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(54) **Use of dish-washing compositions**

Verwendung von Geschirrspülmitteln

Utilisation d'une composition lave-vaisselle

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(72) Inventor: **Tomlinson, Alan Digby,**
Unilever Res. Vlaardingen
3133 AT Vlaardingen (NL)

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(74) Representative: **Boerma, Caroline et al**
Unilever N.V.,
Patent Division,
P.O. Box 137
3130 AC Vlaardingen (NL)

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(73) Proprietors:
• **UNILEVER PLC**
London EC4P 4BQ (GB)
Designated Contracting States:
GB IE CY
• **UNILEVER N.V.**
3013 AL Rotterdam (NL)
Designated Contracting States:
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EP-A- 0 481 547 **EP-A- 0 851 024**
GB-A- 2 330 362 **US-A- 5 962 387**

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Description

Technical Field

5 [0001] The present invention is in the field of machine dishwashing. More specifically, the invention encompasses a process for using automatic dishwashing tablets.

Background of the Invention

10 [0002] To wash articles in a commercially available dish washing machine entails using three product types. Salt is added to the salt compartment to soften the water, a dishwashing formulation is used to clean the articles and a rinse aid is used to ensure that the articles are rinsed with no streaks or smears.

[0003] Consumers find it inconvenient replace the salt and rinse aid in a dish wash machine. The present invention relates to a process of washing dishes that obviates the need for salt and rinse aid in the machine dishwashing process.

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Description of the Invention

[0004] Accordingly, the present invention provides the use of a machine dishwashing tablet in a process for washing dishes in which no rinse aid and no salt is used in the machine, the tablet comprising greater than 45 wt% of a builder and having a distinct defined region (A) which is a maximum of 30 wt% of total weight of the tablet, the distinct defined region (A) comprising a material that controls the regions (A) dissolution in water.

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[0005] Furthermore the present application defines a process for washing articles in a mechanical washing machine comprising the steps of:

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i) treating the articles with a wash liquor to which is added a tablet comprising greater than 45 wt% of a builder and having a separate defined region which is a maximum of 30 wt% of total weight of the tablet, the distinct defined region comprising a material that delays its dissolution in water wherein no additional rinse aid and or salt is present within the machine.

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[0006] In the context of the present invention the term "additional rinse aid or salt" relates to a separate rinse aid or salt product that is not part of the tablet.

[0007] Also claimed is a kit of parts comprising a detergent tablet as described above and instructions stating that no rinse aid or salt is to be added to the dishwashing machine.

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Detailed Description of the Invention

[0008] The tablets of the invention have two regions, regions A and B.

Region A

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[0009] As discussed above the tablet comprises a defined region(A) which is a maximum of 30 wt% of total weight of the tablet, and comprises a material that controls its dissolution in water. Preferably a material is present that delays the dissolution of Region A. For the purposes of the invention the remainder of the tablet will be called region (B). The components of the defined region (A) will be delivered to the water in the machine after the components in the remainder of the tablet(B). In another aspect of the present invention, the defined region (A) preferably dissolves at a temperature of greater than 50°C, preferably greater 60°C. The remainder of the tablet(B) will begin to dissolve immediately on contact with water. Preferably for region(B) at least 60%, more preferably at least 80%, most preferably at least 95% of region (B) dissolves in deionised water at 50°C within 12 minutes. It is highly preferable if region A is solid.

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[0010] Delayed dissolution of region (A) may be achieved by selecting particulate components that are encapsulated with a component which is slow dissolving or partially soluble in water. Such encapsulating materials include cellulose and cellulose derivatives e.g. cellulose acetate, cellulose acetate plithalate (CAP), hydroxypropyl Methyl Cellulose (HPMC), carboxymethylcellulose (CMC) and mixtures thereof. The hydroxypropyl methylcellulose polymer preferably has a number average molecular weight of 50,000 to200,000 and a viscosity of a 2 wt.% aqueous solution at 25°C (ADTMD2363) of 50,000 to 120,000 cps. An especially preferred hydroxypropyl cellulose polymer is Methocel O J75MS-N wherein a 2.0 wt.% aqueous solution at 25°C has a viscosity of about 75,000 cps. Other preferred encapsulating materials include gelatine of bloom strength in the range of from 30 to 200, preferably from 75 to 200.

