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(71) Applicant: **The Procter & Gamble Company**
Cincinnati, OH 45202 (US)

(72) Inventors:
- **DI IORIO, Marta**
  1853 Strombeek-Bever (BE)
- **MATTHYS, Bruno Jean-Pierre**
  1853 Strombeek-Bever (BE)
- **WENDT, Hans**
  1853 Strombeek-Bever (BE)

(74) Representative: **Pickford, James Lawrence**
Procter & Gamble
Technical Centres Limited
Whitley Road
Longbenton
Newcastle upon Tyne NE12 9TS (GB)

(54) **USE OF AN AMPHIPHILIC GRAFT POLYMER AS A DYE TRANSFER INHIBITOR**

(57) Disclosed is the use of an amphiphilic graft polymer as a dye transfer inhibitor and use of said amphiphilic graft polymer as a dye transfer inhibitor in a laundry wash process.

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Description

FIELD OF THE INVENTION

[0001] The present invention discloses the use of an amphiphilic graft polymer as a dye transfer inhibitor and use of said amphiphilic graft polymer as a dye transfer inhibitor in a laundry wash process.

BACKGROUND OF THE INVENTION

[0002] Consumers use laundry detergent compositions during the laundry process. Such laundry detergent compositions provide cleaning and/or care benefits to the fabrics during the laundry operation. Water-soluble unit dose articles are especially liked by consumers due to their convenience and ease of use during the laundry operation.

[0003] It is desired to formulate multiple active materials into laundry detergent compositions to provide multiple consumer preferred benefits. However, formulators often face a trade-off of one benefit for another due to a required prioritization call of one active versus the other due to space constraints for actives within the formulation. This is especially true for compacted formulations, such as those found in water-soluble unit dose articles in which there is finite space available for formulating actives into the composition.

[0004] Therefore, there is a desire in the art to formulate actives that provide multiple benefits in laundry detergent compsotions especially in compacted compositions such as water-soluble unit dose articles, with reduced or no trade-off of one benefit in preference of another.

[0005] Today there is an increased desire to formulate dye transfer inhibitors within laundry detergent composition especially water soluble unit dose laundry detergents, especially in view of consumers' wish not having to separate colored from white laundry items anymore. More specifically, there is a desire in the art to formulate dye transfer inhibitors into laundry detergent compositions especially water-soluble unit dose articles without trade-off of one or more other benefits due to space restrictions to formulate further detergent actives, i.e. it is particularly desired to formulate actives providing dye transfer inhibiting benefits beyond further key performance benefits expected from laundry detergent composition, especially grease removal, body soil cleaning, soil suspension and whiteness maintenance performance benefits.

[0006] Amphiphilic graft polymers are known to provide grease-removal, body soil cleaning, soil suspension and whiteness maintenance benefits.

[0007] It was now surprisingly found that amphiphilic graft polymers also provide a dye transfer inhibition benefit in addition to the benefit of grease-removal, body soil cleaning, soil suspension and whiteness maintenance for which they have traditionally been used.

SUMMARY OF THE INVENTION

[0008] A first aspect of the present invention is the the use of an amphiphilic graft polymer as a dye transfer inhibiter wherein the amphiphilic graft polymer is based on polyalkylene oxides and vinyl esters, preferably based on water-soluble polyalkylene oxides (A) as a graft base and side chains formed by polymerization of a vinyl ester component (B), preferably, said polymer having an average of < 1 graft site per 50 alkylene oxide units and wherein the amphiphilic graft polymer has from 20% to 70% by weight of the amphiphilic graft polymer of the polyalkylene oxide (A), preferably the water-soluble polyalkylene oxide (A) as a graft base, and wherein the amphiphilic graft polymer comprises from 30 to 80% by weight of the vinyl ester component (B) and from 0% to 30% by weight of a C1-C8-alkyl acrylate (B2).

[0009] A second aspect of the present invention is use of the amphiphilic graft polymer according to the present invention as a dye transfer inhibitor in a laundry wash operation, preferably wherein the amphiphilic graft polymer is comprised within a wash liquor wherein the wash liquor is in contact with fabrics to be washed.

DETAILED DESCRIPTION OF THE INVENTION

Use

[0010] The present invention discloses the use of an amphiphilic graft polymer as a dye transfer inhibiter. The amphiphilic graft polymer is described in more detail below.

[0011] By "dye transfer inhibitor" we herein mean an active preventing or reducing the transfer of a dye from a first colored item, preferably laundry item, onto a second item, preferably laundry item, during a washing cycle, preferably during a laundry wash cycle. Without wishing to be bound by theory the dye transfer inhibitor might 'lock the dye' on the first item, capture the bleeded dye into the wash solution, or shield the second item from the bled dye.

[0012] Preferably, the amphiphilic graft polymer is used as a dye transfer inhibitor in a laundry wash operation. Those

skilled in the art will recognize a suitable laundry wash operation. Without wishing to be bound by theory a laundry wash operation involves the preparation of a wash liquor. Fabrics to be washed are contacted with the wash liquor. The wash operation can be a manual wash operation, an automatic wash operation or a mixture thereof.

