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Applicant: **UNILEVER NV, Burgemeester
s'Jacobplein 1 P.O. Box 760, NL-3000 DK Rotterdam (NL)**
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Applicant: **UNILEVER PLC, Unilever House Blackfriars P
O Box 68, London EC4P 4BQ (GB)**

(84)

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(72)

Inventor: **Pawson, David, Mittlerer Rainweg 41,
D-6900 Heidelberg-Ziegelhausen (DE)**
Inventor: **Rabitsch, Hermann, Gottenweg 3,
A-1220 Vienna (AT)**

(84)

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(74)

Representative: **Van Gent, Jan Paulus et al, Unilever N.V.
Patent Division P.O. Box 137, NL-3130 AC Vlaardingen
(NL)**

(54)

Low phosphate detergent composition.

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A detergent composition with a reduced phosphate content is provided, without its incrustation behaviour being significantly impaired, by using a builder mixture of an orthophosphate and nitrilotriacetate.

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Low phosphate detergent composition.

The present invention relates to detergent, cleaning and bleaching compositions of any type, having a low phosphate content.

- 5 Condensed phosphates, such as sodiumtripphosphate and tetrasodiumpyrophosphate, have already been known and applied as builder salts in the detergent industry for decades.
- 10 In the last few years, however, the use of high contents of sodiumtripphosphate has been subjected to critical consideration, as soluble phosphates are suspected to accelerate the eutrophication of surface waters. Consequently, the detergent industry has made efforts to find
- 15 substitutes for the phosphate builder salts, and actually a great many phosphate substitutes have been suggested which can wholly or partly replace sodium triphosphate. The use of such partial substitutes, however, may involve certain drawbacks, such e.g. increased incrustation.
- 20 It was therefore an object of the invention to provide a detergent composition with a reduced phosphate content, which nevertheless has an incrustation behaviour corresponding in type and level to that of a detergent composition having the usual high tripolyphosphate content.
- 25 This object was attained by the finding that a detergent composition comprising a builder mixture of from 1 - 5 wt% of an alkalimetal orthophosphate and from 3 - 20 wt%, preferably from 5 - 15 wt%, of an alkalimetal salt of
- 30 nitrilo-triacetic acid shows such an incrustation behaviour. The detergent composition has a phosphate content of 1% or less. The invention therefore relates to a detergent, cleaning and bleaching composition having a phosphor content equivalent to or lower than 1%, which in addition
- 35 to detergent-active substances, comprises builder salts,

and is characterized in that it contains from 1 to 5 percent by weight of an alkalimetal orthophosphate and from 3 to 20, preferably from 5 to 15 percent by weight, of an alkalimetal salt of nitrilotriacetic acid.

5

The alkalimetal orthophosphate can be a mono-, di- or tri-orthophosphate, trisodiumorthophosphate (TSOP) being preferred. The nitrilotriacetic acid alkalimetal salt is preferably the trisodium salt (NTA). Both salts can be
10 used either as an anhydrous salt or as a salt containing water of crystallization.

It has appeared that the ratio of the nitrilotriacetic salt (NTA) to the alkalimetal orthophosphate (TSOP) in-
15 fluences the incrustation behaviour to a certain extent; this ratio is preferred to be 1 or higher, preferably above 2, although good results can also be obtained with lower ratios.

20 Although very good effects can already be achieved with the TSOP/NTA mixture according to the invention, it was found that the incrustation behaviour can be further improved by additionally incorporating a polymeric electrolyte into the detergent composition. Such polymeric elec-
25 trolytes are known per se, typical examples being the alkalimetal- or ammonium-salts of homo- and co-polymers of acrylic acid or substituted acrylic acids, such as sodium polyacrylate, sodium copolymethacrylamide/acrylate and sodium polyalpha-hydroxyacrylate, salts of copolymers of
30 maleic acid anhydride and ethylene, acrylic acid, vinyl-methylether, diisobutylene, allylacetate or styrene, particularly the 1:1 copolymers, which optionally may be partly esterified. Such copolymers preferably have a low molecular weight, for example from 1,000 to 50,000. Other
35 suitable polymeric electrolytes are the alkalimetal salts of polymaleic acid, polyitaconic acid, polyasparaginic

acid, ether polycarboxylic acid such as sodium glycolate-malonate, as well as the compounds according to European patent applications 0009953 and 0009954, laid open to public inspection. Generally, the polymeric electrolytes are used in an amount of from 0.1 to 5 percent by weight, preferably from 0.3 to 2 percent by weight.