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[0011] The thickness of the encapsulating material will determine the dissolution rate of the encapsulated detergent component and thus the delivery rate of the detergent component to the wash water.

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[0012] Another example of a means by which the dissolution of the Region A portion may be delayed is premixing detergent components in a matrix, which is slow dissolving or partially soluble in water. Preferred polymers for doing this include polyethylene glycol of molecular weight from 1,000 to 20,000, more preferably from 4,000 to 10,000 or even 12,000.

5 **[0013]** Yet another example of a means by which the dissolution of region A can be controlled is by coating region A with a coating layer. The coating layer preferably comprises a material that becomes solid on contacting Region A within preferably less than 15 minutes, more preferably less than 10 minutes, even more preferably less than 5 minutes, most preferably less than 60 seconds. Preferably the coating layer is water-soluble. Preferred coating layers comprise materials selected from the group consisting of fatty acids, alcohols, diols, esters and ethers, adipic acid, carboxylic acid, dicarboxylic acid, polyvinyl acetate (PVA), polyvinyl pyrrolidone (PVP), polyacetic acid (PLA), polyethylene glycol (PEG) and mixtures thereof. Preferred carboxylic or dicarboxylic acids preferably comprise an even number of carbon atoms. Preferably carboxylic or dicarboxylic acids comprise at least 4, more preferably at least 6, even more preferably at least 8 carbon atoms, most preferably between 8 and 13 carbon atoms. Preferred dicarboxylic acids include adipic acid, suberic acid, azelaic acid, subacic acid, undecanedioic acid, dodecandioic acid, tridecanedioic and mixtures thereof. Preferred fatty acids are those having a carbon chain length of from C12 to C22, most preferably from C 18 to C22. The coating layer may also preferably comprise a disrupting agent.

[0014] Suitable coatings for region A are described in WO 00/06684, JP 61-28440, JP60-141705, JP 61-28441, JP 61-28596, JP 61-28597 and JP 61-28598.

[0015] Where present the coating layer is generally present at a level of at least 0.05%, preferably at least 0.1%, more preferably at least 1%, most preferably at least 2% or even at least % of the detergent tablet.

[0016] The coating may be used to affix a Region A the Region B.

[0017] In yet another example region A is such that it comprises at least one component which react with an outside stimulus, such as temperature or pH, to initiate dissolution. An example of a component that would initiate dissolution on reaction to a change in temperature is a wax. In particular it is envisaged that a suitable wax will have a melting temperature above room temperature, preferably above 40°C, more preferably above 50°C, most preferably above 55°C.

[0018] It is preferred if region A is inset within the tablet.

[0019] Region A for use in the invention may further comprise 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.

[0020] Suitable water-soluble monomeric or oligomeric carboxylate builders can be selected from a wide range of compounds but such compounds preferably have a first carboxyl logarithmic acidity/constant (pK_1) of less than 9, preferably of between 2 and 8.5, more preferably of between 2.5 and 7.5.

[0021] The carboxylate or polycarboxylate builder can be monomeric or oligomeric in type although monomeric polycarboxylates are generally preferred for reasons of cost and performance. Monomeric and oligomeric builders can be selected from acyclic, alicyclic, heterocyclic and aromatic carboxylates.

[0022] Suitable carboxylates containing one carboxy group include the water-soluble salts of lactic acid, glycolic acid and ether derivatives thereof. Polycarboxylates containing two carboxy groups include the water-soluble salts of succinic acid, malonic acid, (ethylenedioxy) diacetic acid, maleic acid, diglycolic acid, tartaric acid, tartronic acid and fumaric acid, as well as the ether carboxylates and the sulfinyl carboxylates. Polycarboxylates containing three carboxy groups include, in particular, water-soluble citrates, aconitrates and citraconates as well as succinate derivatives such as the carboxymethyloxysuccinates, lactoxysuccinates, and aminosuccinates, and the oxypolycarboxylate materials such as 2-oxa-1,1,3-propane tricarboxylates. The carboxylate or polycarboxylate builder compounds described above can also have a dual function as pH controlling agents.