[0013] Preferably, the amphiphilic graft polymer is comprised within a wash liquor wherein the wash liquor is in contact with fabrics to be washed.

[0014] By fabric we preferably mean a textile or cloth comprising a network of natural or artificial fibers. Those skilled in the art will be aware of suitable fabrics. The fabric may be selected from cotton, polyester, cotton/polyester blends or a mixture thereof, preferably cotton. The fabric may comprise a stain, soil or mixture thereof to be removed. Those skilled in the art will be aware of suitable stains or soils to be removed.

[0015] Preferably, the wash liquor is prepared by diluting a laundry detergent composition, preferably a liquid laundry detergent composition in water wherein the laundry detergent composition comprises the amphiphilic graft polymer. Preferably, the laundry detergent composition is diluted by between 300 and 800 fold, more preferably between 400 and 700 fold in water to form the wash liquor. Those skilled in the art will be aware of suitable laundry detergent compositions. The laundry detergent composition may be a powder, a liquid or a mixture thereof. The laundry detergent composition maybe comprised within a water-soluble unit dose article comprising a water-soluble film. The laundry detergent composition and water-soluble unit dose article are described in more detail below.

[0016] Preferably, the wash liquor is at a temperature ofbetween 5°C and 90°C, preferably between 10°C and 60°C, more preferably between 12°C and 45°C, most preferably between 15°C and 40°C.

[0017] Preferably, the wash step takes between 5 minutes and 50 minutes, preferably between 5 minutes and 40 minutes, more preferably between 5 minutes and 30 minutes, even more preferably between 5 minutes and 20 minutes, most preferably between 6 minutes and 18 minutes to complete.

[0018] Preferably, the fabrics to be washed have previously been washed in a wash liquor comprising an amphiphilic graft polymer, a fabric softening active or a mixture thereof. Preferably, the fabrics to be washed comprise an amphiphilic graft polymer, a fabric softening active or a mixture thereof deposited thereon in a previous wash or rinse cycle.

[0019] The amphiphilic graft polymer in the previous wash liquor, deposited on the fabrics to be washed maybe the same or different to the amphiphilic graft polymer in the wash liquor. Preferably, the amphiphilic graft polymer in the previous wash liquor, deposited on the fabrics to be washed is the same as the amphiphilic graft polymer in the wash liquor.

[0020] The fabric softening active may be selected from the group consisting of quaternary ammonium compounds, amines, fatty esters, sucrose esters, silicones, dispersible polyolefins, polysaccharides, fatty acids, softening oils, polymer latexes, softening clays and combinations thereof. Preferably the fabric softening active is selected from the group consisting of quaternary ammonium compounds and mixtures thereof, more preferably ester quats, most preferably the fabric softening active is selected from the group consisting of monester quats, diester quats, triester quats and combinations thereof, more preferably diester quats, most preferably Diethylester Dimethyl Ammonium Chloride.

Amphiphilic graft polymer

[0021] It was surprisingly found that amphiphilic graft polymers preferably amphiphilic graft polymers based on water-soluble polyalkylene oxides (A) as a graft base and side chains formed by polymerization of a vinyl ester component (B) are inhibiting transfer of dyes between fabrics during a laundry cycle.

[0022] The amphiphilic graft polymers preferably have a low degree of branching (degree of grafting). They have, on average, based on the reaction mixture obtained, not more than 1 graft site, preferably not more than 0.6 graft site, more preferably not more than 0.5 graft site and most preferably not more than 0.4 graft site per 50 alkylene oxide units. They comprise, on average, based on the reaction mixture obtained, preferably at least 0.05, in particular at least 0.1 graft site per 50 alkylene oxide units. The degree of branching can be determined, for example, by means of 13C NMR spectroscopy from the integrals of the signals of the graft sites and the -CH2-groups of the polyalkylene oxide.

[0023] In accordance with their low degree of branching, the molar ratio of grafted to ungrafted alkylene oxide units in the preferred amphiphilic graft polymers is from 0.002 to 0.05, preferably from 0.002 to 0.035, more preferably from 0.003 to 0.025 and most preferably from 0.004 to 0.02.

[0024] The mean molecular weight Mw of the preferred amphiphilic graft polymers is from 3000 to 100 000, preferably from 6000 to 45 000 and more preferably from 8000 to 30 000.

[0025] The preferred amphiphilic graft polymers feature a narrow molar mass distribution and hence a polydispersity Mw/Mn of generally < 3, preferably < 2.5 and more preferably < 2.3. Most preferably, their polydispersity Mw/Mn is in the range from 1.5 to 2.2.

[0026] Without wishing to be bound by theory, the polydispersity is a measure of the distribution of molecular mass in a given polymer sample. Polydispersity is calculated and is the weight average molecular weight (Mw) divided by the number average molecular weight (Mn). It indicates the distribution of individual molecular masses in a batch of polymers. Polydispersity has a value equal to or greater than 1, but as the polymer chains approach uniform chain length, polydiseprsity approaches unity.

