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(54) DETERGENT COMPOSITIONS

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EP-A- 0 262 897 **EP-A- 0 372 291**Remarks:

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DescriptionTECHNICAL FIELD

5 [0001] The present invention relates to laundry detergent compositions containing polyvinyl pyrrolidone. The compositions exhibit improved detergency on oily soils.

BACKGROUND AND PRIOR ART

10 [0002] Polyvinyl pyrrolidone and some related polymers are known ingredients of laundry detergent compositions, providing the benefit of reduced dye transfer between fabrics in a mixed load.

[0003] Laundry detergent compositions containing polyvinyl pyrrolidone as a dye transfer inhibitor are disclosed, for example, in WO 92 18597A, WO 94 03567A, WO 95 03390A, WO 95 17496A, WO 95 27028A and WO 95 34627A (Procter & Gamble), and WO 94 24249A and WO 97 03166A (Henkel).

15 [0004] GB 1 354 498 (Unilever) discloses laundry detergent compositions containing vinyl pyrrolidone/vinyl acetate copolymers as antiredeposition agents. Polyvinyl pyrrolidone itself is stated to be ineffective.

[0005] EP 0 262 897 (unilever) discloses a detergent composition comprising an anionic detergent active material, and polyvinyl pyrrolidone further comprising a nonionic material or a mixture there of the nonionic material or its mixture having an HLB of not more than 10.5.

20 [0006] It has now been discovered that polyvinyl pyrrolidone is also effective to enhance oily soil detergency, especially in detergent compositions containing anionic surfactants, more especially alkylbenzene sulphonate.

DEFINITION OF THE INVENTION

25 [0007] The present invention provides the use of polyvinyl pyrrolidone in a laundry detergent composition according to claim 1 to improve the oily soil detergency of the composition.

The polyvinyl pyrrolidone

30 [0008] The polyvinyl pyrrolidone (hereinafter PVP) preferably has a molecular weight within the range of from 10 000 to 100 000, more preferably from 25 000 to 75 000.

[0009] PVP is commercially available, for example, from BASF as the Luviskol (Trade Mark) K series (powders and solutions of various concentrations) and Sokalan (Trade Mark) HP50 (powder), and from International Specialty Products (ISP) as the ISP-K series.

The laundry detergent composition

40 [0010] In a laundry detergent composition in accordance with the invention, the PVP is present in an amount sufficient to enhance oily soil detergency. Suitably the PVP is present in an amount of from 0.5 to 3 wt%, preferably from 1 to 2 wt%.

[0011] The detergent composition may suitably comprise:

- (a) from 5 to 60 wt%, preferably from 10 to 40 wt%, of organic surfactant,
- (b) from 10 to 60 wt%, of detergency builder,
- (c) from 0.5 to 3 wt%, preferably from 1 to 2 wt%, of PVP,
- (d) optionally other detergent ingredients to 100 wt%.

The organic surfactant

50 [0012] The detergent composition in accordance with the invention may contain any organic surfactants (detergent-active compounds) suitable for incorporation into laundry detergent compositions. The composition comprises linear alkylbenzene sulphonate (LAS).

[0013] Detergent-active compounds (surfactants) may be chosen from soap and non-soap anionic, cationic, nonionic, amphoteric and zwitterionic detergent-active compounds, and mixtures thereof. Many suitable detergent-active compounds are available and are fully described in the literature, for example, in "Surface-Active Agents and Detergents", Volumes I and II, by Schwartz, Perry and Berch. The preferred detergent-active compounds that can be used are soaps and synthetic non-soap anionic and nonionic compounds. The total amount of surfactant present is suitably within the range of from 5 to 60 wt%, preferably from 5 to 40 wt%. Anionic surfactants are well-known to those skilled in the art.

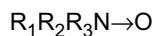
Examples include alkylbenzene sulphonates, particularly linear alkylbenzene sulphonates having an alkyl chain length of C₈-C₁₅; primary and secondary alkylsulphates, particularly C₈-C₂₀ primary alkyl sulphates; alkyl ether sulphates; olefin sulphonates; alkyl xylene sulphonates; dialkyl sulphosuccinates; and fatty acid ester sulphonates. Sodium salts are generally preferred.