[0023] Polycarboxylates containing four carboxy groups include oxydisuccinates, 1,1,2,2-ethane tetracarboxylates, 1,1,3,3-propane tetracarboxylates and 1,1,2,3-propane tetracarboxylates. Polycarboxylates containing sulfo substituents include the sulfosuccinate derivatives, and the sulfonated pyrolysed citrates.

[0024] Alicyclic and heterocyclic polycarboxylates include cyclopentane-cis,cis,cis-tetracarboxylates, cyclopentadienide pentacarboxylates, 2,3,4,5-tetrahydrofuran - cis, cis, cis-tetracarboxylates, 2,5-tetrahydrofuran - cis - dicarboxylates, 2,2,5,5-tetrahydrofuran- tetracarboxylates, 1,2,3,4,5,6-hexane - hexacarboxylates and carboxymethyl derivatives of polyhydric alcohols such as sorbitol, mannitol and xylitol. Aromatic polycarboxylates include mellitic acid, pyromellitic acid and the phthalic acid derivatives disclosed in British Patent No. 1,425,343.

[0025] Of the above, the preferred polycarboxylates are hydroxycarboxylates containing up to three carboxy groups per molecules, more particularly citrates or citric acid.

[0026] The parent acids of the monomeric or oligomeric polycarboxylate chelating agents or mixtures thereof with their salts, e.g. citric acid or citrate/citric acid mixtures are also contemplated as components of builder systems of Phase A in accordance with the present invention.

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[0027] An anti-scalant may be present within region A. Suitable anti-scalants are EDHP hydroxy-ethylene 1,1 di-phosphonate and Bayhibit (2 phosphono-butane 1,2,4 tricarboxylic acid), also suitable are polymers such as Al-cosperse 240 as described in US 5 956 855 and US 5 547 612. As an alternative polymers and co-polymers of acrylic acid having a molecular weight between 500 and 20,000 can also be used. Anti-scalants are present at levels to deliver 1-100 ppm in a 5 litre rinse.

[0028] A surfactant system comprising a surfactant selected from nonionic, anionic, cationic, ampholytic and zwitterionic surfactants and mixtures thereof is preferably present in Region A.

[0029] The surfactant system most preferably comprises low foaming nonionic surfactant, selected for its wetting ability, preferably selected from ethoxylated and/or propoxylated nonionic surfactants, more preferably selected from nonionic ethoxylated/propoxylated fatty alcohol surfactants.

[0030] The surfactant system is typically present within region A at a minimum level of 0.05g. more preferably at a minimum level of 0.1g. The preferred maximum level is preferably 0.8g or below, more preferably 0.6g or below. The most preferred level is from 0.2g to 0.4 g. It is highly preferable if the level of surfactant, in particular nonionic surfactant is from 25% to 75% of the weight of the total nonionic surfactant within the tablet.

[0031] Hydrotropes may be present and are typically present at levels of from 0.5% to 20%, preferably from 1% to 10%, by weight.

[0032] Useful hydrotropes include sodium, potassium, and ammonium xylene sulfonates, sodium, potassium, and ammonium toluene sulfonate, sodium potassium and ammonium cumene sulfonate, and mixtures thereof.

[0033] In a highly preferred aspect of the invention, region A will have a pH as a 1% solution in distilled water at 20°C of less than 7, preferably from 0.5 to 6.5, most preferably from 0.5 to 1.0.

Region B

Builder material

[0034] The compositions of the invention may contain a builder. The builder may be a phosphate or non-phosphate builder.

[0035] Compositions of the invention comprising a water-soluble phosphate builder typically contain this builder at a level of from 50 to 90% by weight, preferably from 55 to 80% by weight.

[0036] 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.

[0037] The compositions of the present invention may comprise a water-soluble nonphosphate builder. This is typically present at a level of from 1 to 90% by weight, preferably from 10 to 80% by weight, most preferably from 20 to 70% by weight of the composition. 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.

[0038] 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. Alkali metal citrates, nitrilotriacetates, oxydisuccinates, acrylate/maleate copolymers and acrylate/maleate/vinyl alcohol terpolymers are especially preferred nonphosphate builders.