[0027] Gel permeation chromatography is used to define Mw and Mn and then Polydispersity is calculated accordingly as Mw/Mn. The polydispersity of the graft polymers can be determined, for example, by gel permeation chromatography using narrow-distribution polymethyl methacrylates as the standard.

[0028] Owing to their low degree of branching and their low polydispersity, the amphiphilic character and the block polymer structure of the inventive graft polymers is particularly marked. The preferred amphiphilic graft polymers also have only a low content of ungrafted polyvinyl ester (B). In general, they comprise < 10% by weight, preferably < 7.5% by weight and more preferably < 5% by weight of ungrafted polyvinyl ester (B).

[0029] Owing to the low content of ungrafted polyvinyl ester and the balanced ratio of components (A) and (B), the preferred amphiphilic graft polymers are soluble in water or in water/alcohol mixtures (for example a 25% by weight solution of diethylene glycol monobutyl ether in water). They have pronounced, low cloud points which, for the graft polymers which are soluble in water at up to 50°C, are generally < 95°C, preferably < 85°C and more preferably < 75°C, and for the other graft polymers in 25% by weight diethylene glycol monobutyl ether, generally < 90°C, preferably from 45 to 85°C.

[0030] The preferred amphiphilic graft polymers have

(A) from 20 to 70% by weight of a water-soluble polyalkylene oxide as a graft base and
(B) side chains formed by free-radical polymerization of from 30 to 80% by weight of a vinyl ester component composed of

(B 1) from 70 to 100% by weight of vinyl acetate and/or vinyl propionate and (B2) from 0 to 30% by weight of a further ethylenically unsaturated monomer in the presence of (A).

More preferably, they comprise from 25 to 60% by weight of the graft base (A) and from 40 to 75% by weight of the polyvinyl ester component (B).

[0031] Water-soluble polyalkylene oxides suitable for forming the graft base (A) are in principle all polymers based on C2-C4-alkylene oxides which comprise at least 50% by weight, preferably at least 60% by weight, more preferably at least 75% by weight of ethylene oxide in copolymerized form.

[0032] The polyalkylene oxides (A) preferably have a low polydispersity Mw/Mn. Their polydispersity is preferably < 1.5.

[0033] The polyalkylene oxides (A) maybe the corresponding polyalkylene glycols in free form, i.e. with OH end groups, but they may also be capped at one or both end groups. Suitable end groups are, for example, C1-C25-alkyl, phenyl and C1-C14-alkylphenyl groups.

[0034] Specific examples of particularly suitable polyalkylene oxides (A) include:

(A1) polyethylene glycols which may be capped at one or both end groups, especially by C1-C25-alkyl groups, but are preferably not etherified, and have mean molar masses Mn of preferably from 1500 to 20 000, more preferably from 2500 to 15 000;
(A2) copolymers of ethylene oxide and propylene oxide and/or butylene oxide with an ethylene oxide content of at least 50% by weight, which may likewise be capped at one or both end groups, especially by C1-C25-alkyl groups, but are preferably not etherified, and have mean molar masses Mn of preferably from 1500 to 20 000, more preferably from 2500 to 15 000;
(A3) chain-extended products having mean molar masses of in particular from 2500 to 20 000, which are obtainable by reacting polyethylene glycols (A1) having mean molar masses Mn of from 200 to 5000 or copolymers (A2) having mean molar masses Mn of from 200 to 5000 with C2-C12-dicarboxylic acids or -dicarboxylic esters or C6-C18-diisocyanates.

Preferred graft bases (A) are the polyethylene glycols (A1).

[0035] The side chains of the inventive graft polymers are formed by polymerization of a vinyl ester component (B) in the presence of the graft base (A).

[0036] The vinyl ester component (B) may consist advantageously of (B1) vinyl acetate or vinyl propionate or of mixtures of vinyl acetate and vinyl propionate, particular preference being given to vinyl acetate as the vinyl ester component (B).

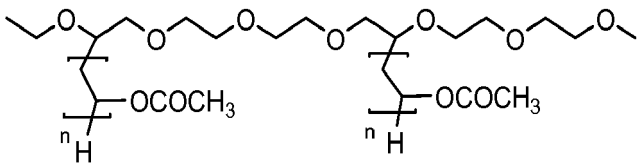
[0037] However, the side chains of the graft polymer can also be formed by copolymerizing vinyl acetate and/or vinyl propionate (B1) and a further ethylenically unsaturated monomer (B2). The fraction of monomer (B2) in the vinyl ester component (B) may be up to 30% by weight, which corresponds to a content in the graft polymer of (B2) of 24% by weight.

[0038] Suitable comonomers (B2) are, for example, monoethylenically unsaturated carboxylic acids and dicarboxylic acids and their derivatives, such as esters, amides and anhydrides, and styrene. It is of course also possible to use mixtures of different comonomers. Specific examples of comonomers include: (meth)acrylic acid, C1-C12-alkyl and hydroxy-C2-C12-alkyl esters of (meth)acrylic acid, (meth)acrylamide, N-C1-C12-alkyl(meth)acrylamide, N,N-di(C1-C6-

alkyl)(meth)acrylamide, maleic acid, maleic anhydride and mono(C1-C12-alkyl)esters of maleic acid. Preferred monomers (B2) are the C1-C8-alkyl esters of (meth)acrylic acid and hy droxyethyl acrylate, particular preference being given to the C1-C4-alkyl esters of (meth)acrylic acid.