The binary or ternary mixture according to the invention can be used in all types of detergent compositions. Thus, the combination according to the invention can be used in detergent compositions containing an anionic, a nonionic, a cationic synthetic detergent compound or a soap or mixtures thereof, and which additionally comprise the normal additives and/or auxiliary materials for detergent compositions. By the term soap is to be understood an alkali-metal-, e.g. sodium- or potassium-salt, of a (C₁₀-C₂₄)-carboxylic acid.

The detergent compositions essentially comprise one or more anionic, nonionic, amphoteric or zwitterionic, detergent-active compounds, or mixtures thereof, and generally builder salts.

The synthetic detergent-active compounds which can be used according to the invention are preferably anionic detergent-active compounds that are readily available and relatively cheap, as well as mixtures thereof. Normally these compounds are water-soluble alkalimetal salts of organic sulphonates or sulphuric acid esters having alkyl radicals with about 8 to 22 carbon atoms. Examples of such synthetic anionic detergent-active compounds are sodium- or potassium-sulphuric acid esters, particularly those which can be prepared by sulphating C₈-C₁₈-fatty alcohols that are obtained by reduction of fatty acids derived from tallow or coconut oil, or synthetic alcohols, which are obtained e.g.

by Oxo-synthesis or Ziegler-synthesis; sodium- or potassium-alkyl (C₉-C₂₀)-benzenesulphonates, particularly sodium-lin.-sec.-alkyl (C₁₀-C₁₅)-benzenesulphonates; sodium- or potassium-alkyl-polyglycolether sulphuric acid esters, particularly from ethers of higher alcohols which are obtained from tallow or coconut oil, or of synthetic higher alcohols; sodium- or potassium-salts of fatty acid monoglyceride-sulphates or -sulphonates; reaction products of fatty acids, e.g. tallow of coconut fatty acid, with isethionic acid and neutralised with sodium- or potassium-hydroxide; sodium- and potassium-salts of fatty acid methyl taurides; alkane monosulphonates, such as those which are obtained by reaction of C₈- to C₂₀-alpha-olefins with sodium hydrogensulphite or by reaction of paraffins with SO₂ and Cl₂ or O₂ and subsequent hydrolysis with sodium- or potassium-hydroxide; as well as olefinsulphonates, which term is meant to denote the material which is obtained by reaction of olefins, particularly alpha-olefins, with SO₃ and subsequent hydrolysis and neutralisation.

20

Nonionic detergent-active compounds can also be used. Examples are the reaction products of alkylene oxide, particularly ethylene oxide and/or propylene oxide, with alkyl (C₆-C₁₂)-phenols, C₈- to C₂₀-alkanols, fatty acid amides, in which in general from 5 to 30 ethylene units are present in the molecule, block polymerisates from propylene oxide and ethylene oxide, condensation products of ethylene oxide with reaction products from propylene oxide with ethylene diamine, etc. Other nonionic detergent-active compounds comprise long-chain tertiary amine- or phosphine oxides and dialkyl sulfoxides.

Mixtures of detergent-active compounds, e.g. mixed anionic and mixed anionic and nonionic compounds can be used in the detergent compositions, particularly to impart controlled

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low-sudsing properties. This is particularly advantageous for compositions that are to be used in suds-intolerant, automatic washing machines. Mixtures of amine oxides and ethoxylated, nonionic compounds can also be advantageous.

5

Many suitable detergent-active compounds are commercially available and have been described in the literature, e.g. in "Surface Active Detergents" of Schwartz, Perry and Berch.

10

Mixtures of amphoteric and zwitterionic detergent-active compounds can also be used in the compositions of the invention; normally however this is not desirable in view of their relatively high cost. In case any amphoteric or
15 zwitterionic compounds are used, this is generally done in small amounts in compositions based on the more commonly used anionic or nonionic detergent-active compounds.