Silica material

[0039] 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).

[0040] 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.

[0041] The particle size of the silica material of the present invention may be of importance, especially as it is believed that any silica material that remains undissolved during the washing process, may deposit on the glass at a later stage.

[0042] Therefore, it is preferred that silica material are used that have a particle size (as determined with a Malvern Laser, i.e. "aggregated" particles size) of at most 40 μ m, most preferably at most 20 μ m provides better results in the wash. In view of incorporation in a cleaning composition, it is preferred that the particle size of the silica material is at least 1 μ m, more preferably at least 2 μ m, most preferably at least 5 μ m.

[0043] Preferably the primarily particle size of the silica is in general less than about 30nm, in particular less than about 25nm. Preferably, elementary particles size are less than 20nm or even 10nm. There is no critical lower limit of the elementary particle size; the lower limit is governed by other factors such as the manner of manufacture, etc. In general commercial available silicas have elementary particle sizes of 1 nm or more.

[0044] Preferably, the silica material is present in the wash liquor at a level of at least 2.5x10⁻⁴%, more preferably at least 12.5x10⁻⁴%, most preferably at least 2.5x10⁻³% by weight of the wash liquor and preferably at most 1x10⁻¹%, more preferably at most 8x10⁻²%, most preferably at most 5x10⁻²% by weight of the wash liquor.

[0045] Preferably, the level of dissolved silica material in the wash liquor is at least 80 ppm, more preferably at least 100 ppm, most preferably at least 120-ppm and preferably at most 1,000 ppm. It is noted that for the silica material to be effective, the lower level of dissolved silica material depends on the pH value, i.e. thus at pH 6.5, the level is preferably at least 100 ppm; at pH 7.0 preferably at least 110 ppm; at pH 7.5 preferably at least 120 ppm; at pH 9.5 preferably at least 200 ppm; at pH 10 preferably at least 300 ppm; at pH 10.5 preferably at least 400 ppm.

[0046] 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.

Silicates

[0047] The composition optionally comprises alkali metal silicates. The alkali metal may provide pH adjusting capability and protection against corrosion of metals and against attack on dishware, including fine china and glassware benefits. When silicates are present, the SiO₂ level should be from 1% to 25%, preferably from 2% to 20%, more preferably from 3% to 10%, based on the weight of the ADD. The ratio of SiO₂ to the alkali metal oxide (M₂O, 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%.

[0048] The highly alkali metasilicates can in general be employed, although the less alkaline hydrous alkali metal silicates having a SiO₂:M₂O ratio of from 2.0 to 2.4 are, as noted, greatly preferred. Anhydrous forms of the alkali metal silicates with a SiO₂:M₂O 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.

[0049] Sodium and potassium, and especially sodium, silicates are preferred. A particularly preferred alkali metal silicate is a granular hydrous sodium silicate having a SiO₂:Na₂O 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 SiO₂:Na₂O 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 then 1700 microns. Compositions of the present invention having a pH of 9 or less preferably will be substantially free of alkali metal silicate.

Enzymes

[0050] 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.

[0051] Well-known and preferred examples of these enzymes are lipases, amylases and proteases. The enzymes most commonly used in machine dishwashing compositions are amylolytic enzymes. Preferably, the composition of the invention also contains a proteolytic enzyme. Enzymes may be present in a weight percentage amount of from 0.2 to 7% by weight. For amylolytic enzymes, the final composition will have amylolytic activity of from 10² to 10⁶ Maltose units/kg. For proteolytic enzymes the final composition will have proteolytic enzyme activity of from 10⁶ to 10⁹ Glycine Units/kg.

Bleach Material

[0052] Bleach material may optionally and preferably be incorporated in composition for use in processes 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.

[0053] The bleach material may be a chlorine- or bromine-releasing agent or a peroxygen compound. Peroxygen based bleach materials are however preferred.

[0054] 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.

[0055] 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.

[0056] 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 peroxystearic acid); and phthaloyl amido peroxy caproic acid (PAP).