[0039] Very particularly preferred monomers (B2) are methyl acrylate, ethyl acrylate and in particular n-butyl acrylate. When the preferred amphiphilic graft polymers comprise the monomers (B2) as a constituent of the vinyl ester component (B), the content of graft polymers in (B2) is preferably from 0.5 to 20% by weight, more preferably from 1 to 15% by weight and most preferably from 2 to 10% by weight.

[0040] Most preferred amphiphilic graft polymers are graft co-polymers of polyethylene glycol graft base and vinyl acetate side chains, as according to the following structure:



[0041] The polymers preferably have an ethylene oxide / vinyl acetate content of from about 30%/70% to about 50%/50%, most preferably about 40%/60%, and have a Mn value of from about 10000g/mol to about 20000g/mol, more preferably from about 10000g/mol to about 15000g/mol, most preferably about 13100g/mol, and a MW value of from about 20000g/mol to about 30000g/mol, preferably from about 25000g/mol to about 30000g/mol, most preferably about 27100g/mol, yielding a polydispersity Mw/Mn of from about 1 to 3, preferably 1.5 to 2.5, most preferably about 2.1. The average degree of grafted units per polyethyleneglycol polymer graft base preferably is less than 2.7, preferably between 0.5 and 2.5, more preferably between 1 and 2, most preferably about 1.6. n preferably is on average between 30 and 70, more preferably between 40 and 60, most preferably between 50 and 55. The polymer can for example be made through a reaction between PEG6000 and vinyl acetate in a weight ratio of 40:60 using a radical initiator.

[0042] The described amphiphilic graft polymers can be made using techniques previously described in the art, and as such those skilled in the art would understand how to produce such compounds. The amphiphilic graft polymers can for example be prepared by polymerizing a vinyl ester component (B) composed of vinyl acetate and/or vinyl propionate (B1) and, if desired, a further ethylenically unsaturated monomer (B2), in the presence of a water-soluble polyalkylene oxide (A), a free radical-forming initiator (C) and, if desired, up to 40% by weight, based on the sum of components (A), (B) and (C), of an organic solvent (D), at a mean polymerization temperature at which the initiator (C) has a decomposition half-life of from 40 to 500 min, in such a way that the fraction of unconverted graft monomer (B) and initiator (C) in the reaction mixture is constantly kept in a quantitative deficiency relative to the polyalkylene oxide (A).

[0043] Without wishing to be bound by theory, the amphiphilic graft polymer of the present invention balances the degree of hydrophilicity to hydrophobicity of the polymer. The need for low grafting level is to ensure overall solubility in water of the polymer. If a too high grafting level will be incorporated the polymer will turn insoluble and as such not provide dye transfer inhibiting benefits. On the other side too low amount of ungrafted content the polymer will just be soluble in water but not have the hydrophobic interaction with the respective dyes required to inhibit them from transferring on fabrics.

Laundry detergent composition

[0044] Preferably, the wash liquor is prepared by diluting a laundry detergent composition, preferably a liquid laundry detergent composition in water wherein the laundry detergent composition comprises the amphiphilic graft polymer.

[0045] A laundry detergent composition is any detergent suitable to be used in a fabric laundering operation.

[0046] The laundry detergent composition may be in the form of a powder, a liquid or a mixture thereof. Most preferably the laundry detergent is a water soluble unit dose article comprising a liquid laundry detergent and a water-soluble film.

[0047] The term 'liquid laundry detergent composition' refers to any laundry detergent composition comprising a liquid capable of wetting and treating a fabric, and includes, but is not limited to, liquids, gels, pastes, dispersions and the like. The liquid composition can include solids or gases in suitably subdivided form, but the liquid composition excludes forms which are non-fluid overall, such as tablets or granules.

[0048] The laundry detergent composition may comprise between 0.1% and 10%, preferably between 0.5% and 7%, more preferably between 0.75% and 5% even more preferably between 1% and 4%, most preferably between 1.25% and 3% by weight of the laundry detergent composition of the amphiphilic graft polymer.

[0049] The laundry detergent composition may comprise between 10% and 60%, preferably between 15% and 55%, more preferably between 20% and 50%, most preferably between 25% and 45% by weight of the laundry detergent composition of a non-soap surfactant. Preferably, the non-soap surfactant comprises an anionic surfactant and a non-

ionic surfactant. More preferably, the weight ratio of anionic surfactant to non-ionic surfactant is from 1:2 to 20:1, preferably from 1:1 to 15:1, more preferably from 1.5:1 to 10:1, most preferably from 5:1 to 10:1.

