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(54) **Title:** COMPOSITION

(57) **Abstract:** A liquid detergent composition comprises: (a) from about 0.01% to about 5% by weight of a cellulase enzyme; and (b) from about 0.001% to about 5% by weight polyvinylpyrrolidone (PVP) or salt thereof, or mixtures thereof, wherein said polyvinylpyrrolidone or salts thereof have an average molecular weight of from 20000 to 60000.

COMPOSITION

The present invention relates to a detergent composition.

Detergent compositions (especially laundry detergents) have to be able to provide many functions within the overall cleaning operation, such as soil removal, water softening, fabric softening and so on. Furthermore the functions have to be provided with a view to external considerations such as ease of use, formulation stability, and environmental considerations.

Of the external factors one of ever increasing importance is that of environmental considerations. The effect of household effluent discharges, even following processing, into water features such as rivers, lakes and seas can no longer be ignored.

However, the simple removal of some of components from the detergent formulation as a result of their detrimental environmental impact is no so straightforward. The loss of certain components cannot be readily tolerated due to the impact that such a loss leaves on the remaining formulation. This loss is generally reflected in overall poorer performance on certain aspects of the washing operation. Other negative factors (such as reduced stability) may also come into play.

The impact of these considerations is strongly felt in the area of soil suspension. This is a required / desired part of a laundry washing operation as soil suspension agents prevent the re-deposition of soils back onto the item (fabric) being cleaned. The simple removal of soil suspension agents is typically reflected in that the items being cleaned show a larger tendency towards graying / discoloration which is aesthetically unpleasing as well as being indicative of a poor cleaning operation.

An additional issue affecting the performance of laundry detergent is that of water consumption in domestic washing machines. The amount of water used in a typical wash cycle is continually being lowered for environmental and cost reasons (an increasing issue since most consumers are now charged per unit of water used). More economical (in terms of water) laundry washing machines present a concern since the soil removed from the clothing being washed is more concentrated in the wash liquor and thus imparts a larger

re-deposition effect on clothing being washed. It is an escalating problem to address performance of laundry detergents with lower machine water consumption.

It is an object of the present invention to obviate / mitigate the problems outlined above.

According to a first aspect of the invention there is provided a liquid detergent composition comprising:

(a) from about 0.01% to about 5% by weight of a cellulase enzyme; and

(b) from about 0.001% to about 5% by weight polyvinylpyrrolidone (PVP) or salt thereof, or mixtures thereof, wherein said polyvinylpyrrolidone or salts thereof have an average molecular weight of from 20000 to 60000.

It has surprisingly been found that the composition of the invention provides an excellent soil removal / suspension ability in a laundry washing operation. Without wishing to be limited by theory it is proposed that this effect arises due to a synergistic combination of the PVP and cellulase enzyme. Also the composition is unexpectedly advantageous in that it is readily biodegradable

Further, the invention is also directed (in a second aspect) to the use of the above-described compositions as a laundry detergent, detergent booster, stain treater, laundry detergent, etc.

The use is particularly suited to the enhancement of soil suspending performance in a laundry washing operation.

Preferably the composition is free of polyacrylate polymer and / or carboxymethyl cellulose.

Preferably the composition is free of bleach and / or phosphate based builders.

Generally the composition comprises the cellulase enzyme in an amount of 0.1% to about 1% by weight, most preferably about 0.5% by weight.

Preferably the cellulase enzyme comprises a cellulase enzyme supplied under the Trade Name Endolase (e.g. Endolase 5000L), (available from Novozymes).

Generally the composition comprises the PVP in an amount of 0.1% to about 2% by weight, most preferably about 1.5% by weight.

Preferably the PVP has a molecular weight of about 40000. Preferably the PVP is supplied under the Trade Name Sokalan (e.g. Sokalan HP53), (available from BASF).

Additional Enzymes

Further enzymes suitable for use in the compositions include protease and amylase enzymes.

The proteolytic enzymes suitable for the present compositions include the various commercial liquid enzyme preparations which have been adapted for use in association with detergent compositions. Enzyme preparations in powdered form are also useful although, as a general rule, less convenient for incorporation into liquid compositions. Suitable liquid enzyme preparations include "Alcalase", "Savinase", "Liquanase" and "Esperase", all trademarked products sold by Novo Industries, Copenhagen, Denmark, and "Maxatase", "Maxacal", "Purafect Prime" and "AZ-Protease" and "Properase" sold by Gist-Brocades, Delft, The Netherlands.

Among the suitable alpha-amylase liquid enzyme preparations are those sold by Novo Industries and Gist-Brocades under the tradenames "Stainzyme", "Termamyl" and "Maxamyl", respectively.

Mixtures of proteolytic and amylase enzymes can and often are used to assist in removal of different types of stains.

The proteolytic enzyme and/or amylase enzyme will normally be present in the compositions in an effective amount in the range of from about 0.05% to about 5%, preferably from about 0.5% to about 2%, by weight of the composition. Generally, lower levels of amylase are required.