[0057] Typical diperoxy acids useful herein include alkyl diperoxy acids and aryldiperoxy acids, such as 1,12-diperoxy-dodecanedioic acid (DPDA); 1,9-diperoxyazelaic acid, diperoxybrassylic acid, diperoxysebacic acid and diperoxy-isophthalic acid; and 2-decyldiperoxybutane-1,4-dioic acid.

[0058] 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 benzyloxybenzene sulphonate (SBOBS) and the cationic peroxyacid precursor (SPCC) as described in US-A-4,751,015.

[0059] 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.

[0060] Among suitable reactive chlorine- or bromine-oxidizing materials are heterocyclic N-bromo and N-chloro imides such as trichloroisocyanuric, tribromoisocyanuric, dibromoisocyanuric and dichloroisocyanuric acids, and salts thereof with water-solubilizing cations such as potassium and sodium. Hydantoin compounds such as 1,3-dichloro-5,5-dimethyl-hydantoin are also quite suitable.

[0061] Particulate, water-soluble anhydrous inorganic salts are likewise suitable for use herein such as lithium, sodium or calcium hypochlorite and hypobromite. Chlorinated trisodium phosphate and chloroisocyanurates are also suitable bleaching materials.

[0062] Encapsulation techniques are known for both peroxygen and chlorine bleaches, e.g. as described in US-A-4,126,573, US-A-4,327,151, US-A-3,983,254, US-A-4,279,764, US-A-3,036,013 and EP-A-0,436,971 and EP-A-0,510,761. However, encapsulation techniques are particularly useful when using halogen based bleaching systems.

[0063] Chlorine bleaches, the compositions of the invention may comprise from about 0.5% to about 3% avCl (available Chlorine). 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.

Surfactant material

[0064] A surfactant system comprising a surfactant selected from nonionic, anionic, cationic, ampholytic and zwitterionic surfactants and mixtures thereof is preferably present in the composition.

[0065] Typically the surfactant is a low to non foaming nonionic surfactant, which includes any alkoxyated nonionic surface-active agent wherein the alkoxy moiety is selected from the group consisting of ethylene oxide, propylene oxide and mixtures thereof, is preferably used to improve the detergency without excessive foaming.

[0066] Examples of suitable nonionic surfactants for use in the invention are the low- to non-foaming ethoxylated straight-chain alcohols of the Plurafac® LF series, supplied by the BSF Company; Synperonic RA series supplied by ICI Tritons DF series, supplied by the Rohm & Haas Company.

[0067] Other surfactants such as anionic surfactant may be used but may require the additional presence of an antifoam to suppress foaming. If an anionic surfactant is used it is advantageously present at levels of 2 wt% or below.

Water Soluble Polymeric Polycarboxylic Compounds

[0068] A water-soluble polymeric polycarboxylic compound is advantageously present in the dish wash composition. Preferably these compounds are homo- or co-polymers of polycarboxylic compounds, especially co-polymeric com-

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pounds in which the acid monomer comprises two or more carboxyl groups separated by not more than two carbon atoms. Salts of these materials can also be used.

[0069] Particularly preferred polymeric polycarboxylates are copolymers 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.

[0070] Another type of polymeric polycarboxylic compounds suitable for use in the composition of the invention are homopolymeric polycarboxylic acid compounds with acrylic acid as the monomeric unit. The average weight of such homopolymers in the acid form preferably ranges from 1,000 to 100,000 particularly from 3,000 to 10,000.

[0071] Acrylic sulphonated polymers as described in EP 851 022 (Unilever) are also suitable.

[0072] Preferably, this polymeric material is present at a level of at least 0.1%, more preferably at levels from 1 wt% to 7 wt% of the total composition.

Chelating Agent

[0073] A chelating agent may be present in the composition. If present it is preferable if the level of chelating agent is from 0.5 to 3 wt% of the total composition.

[0074] Preferred chelating agents include organic phosphonates, amino carboxylates, polyfunctionally-substituted compounds, and mixtures thereof.

[0075] Particularly preferred chelating 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 and 2 phosphono-butane, 1,2,4 tricarboxylic acid.

Anti-tarnishing Agents

[0076] Anti-tarnishing agents such as benzotriazole and those described in EP 723 577 (Unilever) may also be included.