[0050] The non-soap anionic surfactant is preferably selected from linear alkylbenzene sulphonate, alkyl sulphate, alkoxylated alkyl sulphate or a mixture thereof. Preferably, the alkoxylated alkyl sulphate is an ethoxylated alkyl sulphate preferably with an average degree of ethoxylation of between 0.5 and 4, preferably between 1 and 4, more preferably between 2 and 4, most preferably about 3.

[0051] Preferably, the weight ratio of linear alkylbenzene sulphonate to alkoxylated alkyl sulphate is between 15:1 and 1:3, preferably 10:1 and 1:2, more preferably 5:1 and 1:1, even more preferably 3:1 and 1:1, most preferably 2:1 and 1:1.

[0052] The non-ionic surfactant may be selected from a fatty alcohol alkoxylate, an oxo-synthesised fatty alcohol alkoxylate, Guerbet alcohol alkoxylates, alkyl phenol alcohol alkoxylates, alkyl polyglucoside or a mixture thereof. Preferably, the non-ionic surfactant comprises a fatty alcohol ethoxylate non-ionic surfactant. Even more preferably the nonionic surfactant consists of a fatty alcohol ethoxylate surfactant.

[0053] Suitable fatty alcohol ethoxylate nonionic surfactants include the condensation products of aliphatic alcohols with from 1 to 25 moles of ethylene oxide. The alkyl chain of the aliphatic alcohol can either be straight or branched, guerbet, primary or secondary, and generally contains from 8 to 22 carbon atoms. The starting alcohol can be naturally derived, e.g. starting from natural oils, or synthetically derived, e.g. alcohols obtained from for example oxo-, modified oxo- or Fischer-Tropsch processes. Examples of oxo-process derived fatty alcohols include the Lial and Isalchem fatty alcohols ex Sasol company and Lutensol fatty alcohols ex BASF company. Examples of modified-oxo process derived fatty alcohols include the Neodol fatty alcohols ex Shell company. Fischer-Tropsch derived fatty alcohols include Safol fatty alcohols ex Sasol company. The alkoxylate chain of fatty alcohol ethoxylates is made up solely of ethoxylate groups.

[0054] Preferably, the fatty alcohol ethoxylate non-ionic surfactant comprises on average between 8 and 18, more preferably between 10 and 16 even more preferably between 12 and 15 carbon atoms in the alcohol carbon chain, and on average between 5 and 12, preferably between 6 and 10, more preferably between 7 and 8 ethoxy units in the ethoxylation chain.

[0055] Preferably, the weight ratio of linear alkylbenzene sulphonate to non-ionic surfactant is between 2:1 to 20:1 preferably 2:1 and 10:1; more preferably 5:1 and 10:1.

[0056] Preferably, the weight ratio of alkoxylated alkyl sulphate to non-ionic surfactant is between 2:1 and 20:1 preferably between 2:1 and 10:1 more preferably between 2:1 and 5:1.

[0057] Preferably, the weight ratio of linear alkylbenzene sulphonate to fatty alcohol ethoxylate non-ionic surfactant is between 2:1 to 20:1 preferably 2:1 and 10:1; more preferably 5:1 and 10:1.

[0058] Preferably, the weight ratio of alkoxylated alkyl sulphate to fatty alcohol ethoxylate non-ionic surfactant is between 2:1 and 20:1 preferably between 2:1 and 10:1 more preferably between 2:1 and 5:1.

[0059] The liquid laundry detergent composition may comprise a further polymer, preferably selected from alkoxylated, preferably ethoxylated polyethyleneimine, alkoxylated polyalkyl phenol, a polyester terephthalate, hydroxyethylcellulose, preferably quaternized hydroxyethylcellulose, a carboxymethylcellulose or a mixture thereof.

[0060] The liquid laundry detergent composition may comprise an adjunct material, wherein the adjunct material is preferably selected from polymers, builders, dispersants, enzyme stabilizers, catalytic materials, bleach, bleach activators, polymeric dispersing agents, anti-redeposition agents, suds suppressors, aesthetic dyes, opacifiers, perfumes, perfume delivery systems, structurants, hydrotropes, processing aids, pigments and mixtures thereof.

[0061] Those skilled in the art will know how to make the laundry detergent composition using known techniques.

Water-soluble unit dose article

[0062] The laundry detergent composition may be comprised in a water-soluble unit dose article comprising a water-soluble film.

[0063] The water-soluble unit dose article comprises the water-soluble film shaped such that the unit-dose article comprises at least one internal compartment surrounded by the water-soluble film, and wherein the laundry detergent composition is present within said compartment. The unit dose article may comprises a first water-soluble film and a second water-soluble film sealed to one another such to define the internal compartment. The water-soluble unit dose article is constructed such that the laundry detergent composition does not leak out of the compartment during storage. However, upon addition of the water-soluble unit dose article to water, the water-soluble film dissolves and releases the contents of the internal compartment into the wash liquor.

[0064] The compartment should be understood as meaning a closed internal space within the unit dose article, which holds the detergent composition. During manufacture, a first water-soluble film may be shaped to comprise an open compartment into which the detergent composition is added. A second water-soluble film is then laid over the first film in such an orientation as to close the opening of the compartment. The first and second films are then sealed together along a seal region.

