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(54) **Detergent with suds control.**

(57) Granular laundry detergents comprising conventional detersive surfactants, builders, enzymes, as well as a fabric softener clay, are coated with a mixture of silica-silicone-alkoxylated siloxane-ethoxylated alcohol which provides suds control, especially in front loading automatic washing machines.

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DETERGENT WITH SUDS CONTROL

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TECHNICAL FIELD

The present invention relates to compositions suitable for use in suppressing excess suds in laundry detergent compositions containing fabric softener clay. The detergent compositions herein comprise mixtures of conventional detersive surfactants and detergency adjuvants and fabric softener clays, all in the form of granules, having coated thereon a suds control agent which comprises a mixture of particulate silica, polydimethylsiloxane, alkoxylated siloxane and ethoxylated alcohol.

BACKGROUND

The use of suds suppressors of various types in laundry detergents is common, commercial practice, especially in situations where the detergent is intended

for use in front-loading automatic washing machines. A wide variety of suds suppressors are known from the literature, including, for example, various fatty-chain length materials adsorbed on various carrier granules, as well as various silicone materials which are well-kown as suds and foam depressants.

EPO patent application 0 046 342 relates to suds control agents which comprise mixtures of alkoxylated nonionic surfactants, polydimethylsiloxane as a foam-controller dispersed therein and siloxane-oxyalkylene copolymer as dispersing agent therefor.

Various detergent compositions which use clay as through-the-wash fabric softeners are described in several patent documents: German 29 64 114.3, 28 57 163.3, 24 39 541.3, 23 34 899.4 and EPO 80 200 570.2, 80 200 877.1 and 80 201 015.7.

The present invention relates to granular detergent compositions which contain clay (especially smectite clay) fabric softeners, said compositions having controlled sudsing by virtue of the suds suppressor herein. Importantly, the suds suppressors described herein can be coated onto the detergent granules without undesirably affecting the fabric softening performance of the clay, nor the dispensing quality of the granules.

SUMMARY OF THE INVENTION

The present invention encompasses granular detergent compositions which comprise fabric softener clays, detersive surfactants and detersive adjuncts, all at conventional levels, said compositions being characterized in that the granules are substantially coated with a suds control agent mixture which comprises (as percentages of total composition) :

i) from 0.18%-0.35% (preferably 0.25%) polydimethylsiloxane fluid;

ii) 0.06%-0.12% (preferably 0.08%) of impalpable (preferably 1-10micron) hydrophobic silica;

iii) 0.015%-0.035% (preferably 0.026%) alkoxylated siloxane; and

iv) 0.5%-1.5% (preferably 0.9%) ethoxylated fatty alcohol (preferably tallow alcohol ethoxylated with 11 (avg.) EO units).

All percentages herein are by weight of the total detergent compositions, unless otherwise specified.

DETAILED DESCRIPTION OF THE INVENTION

As noted herein, the detergent compositions of this invention comprise, in major part, conventional ingredients that are quite familiar to formulators of laundry compositions. One of the major advantages of the suds control agents used herein is that they are entirely compatible with such conventional detergent ingredients, used at conventional concentrations.

Stated generally, the compositions herein are in granular form, and comprise

i) at least 1%, typically 5-40%, conventional detersive surfactant;

ii) at least 1%, typically 1-20%, softener clay;

iii) 0.5%-45% detergency builder;

iv) optionally (typically 0.001-2%) enzymes;

v) optionally, conventional detersive adjuncts such as sodium perborate bleach, perborate activators, optical brighteners, and the like, at conventional levels.

vi) the granules of said composition being substantially coated with a suds control agent as noted hereinabove.

In a highly preferred mode, the compositions will also contain 0.1% to 15% one or more of the amine and/or cationic fabric softener adjuncts (described in EPO 80 200 877.1), together with the softener clay.

Suds Control Agent : The suds control agent which is key to the practice of this invention is prepared using commercially-available materials.

i) polydimethylsiloxane fluid is commercially available in the viscosity range of 700cps to 1400cps, which is entirely suitable for use herein.

ii) hydrophobic silica (impalpable, preferably 1-10 micron) is also commercially available as coated "fumed" silica, or "micronized" silica from various commercial suppliers.

iii) alkoxylated siloxanes are rather thoroughly described in EPO 0 046 342, and are, generally, ethoxylated or mixed ethoxy-propoxy polysiloxanes that are commercially available, for example, as DC 198®.

iv) ethoxylated fatty alcohols are the 8-16 ethoxylates of C_{10}-C_{18} alochols, and mixtures thereof such as the "tallow alcohol" ethoxylates.