Depending on the properties desired, the amount in which
20 the synthetic detergent-active compound(s) is/are used generally ranges from about 5 to about 50 percent by weight, calculated on the compositions. The detergent compositions can optionally contain further inorganic and/or organic builders, but no condensed phosphate
25 builders. Examples of such builders are citrates, oxidised starch- and cellulose derivatives, particularly those with dicarboxyl radicals, sodiumalkenyl-(C₁₀-C₂₀)-succinates, sodiumsulpho-fatty acids, alkalimetalcarbonates, sodiumaluminosilicates, carboxymethyloxysuccinates,
30 etc. These builders can be incorporated in minor amounts.

Other conventional materials can be present in the detergent compositions according to the invention, e.g. anti-deposition agents, hydrotropes, corrosion inhibitors, dyes, perfumes,
35 fillers, fluorescers, enzymes, suds-boosters, suds-depressors,

germicides, anti-tarnishing agents, fabric softeners, chlorine-releasing agents, oxygen-releasing bleaching agents, such as sodium-perborate or -percarbonate with or without peracid precursors, buffers and the like. The
5 remainder of the detergent compositions consists of water, e.g. ranging from 5 to 15% in the powdered detergent compositions.

The compositions according to the invention can be used
10 for domestic products and industrial products, as well as for machine dishwashing agents, household cleaners etc.

The detergent compositions according to the invention can have any customary form for such compositions, such as
15 powder, pellets, flakes, bars, tablets, noodles, liquids, pastes and the like. The detergent compositions are prepared and applied in the conventional way, e.g. in the case of powdered detergent compositions they can be made by spray-drying aqueous slurries of the detergent ingredients or by dry-mixing processes, in which also the NTA
20 can be added to the base powder in a secondary step. The invention will be further illustrated by means of the following Examples, in which percentages are by weight, calculated on the finished detergent composition.

25 The experiments were carried out in an Atlas-Lauderometer, in which water of 23° GH was used. Ten repeated washes were carried out at 95°C, using the following base formulation:

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	wt. %
sodium dodecyl benzenesulphonate	6.0
C ₁₂ -C ₁₅ -p-alcohol, condensed with	
15 mol EO	4.0
sodium-C ₁₆ -C ₂₂ -fatty acid soap	3.0
5 carboxymethylcellulose	1.0
alkaline waterglass (2/1)	6.0
sodium perborate	22.0
sodium sulphate) taking into account	
water, additives) NTA, TSOP and sodium	
10 polyacrylate	to 100.0

Varying amounts of NTA and TSOP were incorporated in this formulation, and the ash contents of the "Krefelder" cotton test fabrics washed with these formulations were determined and compared with the ash content of the test fabric washed with the control composition. A dosing of 6, 8 or 10 g/l of the formulation in water was applied. The greying degrees were also determined and compared; for this purpose an Elrephometer with Xenon-lamp at 620 nm was used.

20 The following results were obtained:

		Formulations with:			
STP (%)	30	-	-	-	-
NTA (%)	-	16.8	16.8	14.0	14.0
25 TSOP (%)	-	2	2	4	4
sodium polyacrylate					
(mol.w. 25000 (%)	-	0	1	0	1
Ratio NTA:TSOP		8.4	8.4	3.5	3.5
		Ash content			
30 6 g/l	1.0	1.1	0.5	2.0	1.2
8 g/l	0.7	0.1	0.1	0.4	0.2
10 g/l	0.1	0.1	0.1	0.1	0.1

	Greying				
6 g/l	16.5	16.2	12.8	16.6	14.6
8 g/l	13.9	6.9	6.2	12.9	9.6
10 g/l	8.6	6.0	4.9	7.5	5.3

CLAIMS

1. Detergent, cleaning and bleaching compositions based on detergent-active substances and builders, having a phosphor content of 1 % or less, characterized in that they contain from 1 to 5 percent by weight of an alkalimetal orthophosphate and from 3 to 20 percent by weight of an alkalimetal salt of nitrilotriacetic acid.
5
2. Compositions according to claim 1, characterized in that they contain from 5 to 15 percent by weight of an alkalimetal salt of nitrilotriacetic acid.
10
3. Compositions according to claim 1 or 2, characterized in that the weight ratio of the alkalimetal salt of nitrilotriacetic acid to the alkalimetal orthophosphate is at least 1, preferably at least 2.
15
4. Compositions according to claims 1 - 3, characterized in that they further contain from 0.1 to 5 percent by weight of a polymeric electrolyte.