5 [0014] Nonionic surfactants that may be used include the primary and secondary alcohol ethoxylates, especially the C₈-C₂₀ aliphatic alcohols ethoxylated with an average of from 1 to 20 moles of ethylene oxide per mole of alcohol, and more especially the C₁₀-C₁₅ primary and secondary aliphatic alcohols ethoxylated with an average of from 1 to 10 moles of ethylene oxide per mole of alcohol. Non-ethoxylated nonionic surfactants include alkylpolyglycosides, glycerol monoethers, and polyhydroxyamides (glucamide).

10 [0015] Cationic surfactants that may be used include quaternary ammonium salts of the general formula R₁R₂R₃R₄N⁺X⁻ wherein the R groups are long or short hydrocarbyl chains, typically alkyl, hydroxyalkyl or ethoxylated alkyl groups, and X is a solubilising anion (for example, compounds in which R₁ is a C₈-C₂₂ alkyl group, preferably a C₈-C₁₀ or C₁₂-C₁₄ alkyl group, R₂ is a methyl group, and R₃ and R₄, which may be the same or different, are methyl or hydroxyethyl groups); and cationic esters (for example, choline esters).

15 [0016] Amphoteric surfactants and/or zwitterionic surfactants may also be present.

Preferred amphoteric surfactants are amine oxides. These are materials of the general formula



20 wherein R₁ is typically a C₈-C₁₈ alkyl group, for example, C₁₂-C₁₄ alkyl, and R₂ and R₃, which may be the same or different, are C₁-C₃ alkyl or hydroxyalkyl groups, for example, methyl groups. The most preferred amine oxide is coco dimethylamine oxide.

25 [0017] Preferred zwitterionic surfactants are betaines, and especially amidobetaines. Preferred betaines are C₈-C₁₈ alkyl amidoalkylbetaines, for example, coco amidopropyl betaine (CAPB).

[0018] An especially favourable interaction between LAS and PVP has been observed, giving improved primary detergency on difficult oily soils such as dirty motor oil. Without being bound by theory, it is postulated that the this benefit may be attributed to a reduction in the critical micelle concentration (CMC) of the LAS.

[0019] The known benefit of dye transfer inhibition is also observed.

30 [0020] Preferably, the compositions contains from 3 to 30 wt%, more preferably from 10 to 25 wt%, of LAS.

The optional detergency builder

[0021] The detergent compositions in accordance with the invention also contain one or more detergency builders. The detergency builder, which is present in an amount of from 10 to 60 wt%, is selected from sodium tripolyphosphate, 35 zeolites, sodium carbonate and mixtures thereof.

[0022] Preferred builders are alkali metal aluminosilicates, more especially crystalline alkali metal aluminosilicates (zeolites), preferably in sodium salt form.

[0023] Zeolite builders may suitably be present in a total amount of from 5 to 60 wt%, preferably from 10 to 50 wt%.

40 [0024] The zeolites may be supplemented by other inorganic builders, for example, amorphous aluminosilicates, or layered silicates such as SKS-6 ex Clariant.

[0025] The zeolites may be supplemented by organic builders, for example, polycarboxylate polymers such as polyacrylates and acrylic/maleic copolymers; monomeric polycarboxylates such as citrates, gluconates, oxydisuccinates, glycerol mono-, di- and trisuccinates, carboxymethyloxysuccinates, carboxymethyloxymalonates, dipicolinates, hydroxyethyliminodiacetates, alkyl- and alkenylmalonates and succinates; and sulphonated fatty acid salts.

45 [0026] Alternatively, the compositions in accordance with the invention may contain phosphate builders, for example, sodium tripolyphosphate.

Especially preferred organic builders are citrates, suitably used in amounts of from 1 to 30 wt%, preferably from 2 to 15 wt%; and acrylic polymers, more especially acrylic/maleic copolymers, suitably used in amounts of from 0.5 to 15 wt%, 50 preferably from 1 to 10 wt%. Builders, both inorganic and organic, are preferably present in alkali metal salt, especially sodium salt, form.