In a typical process, the suds control agent is prepared by simply admixing ingredients (i)-(iv) in a suitable mixer (preferably, a mill) and blending thoroughly. The resulting composition is in fluid form that is suitable for spraying onto the detergent "base" granules.

Softener Clay : Clay softeners are well-known in the detergency patent literature and are in broad commercial use, both in Europe and in the United States. Included among such clay softeners are various heat-treated kaolins and various multi-layer smectites. Preferred clay softeners are smectite softener clays that are described in German patent document 2 334 899 and in U.K. Patent 1 400 898 which can be referred to for details. Softener clays are used in the preferred compositions at levels of at least 1%, generally 1-20%, preferably 2-7%. Highly preferred smectite clay softeners are those having an exchange capacity of at least 50 meq/100g (measured as Ca^{++} exchange ; expressed as Ca CO_3 capacity).

Detersive Surfactants - The detergent compositions of this invention will contain organic surface-active agents ("surfactants") to provide the usual cleaning benefits associated with the use of such materials.

Detersive surfactants useful herein include well-known synthetic anionic, amphoteric and zwitterionic surfactants. Typical of these are the alkyl benzene sulfonates, alkyl- and alkylether sulfates, paraffin sulfonates, olefin sulfonates, amine oxides, α-sulfonates of fatty acids and of fatty acid esters, and the like, which are well-known from the detergency art. In general, such detersive surfactants contain an alkyl group in the C_9-C_{18} range; the anionic detersive surfactants can be used in the form of their sodium, potassium or triethanolammonium salts. U.S. Patent 4 111 855 contains detailed listings of such typical detersive surfactants. C_{11}-C_{16} alkyl benzene sulfonates, C_{12}-C_{18} paraffin-sulfonates and alkyl sulfates are especially preferred in the compositions of the present type.

Also useful herein as the surfactant are the water-soluble soaps, e.g. the common sodium and potassium coconut or tallow soaps well-known in the art.

The surfactant component can comprise as little as 1% of the laundry detergent compositions herein, but generally the compositions will contain 5% to 40%, preferably 6% to 30%, of surfactant. Mixtures of the anionics, such as the alkyl benzene sulfonates, alkyl sulfates and paraffin sulfonates are preferred for through-the-wash cleansing of a broad spectrum of soils and stains from fabric.

Detersive Adjuncts - the Compositions herein can contain other ingredients which aid in their cleaning performance. For example, it is highly preferred that

through-the-wash detergent compositions contain a detergent builder and/or metal ion sequestrant. Compounds classifiable and well-known in the art as detergent builders include the nitrilotriacetates, polycarboxylates, citrates, water-soluble phosphates such as tri-polyphosphate and sodium ortho- and pyro-phosphates, silicates, and mixtures thereof. Metal ion sequestrants include all of the above, plus materials like ethylenediaminetetraacetate, the amino-polyphosphonates and phosphates (DEQUEST) and a wide variety of other poly-functional organic acids and salts too numerous to mention in detail here. See U.S. Patent 3 579 454 for typical examples of the use of such materials in various cleaning compositions. In general, the builder/sequestrant will comprise about 0.5% to 45% of the composition. The 1-10 micron size zeolite (e.g. zeolite A) builders disclosed in German patent 2 422 655 are especially preferred for use in low-phosphate compositions which contain the softeners described herein.

The laundry compositions herein also preferably contain enzymes to enhance their through-the-wash cleaning performance on a variety of soils and stains. Amylase and protease enzymes suitable for use in detergents are well-known in the art and in commercially available liquid and granular detergents. Commercial detersive enzymes (preferably a mixture of amylase and protease) are typically used at levels of 0.001% to 2%, and higher, in the present compositions.

Moreover, the compositions herein can contain, in addition to ingredients already mentioned, various other optional ingredients typically used in commercial products to provide aesthetic or additional product performance benefits. Typical of such ingredients (used at 0.5-35% levels) are: pH regulants, perfumes, dyes, bleaches,

optical brighteners, soil suspending agents, hydrotropes and gel-control agents, freeze-thaw stabilizers, bactericides, preservatives, bleach activators and the like.

Another class of optional ingredient includes the softener adjuncts known in the patent literature for use in combination with smectite clay softeners. In general, such materials are amine or quaternary ammonium compounds, and mixtures thereof. Included among such preferred materials are the C_{12}-C_{18} alkyl trimethyl ammonium chlorides and bromides, dioctyl dimethyl ammonium chloride and bromide, coconutalkyl amine, dicoconut alkyl amine, tri-C_{12}-C_{14} alkyl amine, and the like.