Optional Ingredients

[0077] 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; anti-scaling agents; crystal-growth inhibitors, threshold agents; thickening agents; perfumes and dyestuffs and the like.

[0078] Reducing agents may e.g. be used to prevent the appearance of an enzyme-deactivating concentration of oxidant bleach compound. Suitable agents include reducing sulphur-oxy acids and salts thereof. Most preferred for reasons of availability, low cost, and high performance are the alkali metal and ammonium salts of sulphuroxy acids including ammonium sulphite ((NH₄)₂SO₃), sodium sulphite (Na₂SO₃), sodium bisulphite (NaHSO₃), sodium metabisulphite (Na₂S₂O₃), potassium metabisulphite (K₂S₂O₅), lithium hydrosulphite (Li₂S₂O₄), etc., sodium sulphite being particularly preferred. Another useful reducing agent, though not particularly preferred for reasons of cost, is ascorbic acid. The amount of reducing agents to be used may vary from case to case depending on the type of bleach and the form it is in, but normally a range of about 0.01% to about 1.0% by weight, preferably from about 0.02% to about 0.5% by weight, will be sufficient.

pH of wash liquor

[0079] 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, more preferably lower than about 9.5. The most advantageous pH range is from 8.5 to 10.5.

Temperature of washing process

[0080] The present invention preferably relates to processes of mechanically washing soiled articles with a wash liquor at a temperature of below 55°C.

[0081] The invention will now be illustrated by the following non-limiting Examples.

[0082] All percentages are on a weight basis.

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| | Product 1 | Parts By Weight |
|-----------------|---|-----------------|
| Region A | | |
| | Citric acid | 5 |
| 15% | Nonionic LF 400 S ex BSAF | 2.2 |
| | EHDP or Bayhibit AM | 1 |
| | Hydrocarbon wax - MPT 58 °C | 6.8 |
| | | |
| Region B | | |
| | Sodium tripolyphosphate | 55.54 |
| | Sodium disilicate | 10.41 |
| | Sokalan PA 25CL (Low MWT polyacrylate) | 3.1 |
| 85% | TAED | 2.4 |
| | EHDP or Bayhibit AM | 0.4 |
| | Sodium perborate | 9 |
| | Nonionic LF 403 ex BASF | 1 |
| | Enzymes(Savinade/Amylase 1:1 mix by weight) | 3.1 |
| | BTA (Benzotriazole) | 0.05 |

[0083] Test regime Product 1 (region A & B) above 25g total dosage. No salt or Rinse Aid added extra to the machine.

[0084] Product 2 region B are at 21.25g + 3ml separate Rinse Aid, regenerated ion exchange.

[0085] Product 3 Reference product using regenerated ion exchange and standard products (Sun tablet and rinse aid as sold in France).

[0086] Washing machine: Miele G685 55° Universal programme, 10 washes build-up. Spotting and filming subjectively assessed after 10 washes. Low scores are best.

| | Filming | | Spotting |
|-----------------|-----------|-----|----------|
| Results: | Product 1 | 2 | 2.1 |
| | Product 2 | 1.8 | 2.3 |
| | Product 3 | 1.9 | 2.4 |

No significant differences found.

| | Product 4 | Parts By Weight |
|-----------------|----------------------------|-----------------|
| Region A | | |
| | Citric acid | 5 |
| 15% | Nonionic LF 400 S ex BSAF | 2.2 |
| | EHDP or Bayhibit AM | 0.2 |
| | PEG 6000 | 5.6 |
| | Acumer 3100 ex Rohm & Haas | 1.0 |
| | Coating* | 1.0 |
| Region B | | |
| | Sodium tripolyphosphate | 55.54 |
| | Sodium disilicate | 10.41 |

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(continued)

| | Product 4 | Parts By Weight |
|----|---|-----------------|
| 5 | Region B | |
| | Sokalan PA 25CL (Low MWT polyacrylate) | 3.1 |
| | 85% TAED | 2.4 |
| | EHDP or Bayhibit AM | 0.4 |
| 10 | Sodium perborate | 9 |
| | Nonionic LF 403 ex BASF | 1 |
| | Enzymes(Savinade/Amylase 1:1 mix by weight) | 3.1 |
| 15 | BTA (Benzotriazole) | 0.05 |
| | • The coating is sprayed onto region A. It comprises at a 2:1 ratio of polymer AEA (ex Sankyo) Mawiol 5088 (ex Clariant). | |

[0087] Test regime Product 4 (region A & B) above at 25g total dosage. No salt or Rinse aid added extra.