Other detergent ingredients

[0027] Detergent compositions in accordance with the invention may also suitably contain a bleach system. Preferably this will include a peroxy bleach compound, for example, an inorganic persalt or an organic peroxyacid, capable of yielding hydrogen peroxide in aqueous solution.

[0028] Preferred inorganic persalts are sodium perborate monohydrate and tetrahydrate, and sodium percarbonate, the latter being especially preferred. The sodium percarbonate may have a protective coating against destabilisation by

moisture. The peroxy bleach compound is suitably present in an amount of from 5 to 35 wt%, preferably from 10 to 25 wt%.

[0029] The peroxy bleach compound may be used in conjunction with a bleach activator (bleach precursor) to improve bleaching action at low wash temperatures. The bleach precursor is suitably present in an amount of from 1 to 8 wt%, preferably from 2 to 5 wt%. Preferred bleach precursors are peroxycarboxylic acid precursors, more especially peracetic acid precursors and peroxybenzoic acid precursors; and peroxycarbonic acid precursors. An especially preferred bleach precursor suitable for use in the present invention is N,N,N',N'-tetracetyl ethylenediamine (TAED).

[0030] A bleach stabiliser (heavy metal sequestrant) may also be present. Suitable bleach stabilisers include ethylenediamine tetraacetate (EDTA), diethylenetriamine pentaacetate (DTPA), ethylenediamine disuccinate (EDDS), and the polyphosphonates such as the Dequests (Trade Mark), ethylenediamine tetramethylene phosphonate (EDTMP) and diethylenetriamine pentamethylene phosphate (DETPMP).

[0031] The compositions in accordance with the invention may contain alkali metal, preferably sodium, carbonate, in order to increase detergency and ease processing. Sodium carbonate may suitably be present in amounts ranging from 1 to 60 wt%, preferably from 2 to 40 wt%.

As previously indicated, sodium silicate may also be present. The amount of sodium silicate may suitably range from 0.1 to 5 wt%. Sodium silicate, as previously indicated, is preferably introduced via the second base granule.

[0032] Powder flow may be improved by the incorporation of a small amount of a powder structurant. Examples of powder structurants, some of which may play other roles in the formulation as previously indicated, include, for example, fatty acids (or fatty acid soaps), sugars, acrylate or acrylate/maleate polymers, sodium silicate, and dicarboxylic acids (for example, Sokalan (Trade Mark) DCS ex BASF). One preferred powder structurant is fatty acid soap, suitably present in an amount of from 1 to 5 wt%.

[0033] Other materials that may be present in detergent compositions in accordance with the invention include antideposition agents such as cellulosic polymers; soil release agents; anti-dye-transfer agents; fluorescers; inorganic salts such as sodium sulphate; enzymes (proteases, lipases, amylases, cellulases); dyes; coloured speckles; perfumes; and fabric conditioning compounds. This list is not intended to be exhaustive.

Product form and preparation

[0034] The compositions in accordance with the invention may be of any suitable physical form, for example, particulates (powders, granules, tablets), liquids, pastes, gels or bars. According to one especially preferred embodiment of the invention, the detergent composition is in particulate form.

[0035] Powders of low to moderate bulk density may be prepared by spray-drying a slurry, and optionally postdosing (dry-mixing) further ingredients. "Concentrated" or "compact" powders may be prepared by mixing and granulating processes, for example, using a high-speed mixer/granulator, or other non-tower processes.

[0036] Tablets may be prepared by compacting powders, especially "concentrated" powders.

[0037] Also preferred are liquid detergent compositions, which may be prepared by admixing the essential and optional ingredients in any desired order to provide compositions containing the ingredients in the requisite concentrations.

Incorporation of the PVP

[0038] The PVP may be incorporated at any suitable stage in the manufacture of the compositions in accordance with the invention. As previously indicated, PVP is commercially available both in solution form and in solid form.

For example, in the manufacture of spray-dried particulate compositions, PVP in powder or solution (preferably aqueous) form may be incorporated in the slurry. For non-tower particulates, PVP powder or solution may be easily introduced into mixing and granulating apparatus, either alone or in admixture with other solid or liquid ingredients as appropriate.

EXAMPLES

[0039] The invention is further illustrated by the following Examples, in which parts and percentages are by weight unless otherwise stated.