[0065] The unit dose article may comprise more than one compartment, even at least two compartments, or even at

least three compartments. The compartments may be arranged in superposed orientation, i.e. one positioned on top of the other. In such an orientation the unit dose article will comprise three films, top, middle and bottom. Alternatively, the compartments may be positioned in a side-by-side orientation, i.e. one orientated next to the other. The compartments may even be orientated in a 'tyre and rim' arrangement, i.e. a first compartment is positioned next to a second compartment, but the first compartment at least partially surrounds the second compartment, but does not completely enclose the second compartment. Alternatively one compartment maybe completely enclosed within another compartment.

[0066] Wherein the unit dose article comprises at least two compartments, one of the compartments may be smaller than the other compartment. Wherein the unit dose article comprises at least three compartments, two of the compartments may be smaller than the third compartment, and preferably the smaller compartments are superposed on the larger compartment. The superposed compartments preferably are orientated side-by-side.

[0067] In a multi-compartment orientation, the detergent composition according to the present invention may be comprised in at least one of the compartments. It may for example be comprised in just one compartment, or may be comprised in two compartments, or even in three compartments.

[0068] Each compartment may comprise the same or different compositions. The different compositions could all be in the same form, or they may be in different forms.

[0069] The water-soluble unit dose article may comprise at least two internal compartments, wherein the liquid laundry detergent composition is comprised in at least one of the compartments, preferably wherein the unit dose article comprises at least three compartments, wherein the detergent composition is comprised in at least one of the compartments.

[0070] The film of the present invention is soluble or dispersible in water. The water-soluble film preferably has a thickness of from 20 to 150 micron, preferably 35 to 125 micron, even more preferably 50 to 110 micron, most preferably about 76 micron.

[0071] Preferably, the film has a water-solubility of at least 50%, preferably at least 75% or even at least 95%, as measured by the method set out here after using a glass-filter with a maximum pore size of 20 microns:

> 5 grams ± 0.1 gram of film material is added in a pre-weighed 3L beaker and 2L ± 5ml of distilled water is added. This is stirred vigorously on a magnetic stirrer, Labline model No. 1250 or equivalent and 5 cm magnetic stirrer, set at 600 rpm, for 30 minutes at 30°C. Then, the mixture is filtered through a folded qualitative sintered-glass filter with a pore size as defined above (max. 20 micron). The water is dried off from the collected filtrate by any conventional method, and the weight of the remaining material is determined (which is the dissolved or dispersed fraction). Then, the percentage solubility or dispersability can be calculated.

[0072] Preferred film materials are preferably polymeric materials. The film material can, for example, be obtained by casting, blow-moulding, extrusion or blown extrusion of the polymeric material, as known in the art.

[0073] Preferred polymers, copolymers or derivatives thereof suitable for use as pouch material are selected from polyvinyl alcohols, polyvinyl pyrrolidone, polyalkylene oxides, acrylamide, acrylic acid, cellulose, cellulose ethers, cellulose esters, cellulose amides, polyvinyl acetates, polycarboxylic acids and salts, polyaminoacids or peptides, polyamides, polyacrylamide, copolymers of maleic/acrylic acids, polysaccharides including starch and gelatine, natural gums such as xanthum and carragum. More preferred polymers are selected from polyacrylates and water-soluble acrylate copolymers, methylcellulose, carboxymethylcellulose sodium, dextrin, ethylcellulose, hydroxyethyl cellulose, hydroxypropyl methylcellulose, maltodextrin, polymethacrylates, and most preferably selected from polyvinyl alcohols, polyvinyl alcohol copolymers and hydroxypropyl methyl cellulose (HPMC), and combinations thereof. Preferably, the level of polymer in the pouch material, for example a PVA polymer, is at least 60%. The polymer can have any weight average molecular weight, preferably from about 1000 to 1,000,000, more preferably from about 10,000 to 300,000 yet more preferably from about 20,000 to 150,000.

[0074] Mixtures of polymers can also be used as the pouch material.

[0075] Preferred films exhibit good dissolution in cold water, meaning unheated distilled water. Preferably such films exhibit good dissolution at temperatures of 24°C, even more preferably at 10°C. By good dissolution it is meant that the film exhibits water-solubility of at least 50%, preferably at least 75% or even at least 95%, as measured by the method set out here after using a glass-filter with a maximum pore size of 20 microns, described above.

[0076] Preferred films are those supplied by Monosol under the trade references M8630, M8900, M8779, M8310.

[0077] The film may be opaque, transparent or translucent. The film may comprise a printed area.

[0078] The area of print may be achieved using standard techniques, such as flexographic printing or inkjet printing.

[0079] The film may comprise an aversive agent, for example a bittering agent. Suitable bittering agents include, but are not limited to, naringin, sucrose octaacetate, quinine hydrochloride, denatonium benzoate, or mixtures thereof. Any suitable level of aversive agent may be used in the film. Suitable levels include, but are not limited to, 1 to 5000ppm, or even 100 to 2500ppm, or even 250 to 2000rpm.