[0088] Product 5 region B only at 21.25g + 3ml separate Rinse Aid (Sun ex France) regenerated ion exchange.

[0089] Product 6 reference product using regenerated ion exchanger and standard products. (Sun tablet and rinse aid ex France).

[0090] Washing machine: Miele G685 55° Universal programme, 10 washes build up. Spotting and filming subjectively assessed after 10 washes. Low scores are best.

| | Filming | | Spotting | |
|----|----------|-----------|----------|-----|
| 25 | Results: | Product 4 | 2 | 2.3 |
| | | Product 5 | 1.8 | 2.3 |
| 30 | | Product 6 | 1.9 | 2.4 |

No significant differences found

Claims

1. Use of a machine dishwashing tablet in a process for washing dishes in which no rinse aid and no salt is used in the machine, the tablet comprising greater than 45 wt% of a builder and having a distinct defined region (A) inset within the tablet which has a maximum of 30 wt% of the total weight of the tablet, wherein region (A) comprises particulate detergent components encapsulated with a component which delays their dissolution.
2. Use of a machine dishwashing tablet in a process for washing dishes in which no rinse aid and no salt is used in the machine, the tablet comprising greater than 45 wt% of a builder and having a distinct defined region (A) inset within the tablet which has a maximum of 30 wt% of the total weight of the tablet, wherein region (A) comprises detergent components in a matrix which delays their dissolution.
3. Use according to claim 1 or claim 2 in which the tablet comprises greater than 50 wt% of a builder
4. Use according to any preceding claim in which the builder is phosphate based.
5. Use according to any preceding claim in which the separate defined region (A) further comprises a nonionic surfactant.
6. Use according to any preceding claim in which the level of nonionic surfactant within the separate defined region (A) from 25% to 75% of the weight of the total nonionic surfactant within the tablet.
7. Use according to any preceding claim in which region A further comprises an anti-scalant.

8. Use according to any preceding claim in which the separate defined region (A) is inset within the tablet.
9. A process for washing articles in a mechanical washing machine comprising: treating the articles with a wash liquor to which is added a tablet as defined in claim 1 or claim 2, wherein no additional rinse aid and or salt is present within the machine.
10. A kit of parts comprising
- (i) a detergent tablet as described in claim 1 or claim 2 and;
 - (ii) instructions stating that no rinse aid or salt is to be added to the dishwashing machine.