EXAMPLES 1 to 8, COMPARATIVE EXAMPLES A and B

Detergency benefits on dirty motor oil using model wash liquors

[0040] Wash liquors containing 1 g/litre or 2.5 g/litre of a notional detergent composition (the "product") containing linear alkylbenzene sulphonate (LAS) and sodium carbonate were prepared to the following general formulation:

Ingredient	Weight% in "product"	Weight% in 1 g/l wash liquor	Weight% in 2.5 g/l wash liquor
Sodium LAS	14.82	0.1482	0.3705
Sodium carbonate	11.50	0.1150	0.2785
PVP	0, 0.20 or 0.80	0, 0.0020 or 0.0080	0, 0.0050 or 0.0200
Water	Balance	Balance	Balance

10 [0041] The PVP samples used were as follows:

Example	Trade name	Molecular weight
1, 2, 5, 6	ISP-K15	10 000
3, 4, 7, 8	ISP-K30	30 000

15 [0042] Detergency on white cotton cloth soiled with dirty motor oil was assessed using a high throughput small scale wash method. The wash was carried out in water of 20° (French) hardness (Ca:Mg 2:1), at a temperature of 20°C for 20 minutes.

20 [0043] Whiteness before and after the wash was determined using the technique of colour change by image analysis using a greyness scale. The results are analogous to reflectance changes at 460 nm as measured by a reflectance spectrophotometer and are expressed as ΔR and $\Delta\Delta R$.

25 Results at 1 g/litre "product" concentration

[0044]

Example	Polymer	Polymer level in "product"	ΔR	$\Delta\Delta R$
A	none	0	81.76	0
1	ISP-K15	0.2	81.56	- 0.20
2	ISP-K15	0.8	82.80	+ 1.04
3	ISP-K30	0.2	82.58	+ 0.82
4	ISP-K30	0.8	82.54	+ 0.78

40 Results at 2.5 g/litre "product" concentration

[0045]

Example	Polymer	Polymer level in "product"	ΔR	$\Delta\Delta R$
B	none	0	82.04	0
5	ISP-K15	0.2	82.27	+ 0.23
6	ISP-K15	0.8	84.23	+ 2.19
7	ISP-K30	0.2	82.88	+ 0.84
8	ISP-K30	0.8	82.73	+ 0.69

55 EXAMPLE 9

Particulate detergent composition

[0046] The formulation below is an example of a built particulate laundry detergent composition that may be used in

accordance with the invention.

Ingredient	Weight%
Sodium linear alkylbenzene sulphonate	9.31
Nonionic surfactant	3.58
Sodium tripolyphosphate	21.32
Sodium carbonate	12.97
Sodium hydroxide	1.95
Sodium carboxymethyl cellulose	0.62
Sodium silicate ($r = 2.4$)	5.18
Fluorescers	0.13
Zeolite	1.24
Sodium perborate tetrahydrate	15.00
Tetraacetyl ethylenediamine	3.80
Enzymes (protease, lipase, amylase)	2.27
Antifoam granule	2.00
Dequest 2047	0.50
Granular sodium tripolyphosphate	10.00
Perfume	0.65
Citric acid	2.75
Polyvinyl pyrrolidone	1.0-2.0
Water to	100.00

Claims

- Use of polyvinyl pyrrolidone in a laundry detergent composition comprising an organic surfactant, which comprises linear alkylbenzene sulphonate, and 10 to 60 wt% of detergency builder selected from sodium tripolyphosphate, zeolites, sodium carbonate and mixtures thereof to improve the oily soil detergency of the composition.
- Use as claimed in any preceding claim, **characterised in that** the polyvinyl pyrrolidone has a molecular weight within the range of from 10 000 to 100 000, preferably from 25 000 to 75 000.
- Use as claimed in any preceding claim, **characterised in that** the laundry detergent composition contains from 0.5 to 3 wt%, preferably from 1 to 2 wt%, of polyvinyl pyrrolidone.
- Use as claimed in any preceding claim, **characterised in that** the laundry detergent composition comprises:
 - from 5 to 60 wt%, preferably from 10 to 40 wt%, of organic surfactant,
 - optionally from 5 to 80 wt%, preferably from 10 to 60 wt%, of detergency builder,
 - from 0.5 to 3 wt%, preferably from 1 to 2 wt%, of polyvinyl pyrrolidone,
 - optionally other detergent ingredients to 100 wt%.
- Use as claimed in any preceding claim, **characterised in that** the laundry detergent composition contains from 3 to 30 wt%, preferably from 10 to 25 wt%, of linear alkylbenzene sulphonate.

