The liquid core material consisted of the following ingredients.

[0078] For a 5ml rinse aid product:

61 wt% ethoxylated/propoxylated nonionic surfactant

39 wt% citric acid

[0079] For a 20 ml main wash liquid product:

	Wt. %
Sodium carbonate	5.1
Sodium citrate	21
Sodium silicate	7.8
Sodium perborate mono	5
TAED	2.2
Ethoxylated/propoxylated	7.5
Nonionic Surfactant	-
Glycerol triacetate	45
Minors	to 100

Claims

1. Machine dish cleaning product, which is completely soluble in water and comprises a detergent surfactant, **characterised in that** it is rigid, has a smooth surface and is at least partially transparent or translucent.
2. Machine dish cleaning product according to claim 1 **characterised in that** the surface presents no irregularities visible to the naked eye.
3. Machine dish cleaning product according to claims 1 or 2 **characterised in that** it cannot be squeezed by hand such that its dimensions in any one direction alter by more than 20% of the original value.
4. Machine dish cleaning product according to claims 1-3 **characterised in that** it consists of a solid homogeneous mixture comprising a structuring material and one or more detergents.
5. Machine dish cleaning product according to claims 1-3 **characterised in that** it has a rigid outer shell comprising a structuring material, surrounding a solid or liquid core comprising detergent surfactant.
6. Machine dish cleaning product according to claim 5 **characterised in that** the core is liquid.
7. Machine dish cleaning product according to claims 1-6 **characterised in that** it has a symmetrical shape.
8. Machine dish cleaning product according to claim 7 **characterised in that** it has a crystal-like shape.
9. Machine dish cleaning product according to claim 6 **characterised in that** the shell and the core have different colours.



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 30 3386

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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