[0080] Those skilled in the art will know how to make a water-soluble unit dose article using known techniques in the art.

EXAMPLES

Dye Transfer Inhibition Testing Method:

[0081] The dye transfer inhibition performance is tested with a LaunderO-meter (Washtec DNTE LM.001 device - supplier: Roaches International LTD), following the AISE dye transfer protocol (v.5. - November 2013). Four different dyes (Direct Orange 39, Direct Black 22, Acid Blue 113, Direct Red 83.1) have been tested separately by putting 1 color donator swatch comprising the respective dye (4cm^2 Cotton dyed with Direct Orange39 90g/m^2 (wtk art.code E-134), 4cm^2 Cotton dyed with Direct Black22 90g/m^2 (wtk art.code E-132), 4cm^2 Cotton dyed with Direct Red83.1 180g/m^2 (wtk art.code E-130), 4cm^2 Polyamide dyed with Acid Blue113 65g/m^2 (wtk art.code E-131)) together with two swatches of one of selected dye acceptor tracers (size : 6cm * 16 cm - wool, polyacrylic, polyester, polyamide, cotton, diacetate - Testfabrics, Inc. ISO Multifiber Adjacent Fabric Type "DW") in a LaunderO-meter jar comprising 100ml detergent wash solution (15 gpg water hardness, finished product concentration 1,47ml/lt). The detergent formulations tested are described below.

[0082] Washing is done for 30 min at 60°C. 10 stainless steel marbles were added per jar to bring additional agitation. After washing each swatch is rinsed with ambient temperature 15gpg water and dried in an oven set at 80°C.

[0083] After washing and drying the amount of bleeded dye is defined with a Polaris spectrophotometer by a delta E measurement on the dye acceptor tracers after versus before the wash, following the ISO 105 A 04 protocol. The dye bleeding difference has been defined between a composition comprising the amphiphilic graft polymer according to the invention, compared to the same reference formulation not comprising the amphiphilic polymer according to the invention.

[0084] 2 replicates were run per dye bleeder / dye acceptor / test-reference formulation and average delta values are reported. A higher delta E value represents improved dye transfer inhibition properties for the amphiphilic graft polymer comprising formulation.

Test formulations:

[0085] The following reference and test formulations have been prepared (Table 1), differing single variable in presence versus absence of amphiphilic graft polymer.

Table 1

	Reference formulation	Test formulation
C12-14EO7 nonionic surfactant	3.8%	3.8%
HLAS	22%	22%
C1214 alkyl ethoxy (3) sulfate	15%	15%
Citric acid	0.7%	0.7%
Topped palm kernel fatty acid	6.1%	6.1%
Ethoxylated polyethyleneimine (PEI600EO20)*	3.3%	3.3%
Amphiphilic graft polymer**	-	2.2%
HEDP	2.3%	2.3%
Brightener 49	0.3%	0.3%
1,2-propanediol	15.4%	12.3%
Glycerol	3.8%	3.8%
Dipropyleneglycol	4.0%	4.0%
Monoethanolamine	10.4%	10.3%
Water	8.6%	9.8%

(continued)

	Reference formulation	Test formulation
Balance (enzymes, dyes, perfume, preservative, antioxidant, suds suppressor, MgCl2, hydrogenated castor oil structurant)	To 100%	To 100%
*ethoxylate polyethyleneimine having an average degree of ethoxylation of 20 per EO chain and a polyethyleneimine backbone with MW of about 600 **polyethylene glycol graft polymer comprising a polyethylene glycol backbone (Pluriol E6000) and hydrophobic vinyl acetate side chains, comprising 40% by weight of the polymer system of a polyethylene glycol backbone polymer and 60% by weight of the polymer system of the grafted vinyl acetate side chains		

Test results:

[0086] From Table 2 below it can be concluded that the test formulation comprising the amphiphilic graft polymer according to the invention has better dye transfer inhibition properties compared to the same reference formula not comprising the amphiphilic graft polymer according to the invention.

	Test formula versus reference formula Delta E			
Colors	Direct Orange 39	Direct Red 83.1	Acid Blue 113	Direct Black 22
Wool	0.145	1.687	3.418	0.995
Polyacrylic	1.324	1.203	4.672	1.432
Polyester	1.526	0.883	2.897	0.895
Polyamide	0.578	0.677	0.858	1.476
Cotton	2.089	2.290	2.720	1.517
Diacetate	1.581	1.347	2.131	1.181

[0087] The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as "40 mm" is intended to mean "about 40 mm."

Claims

1. The use of an amphiphilic graft polymer as a dye transfer inhibiter wherein the amphiphilic graft polymer is based on polyalkylene oxides and vinyl esters, preferably based on water-soluble polyalkylene oxides (A) as a graft base and side chains formed by polymerization of a vinyl ester component (B), preferably, said polymer having an average of < 1 graft site per 50 alkylene oxide units and wherein the amphiphilic graft polymer has from 20% to 70% by weight of the amphiphilic graft polymer of the polyalkylene oxide (A), preferably the water-soluble polyalkylene oxide (A) as a graft base, and wherein the amphiphilic graft polymer comprises from 30 to 80% by weight of the vinyl ester component (B) and from 0% to 30% by weight of a C1-C8-alkyl acrylate (B2).