In a through-the-wash mode, the compositions prepared in the manner of this invention are typically used at a concentration of at least 500 ppm, preferably 0.10% to 1.5%, in an aqueous laundry bath at pH 7-11 to launder fabrics. The laundering can be carried out over the range from 5°C to the boil, with excellent results and without excessive sudsing.

INDUSTRIAL APPLICATION

The compositions herein are prepared by separately forming the suds control agent and the detergent "base" granule, and then coating the granule with the suds control agent. In a commercial process, the coating will not usually completely cover each granule, and, indeed, perfect coating is not necessary to the successful practice of the invention; "substantially" coating the base granules will suffice.

The base granules can be formed from an aqueous crutcher mix by any of a number of well-known processes, but conventional spray-drying is convenient.

The coating can be applied in any number of ways, but simple spraying onto the granules is convenient.

One of the advantages of the present invention is that it can be performed using conventional procedures and apparatus known in the detergency arts.

The following examples are typical of a composition prepared according to this invention, but are not intended to be limiting thereof.

EXAMPLE I

An aqueous crutcher mix comprising the following ingredients is prepared (percentages listed relate to percent ingredients in the complete formulation after spray-drying)and spray-dried in a standard tower to form base granules.

Ingredients	Percent
C_{11-12} alkyl benzene sulfonate	6.2
Sodium perborate ***	20.0
Sodium tripolyphosphate	24.0
Sodium sulfate	22.0
Sodium silicate	8.0
Smectite clay*	2.4
Ditallow methyl amine	3.8
Carboxymethyl cellulose	0.4
Polyacrylate(soil suspender)	1.7
Sodium toluene sulfonate	0.8
Enzymes ***	0.5
Optical brightener	0.23
Sulphonated zinc phthalocyanine**	25 ppm
EDTA	0.2
Perfume/copper salts/minors	0.5
Moisture	to 100

* Natural smectite; ion-exchange capacity above 50meq/100g clay

** U.S. Patent 3.927.967.

*** Dry-mixed with granule after spray-drying

A suds-control agent is prepared by milling 0.09% hydrophobic silica (1-10 micron); 0.3 % polydimethylsiloxane fluid; 1.0% tallow alcohol ethoxylate (11) and 0.015% ethoxy/propoxy siloxane (all percentages reported based on final composition) and sprayed onto the base granules.

The composition of Example I is free-flowing and exhibits excellent through-the-wash fabric softening performance.

EXAMPLE II

A highly preferred spray-dried granule which contains a mixed softener active comprising clay/amine/quaternary is prepared as follows.

INGREDIENT	PERCENT
C_{11}-$_{12}$ Alkyl Benzene Sulfonate (Na)	6
Sodium Tripolyphosphate	12
Zeolite A (1-10 micron)	12
Silicate Solids	8
Sodium Sulphate	23
Sodium Perborate (anhydrous)*	10
Tetraacetyl Ethylene Diamine	1.0
Smectite Clay	2.4
Tetradecyl Trimethyl Ammonium Chloride	2
Ditallow Methyl Amine	4
Sodium Toluene Sulfonate	0.6
Protease Enzyme*	0.5
CMC/Soil Release Polymers	2
Brightener/Perfume*/Minors	2
Moisture	balance

* The indicated ingredients are mixed with the granules after spray-drying.

A suds control agent comprising microfine hydrophobic silica (0.08%; Sipernat D-10®) plus tallow alcohol ethoxylate (EO11) 0.9% plus ethoxypropoxysiloxane (0.026%; DC 198®) and polydimethylsiloxane (0.25%; DC 200®) is prepared by milling the ingredients together. The agent is then sprayed uniformly onto the granules of Example II.

CLAIMS

1. A granular detergent composition comprising conventional detersive surfactants, fabric softener clay, and detersive adjuncts, characterized in that the granules of said composition are substantially coated with a suds control agent comprising (as percentages of total composition) :

i) 0.18-0.35% polydimethylsiloxane fluid;

ii) 0.06-0.12% impalpable hydrophobic silica;

iii) 0.015-0.035% alkoxylated siloxane; and

iv) 0.5-1.5% ethoxylated alcohol.

2. A granule according to Claim 1 which comprises 0.5%-45% sodium tripolyphosphate, nitrilotriacetate, zeolite, or mixtures thereof as a detersive adjunct.

3. A granule according to Claim 2 which comprises smectite clay as the fabric softener clay.

4. A granule according to Claim 3 which additionally comprises 0.1%-15% of an amine or quaternary ammonium fabric softener adjunct, or mixtures thereof.

5. A granule according to Claims 1-4 which contains a bleach, a bleach activator or an enzyme as a detersive adjunct.