Patentansprüche

1. Verwendung einer Geschirrspülmaschinentablette in einem Verfahren zum Waschen von Geschirr, in dem keine Spülhilfe und kein Salz in der Maschine verwendet wird, wobei die Tablette mehr als 45 Gewichtsprozent eines Builders umfasst und einen deutlich definierten Bereich (A), eingeschoben in die Tablette, aufweist, welcher ein Maximum von 30 Gewichtsprozent des Gesamtgewichts der Tablette aufweist, wobei Bereich (A) teilchenförmige Waschmittelkomponenten, eingekapselt mit einer Komponente, die ihre Auflösung verzögert, umfasst.
2. Verwendung einer Geschirrspülmaschinentablette in einem Verfahren zum Waschen von Geschirr, in dem keine Spülhilfe und kein Salz in der Maschine verwendet wird, wobei die Tablette mehr als 45 Gewichtsprozent eines Builders umfasst und einen deutlich definierten Bereich (A), eingeschoben in die Tablette, aufweist, welcher ein Maximum von 30 Gewichtsprozent des Gesamtgewichts der Tablette aufweist, wobei Bereich (A) Waschmittelkomponenten in einer Matrix, die ihre Auflösung verzögert, umfasst.
3. Verwendung nach Anspruch 1 oder Anspruch 2, wobei die Tablette mehr als 50 Gewichtsprozent eines Builders umfasst.
4. Verwendung nach einem vorangehenden Anspruch, wobei der Builder auf Phosphat basiert.
5. Verwendung nach einem vorangehenden Anspruch, wobei der getrennt definierte Bereich (A) weiterhin ein nichtionisches Tensid umfasst.
6. Verwendung nach einem vorangehenden Anspruch, wobei der Anteil an nichtionischem Tensid innerhalb des getrennt definierten Bereichs (A) 25% bis 75% des Gewichts des gesamten nichtionischen Tensids innerhalb der Tablette ist.
7. Verwendung nach einem vorangehenden Anspruch, wobei Bereich (A) weiterhin ein Antikesselsteinmittel umfasst.
8. Verwendung nach einem vorangehenden Anspruch, wobei der getrennt definierte Bereich (A) in die Tablette eingeschoben ist.
9. Verfahren zum Waschen von Gegenständen in einer mechanischen Waschmaschine, umfassend: Behandeln der Gegenstände mit einer Waschlauge, zu der eine wie in Anspruch 1 oder Anspruch 2 definierte Tablette gegeben wird, wobei keine zusätzliche Spülhilfe und/oder Salz in der Maschine vorliegt.
10. Salz von Teilen, umfassend:
- i) eine wie in Anspruch 1 oder Anspruch 2 beschriebene Waschmitteltablette und
 - ii) Anweisungen, die ausführen, dass keine Spülhilfe oder Salz zu der Geschirrspülmaschine zu geben ist.

Revendications

1. Utilisation d'une pastille pour le lavage de la vaisselle en machine dans le cadre d'un procédé de lavage de la vaisselle dans laquelle on n'utilise aucun produit d'aide au rinçage et aucun sel dans la machine, la pastille comprenant plus de 45 % en poids d'un édificateur et ayant une région (A) définie et distincte insérée dans la pastille

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et représentant au maximum 30 % en poids du poids total de la pastille, dans laquelle la région (A) comprend des composants détergents particuliers encapsulés à l'intérieur d'un composant qui retarde leur dissolution.

- 5
2. Utilisation d'une pastille pour le lavage de la vaisselle en machine dans le cadre d'un procédé de lavage de la vaisselle dans laquelle on n'utilise aucun produit d'aide au rinçage et aucun sel dans la machine, la pastille comprenant plus de 45 % en poids d'un édificateur et ayant une région (A) définie et distincte insérée dans la pastille et représentant au maximum 30 % en poids du poids total de la pastille, dans laquelle la région (A) comprend des composants détergents dans une matrice qui retarde leur dissolution.
- 10
3. Utilisation selon la revendication 1 ou selon la revendication 2, dans laquelle la pastille comprend plus de 50 % en poids d'un édificateur.
- 15
4. Utilisation selon l'une quelconque des revendications précédentes dans laquelle l'édificateur est à base de phosphate.
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5. Utilisation selon l'une quelconque des revendications précédentes dans laquelle la région définie distincte (A) comprend en outre un tensioactif non ionique.
6. Utilisation selon l'une quelconque des revendications précédentes, dans laquelle le niveau de tensioactif non ionique dans la région définie distincte (A) représente de 25 % à 75 % du poids du tensioactif total dans la pastille.
- 25
7. Utilisation selon l'une quelconque des revendications précédentes dans laquelle la région (A) comprend en outre un anti-calcaire.
8. Utilisation selon l'une quelconque des revendications précédentes dans laquelle ladite région définie distincte (A) est un insert dans la pastille.
- 30
9. Procédé de lavage d'articles dans un lave-vaisselle mécanique comprenant les étapes consistant à :
- traiter les articles avec une liqueur de lavage dans laquelle on a ajouté une pastille telle que définie dans la revendication 1 ou la revendication 2, dans lequel aucun produit d'aide au rinçage et aucun sel supplémentaires ne sont présents à l'intérieur de la machine.
- 35
10. Kit de pièces comprenant :
- (i) une pastille détergente telle que décrite dans la revendication 1 ou dans la revendication 2 ;
 - (ii) des instructions établissant qu'il ne faut pas ajouter de produit d'aide au rinçage ou de sel dans le lave-vaisselle.
- 40
- 45
- 50
- 55