2. The use according to claim 1 wherein the molar ratio of grafted to ungrafted alkylene oxide units is from 0.002 to 0.05, preferably from 0.002 to 0.035, more preferably from 0.003 to 0.025 and most preferably from 0.004 to 0.02.

3. The use according to any preceding claims wherein the amphiphilic graft polymer has a mean molecular weight Mw of from 3000 to 100 000.

4. The use according to any preceding claims wherein the amphiphilic graft polymer has a polydispersity Mw/Mn of less than 3, wherein Mn is the mean molar mass.

5. The use according to any preceding claims wherein the amphiphilic graft polymer has from 25% to 60% by weight of the amphiphilic graft polymer of the polyalkylene oxide (A), preferably the water-soluble polyalkylene oxide (A)

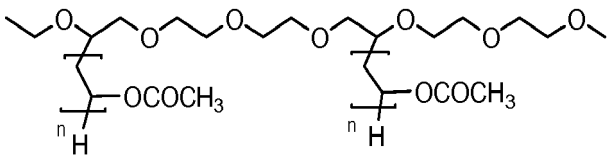
as a graft base.

6. The use according to any preceding claims wherein the vinyl ester component (B) comprises a vinyl acetate, vinyl propionate or a mixture thereof (B1) and optionally an C1-C8-alkyl acrylate (B2) more preferably from 70% to 100% by weight of vinyl acetate (B1).

7. The use according to any preceding claims where the polyalkylene oxide graft base (A) is a polyethylene glycol.

8. The use according to any preceding claims wherein the amphiphilic graft polymer comprises less than 10% by weight of the amphiphilic graft polymer of polyvinyl ester (B) in ungrafted form.

9. The use according to any preceding claims wherein the amphiphilic graft polymers are graft co-polymers of polyethylene glycol graft base and vinyl acetate side chains, as according to the following structure;



wherein, preferably the ethylene oxide / vinyl acetate content is from 30%/70% to 50%/50%, and
wherein preferably the amphiphilic graft polymer has a mean molar mass (Mn) value of from 10000g/mol to 20000g/mol, more preferably from 10000g/mol to 15000g/mol, and wherein preferably the amphiphilic graft polymer has a mean molecular mass (Mw) value of from 20000g/mol to 30000g/mol, preferably from 25000g/mol to 30000g/mol,
more preferably, yielding a polydispersity Mw/Mn of from 1 to 3, preferably 1.5 to 2.5, wherein preferably the amphiphilic graft polymer has an average degree of grafted units per polyethyleneglycol polymer graft base preferably is less than 2.7, preferably between 0.5 and 2.5, more preferably between 1 and 2,
wherein preferably the amphiphilic graft polymer has an average n value of between 30 and 70, more preferably between 40 and 60, most preferably between 50 and 55.

10. The use of the amphiphilic graft polymer according to any preceding claims as a dye transfer inhibitor in a laundry wash operation, preferably wherein the amphiphilic graft polymer is comprised within a wash liquor wherein the wash liquor is in contact with fabrics to be washed.

11. The use according to claim 10 wherein the wash liquor is prepared by diluting a laundry detergent composition, preferably a liquid laundry detergent composition in water, preferably by between 300 and 800 fold, more preferably between 400 and 700 fold wherein the laundry detergent composition comprises the amphiphilic graft polymer.

12. The use according to claim 11 wherein the laundry detergent composition comprises between 0.1% and 10%, preferably between 0.5% and 7%, more preferably between 0.75% and 5% even more preferably between 1% and 4%, most preferably between 1.25% and 3% by weight of the laundry detergent composition of the amphiphilic graft polymer.

13. The use according to claim 12 wherein the laundry detergent composition comprises between 10% and 60%, preferably between 15% and 55%, more preferably between 20% and 50%, most preferably between 25% and 45% by weight of the laundry detergent composition of a non-soap surfactant, wherein preferably the non-soap surfactant comprises an anionic surfactant and a non-ionic surfactant and wherein preferably the weight ratio of anionic surfactant to non-ionic surfactant is from 1:2 to 20:1, preferably from 1:1 to 15:1, more preferably from 1.5:1 to 10:1, most preferably from 5:1 to 10:1.

14. The use according to claims 11-13 wherein the laundry detergent composition is comprised within a water-soluble unit dose article comprising a water-soluble film.

15. The use according to any of claims 10-14 wherein the fabrics to be washed have previously been washed in a wash liquor comprising an amphiphilic graft polymer, a fabric softening active or a mixture thereof.

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EUROPEAN SEARCH REPORT

Application Number
EP 17 18 5848

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 January 2018	Bertran Nadal, Josep

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Application Number
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Place of search	Date of completion of the search	Examiner
The Hague	25 January 2018	Bertran Nadal, Josep

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