Patentansprüche

1. Verwendung von Polyvinylpyrrolidon in einer Wäschewaschmittelzusammensetzung, umfassend lineares Alkylbenzolsulfonat und 10 bis 60 Gew.-% Waschmittelbuilder ausgewählt aus Natriumtripolyphosphat, Zeolithen, Natriumcarbonat und Gemischen davon, um die Waschkraft der Zusammensetzung für öligen Schmutz zu verbessern.
- 5 2. Verwendung nach einem vorangehenden Anspruch, **dadurch gekennzeichnet, dass** das Polyvinylpyrrolidon ein Molekulargewicht im Bereich von 10 000 bis 100 000, vorzugsweise 25 000 bis 75 000, aufweist.
- 10 3. Verwendung nach einem vorangehenden Anspruch, **dadurch gekennzeichnet, dass** die Wäschewaschmittelzusammensetzung 0,5 bis 3 Gewichtsprozent, vorzugsweise 1 bis 2 Gewichtsprozent, Polyvinylpyrrolidon enthält.
- 15 4. Verwendung nach einem vorangehenden Anspruch, **dadurch gekennzeichnet, dass** die Wäschewaschmittelzusammensetzung umfasst:
 - (a) 5 bis 60 Gew.-%, vorzugsweise 10 bis 40 Gew.-%, organisches Tensid,
 - (b) gegebenenfalls 5 bis 80 Gew.-%, vorzugsweise 10 bis 60 Gew.-%, Waschmittelbuilder,
 - (c) 0,5 bis 3 Gew.-%, vorzugsweise 1 bis 2 Gew.-%, Polyvinylpyrrolidon,
 - (d) gegebenenfalls andere Waschmittelbestandteile auf 100 Gewichtsprozent.
- 20 5. Verwendung nach einem vorangehenden Anspruch, **dadurch gekennzeichnet, dass** die Wäschewaschmittelzusammensetzung 3 bis 30 Gew.-%, vorzugsweise 10 bis 25 Gew.-% lineares Alkylbenzolsulfonat enthält.

Revendications

1. Utilisation de polyvinylpyrrolidone dans une composition détergente de blanchissage comprenant un agent tensioactif organique qui comprend un alkylbenzène sulfonate linéaire, et de 10 à 60 % en poids d'un adjuvant de détergence choisi parmi le tripolyphosphate de sodium, les zéolites, le carbonate de sodium et des mélanges de ceux-ci pour améliorer la détergence des salissures huileuses de la composition.
- 30 2. Utilisation selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la polyvinylpyrrolidone possède une masse moléculaire dans la gamme de 10 000 à 100 000, de préférence de 25 000 à 75 000.
- 35 3. Utilisation selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la composition détergente de blanchissage contient de 0,5 à 3 % en poids, de préférence de 1 à 2 % en poids, de polyvinylpyrrolidone.
- 40 4. Utilisation selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la composition détergente de blanchissage comprend :
 - (a) de 5 à 60 % en poids, de préférence de 10 à 40 % en poids, d'un agent tensioactif organique,
 - (b) de manière facultative de 5 à 80 % en poids, de préférence de 10 à 60 % en poids, d'un adjuvant de détergence,
 - (c) de 0,5 à 3 % en poids, de préférence de 1 à 2 % en poids, de polyvinylpyrrolidone,
 - (d) de manière facultative d'autres ingrédients détergents jusqu'à 100 % en poids.
- 45 5. Utilisation selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la composition détergente de blanchissage contient de 3 à 30 % en poids, de préférence de 10 à 25 % en poids, d'un alkylbenzène sulfonate linéaire.

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REFERENCES CITED IN THE DESCRIPTION

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