Enzyme Stabilisers

Preferably a salt of the hydroxycarboxylic acid such as sodium citrate which is preferred because of its ready availability and contribution to improving physical stability of the composition - i.e., preventing phase separation, as well as providing efficacy

against oxidizable stains, e.g., coffee and wine stains. However, other hydroxydi- or hydroxytri-carboxylic acids can be employed, such as malic acid, tartaric acid, isocitric acid or tri-hydroxyglutaric acid. The preferred sodium citrate is conveniently used in the form of its dihydrate. Alternatively, citric acid itself may be used in formulating the compositions. However, since the compositions are at an alkaline pH, the hydroxydi- or hydroxytri-carboxylic acid will be present in its ionized salt state. This ingredient is used in an amount ranging of about 5% to about 20% of the entire enzyme-containing composition, preferably amounts of from 8% to 15%, and more preferably in amounts of from 10% to 13%.

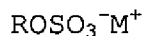
An alkali metal chloride, preferably calcium chloride. This ingredient is used in an amount of from about 2% to about 15% based on the weight of the entire enzyme-containing composition, preferably, the chloride ingredient is used in amounts ranging from 4% to 12%, and more preferably from 5% to 8%.

Surfactant

Preferably the composition contains from about 10% to about 20% of a nonionic surfactant. Preferred examples of nonionic surfactants include C₈-C₁₈ alcohol alkoxyated with 5 to 7 moles of ethylene oxide. A wide variety of alkoxyated fatty alcohols are known to the art and these vary considerably in HLB (hydrophile-lipophile balance). For purposes of this invention, it is preferable to employ an alkoxyated alcohol which is relatively hydrophobic. Preferred surfactants are fatty alcohols having from about 8 about 15 carbon atoms, alkoxyated with about 5 to 7 moles of ethylene oxide. A particularly preferred surfactant is that sold under the trademark Lialet 125 and has a formulation of C₁₂-C₁₅ alcohols alkoxyated with 7 moles of ethylene oxide.

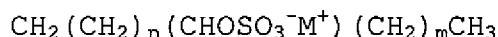
Preferably the composition contains from about 10% to about 20% of an anionic surfactant. Preferred examples of anionic surfactants include straight-chained or branched alkyl sulfates and alkyl polyalkoxyated sulfates, also known as alkyl ether sulfates. Such surfactants may be produced by the sulfation of higher C₈-C₂₀ fatty alcohols.

Other examples of primary alkyl sulfate surfactants are those of formula:



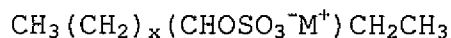
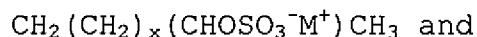
wherein R is a linear C₈-C₂₀ hydrocarbyl group and M is a water-solubilising cation. Preferably R is C₁₀-C₁₆ alkyl, for example C₁₂-C₁₄, and M is alkali metal such as lithium, sodium or potassium.

Examples of secondary alkyl sulfate surfactants are those which have the sulfate moiety on a "backbone" of the molecule, for example those of formula:



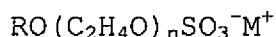
wherein m and n are independently 2 or more, the sum of m+n typically being 6 to 20, for example 9 to 15, and M is a water-solubilising cation such as lithium, sodium or potassium.

Especially preferred secondary alkyl sulfates are the (2,3) alkyl sulfate surfactants of formulae:



for the 2-sulfate and 3-sulfate, respectively. In these formulae x is at least 4, for example 6 to 20, preferably 10 to 16. M is cation, such as an alkali metal, for example lithium, sodium or potassium.

Examples of alkoxyated alkyl sulfates are ethoxylated alkyl sulfates of the formula:



wherein R is a C₈-C₂₀ alkyl group, preferably C₁₀-C₁₈ such as a C₁₂-C₁₆, n is at least 1, for example from 1 to 20, preferably 1 to 15, especially 1 to 6, and M is a salt-forming cation such as lithium, sodium, potassium, ammonium, alkylammonium or alkanolammonium. These compounds can provide especially desirable fabric cleaning performance benefits when used in combination with alkyl sulfates.

The alkyl sulfates and alkyl ether sulfates will generally be used in the form of mixtures comprising varying alkyl chain lengths and, if present, varying degrees of alkoxylation.

Other anionic surfactants which may be employed are salts of fatty acids, for example C₈-C₁₈ fatty acids, especially the sodium potassium or alkanolammonium salts, and alkyl, for example C₈-C₁₈, benzene sulfonates.

Additional

To bring the pH to within the desired range of a sufficient amount of an acid or an alkali is added to adjust the pH.

The compositions of this invention desirably also contain at least one organic solvent which is preferably water-miscible. Such useful organic solvents include: the linear alcohols such as ethanol, isopropanol and the isomers of butanol; diols; glycols such as ethylene glycol, propylene glycol and hexylene glycol; glycol ethers, etc. Low molecular weight solvents, i.e., those from 1 to 8 carbon atoms, are preferred. Particularly preferred solvents are propylene glycol and glycerol.

The composition additionally comprises up to 10%wt, 8% wt, 6%wt, 4%wt, 2%wt, 1%wt or 0.5%wt of minor ingredients selected from one or more of the following: dye, fragrance, preservative, optical brightener, dye transfer inhibitor or a bittering agent.

In order to provide desirable rheologic characteristics to the composition of this invention, thickeners should be added. These include polymeric substances which function as viscosity stabilizers and aid in enzyme stabilization. Exemplary of such polymeric compositions are polyacrylic acid, polymethacrylic acid, acrylic/methacrylic acid copolymers, hydrolyzed polyacrylamide, hydrolyzed polymethacrylamide, hydrolyzed polyacrylonitrile, hydrolyzed polymethacrylonitrile, etc. Water soluble salts or partial salts of these polymers, as well as their respective alkali metal or ammonium salts can also be used. A preferred polymeric substance is sold under the trademark Polygel DA, which is a polyacrylic acid having a molecular weight greater than 1,000,000. These polymers are used in amounts ranging from about 0.1% to 1%, preferably about 0.4%.

A preferred thickening agent is xanthan gum which may be present in an amount of from between 0.1% and 0.5%, preferably about 0.3%. In addition to providing beneficial

viscosity characteristics to the compositions, xanthan gum also assists in the removal of certain stains.

The compositions of this invention may also include one or more of the usual additives usually present in compositions of this type. Such additives include perfumes, dyes, preservatives, antibacterial agents, fluorescent whitening agents, pigments, etc.

Suitable preservatives include the isothiazolinones sold under the trademark Kathon DP3 and available from Rohm & Haas.

The compositions may also comprise suspended particles which differ in colour or shade from the aqueous liquid composition. These particles (speckles) can serve an aesthetic purpose and can also provide an additional amount of an agent to the composition. Speckles can be present in amounts ranging from about 0.01 to about 1.0 weight percent. Typically, they will consist of a solid material which can function as an additional stabilizing agent, a coating which melts at a suitable temperature, and a small amount of dye.

The amount of water present in the composition is at least 30%wt, 40%wt, or 50%wt.

The invention is further illustrated with reference to the following non-limiting Examples.

Examples

The following formulation was tested in a wash program (40min. Temp.40°C, soils Empa 116 - Empa 104, switch EMPA 221) at 75g in 15l of water.

Component	Wt%
Calcium chloride	0.03
Citric Acid (50%)	3.0
Sodium Hydroxide (48%)	3.6
Sodium Sulfite	0.1
TEA (99%)	3.0
Glycerol	21.0
Ethanol	1.0
ELS (26%)	42.0
Coconut Acids	5.0
Rokanol	14.0
DTPMP C (32.5%)	2.0
BIT 20%	0.15
Dye	0.05
Perfume WD4 FM 2433	0.25
Protease	0.9
Amylase	0.3
Cellulase (Endolase 5000L)	0.1
PVP (30%)	0.5
water	To 100

After 5 washes the L-Value was 79.9, this compared favorably with a commercially available powder detergent which had an L-Value of 81.7.

After 10 washes the L-Value was 77.4, this compared favorably with a commercially available powder detergent which had an L-Value of 79.2.

CLAIMS

1. According to a first aspect of the invention there is provided a liquid detergent composition comprising:

(a) from about 0.01% to about 5% by weight of a cellulase enzyme; and

(b) from about 0.001% to about 5% by weight polyvinylpyrrolidone (PVP) or salt thereof, or mixtures thereof, wherein said polyvinylpyrrolidone or salts thereof have an average molecular weight of from 20000 to 60000.

2. A composition according to claim 1, wherein the composition is free of polyacrylate polymer and / or carboxymethyl cellulose.

3. A composition according to claim 1 or 2, wherein the composition is free of bleach and / or phosphate based builders.

4. A composition according to claim 1,2 or 3, wherein the composition comprises the cellulase enzyme in an amount of about 0.5% by weight.

5. A composition according to any one of the preceding claims, wherein the composition comprises the polyvinylpyrrolidone or salt thereof in an amount of about 1.5% by weight.

6. The use of the composition according to any one of claims 1 to 5 as a laundry detergent, detergent booster, stain treater, laundry detergent.

INTERNATIONAL SEARCH REPORT

International application No PCT/GB2010/051073

A. CLASSIFICATION OF SUBJECT MATTER
 INV. C11D3/37 C11D3/386
 ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 576 778 A1 (PROCTER & GAMBLE [US]) 5 January 1994 (1994-01-05) examples 1,2 -----	1-6
X	EP 0 508 358 A1 (PROCTER & GAMBLE [US]) 14 October 1992 (1992-10-14) examples VI, VII -----	1-6
X	WO 97/32958 A1 (UNILEVER NV [NL]; UNILEVER PLC [GB]) 12 September 1997 (1997-09-12) page 14, line 1 - page 15, line 20 -----	1-5

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

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- "&" document member of the same patent family

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/GB2010/051073

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