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(54) Title: LAUNDRY COMPOSITIONS AND USES

(57) Abstract: The invention relates to the use of an alkyl ether carboxylic acid or carboxylate salt thereof in combination with a cationic polymer in a laundry composition to provide softness to fabrics, and to a method of providing a softness benefit to laundered fabrics.

LAUNDRY COMPOSITIONS AND USES

FIELD OF THE INVENTION

This invention relates to the use of a laundry composition. More particularly, the invention is directed to a softening in the wash laundry composition.

BACKGROUND OF THE INVENTION

Textile fabrics, including clothes, have traditionally been cleaned with laundry detergents. After cleaning, fabrics can often feel harsh and they will wear and lose colour over repeat wash cycles. To prevent the drawbacks of fabrics feeling harsh after cleaning and those experienced by multiple wash cycles, technologies have been developed to increase the softness of fabrics, including rinse-added conditioner compositions and softening systems added to the detergent composition.

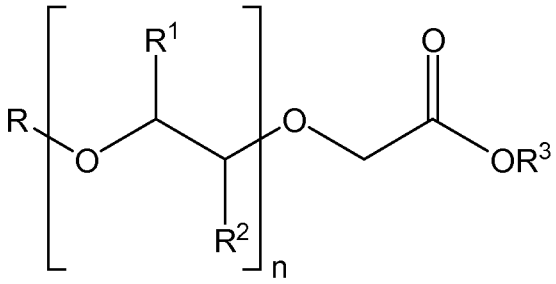
Softening in the wash formulation comprising fabric softening clay are known (US 5 017 296). Softening in the wash formulations comprising fatty acid are also known in the art.

However such clay and fatty acid containing formulations do not show the required level of softness. Hence there is a need to improve softening in the wash technology.

SUMMARY OF THE INVENTION

In a first aspect, the invention is directed to the use of an alkyl ether carboxylic acid or carboxylate salt in combination with a cationic polymer in a laundry composition to provide softness to fabrics.

Preferred alkyl ether carboxylic acid or carboxylate salt thereof are depicted by formula 1:



Formula 1

wherein R denotes a saturated or unsaturated **C6-C22** alkyl chain; R^1 and R^2 are either both hydrogen; or R^1 is hydrogen and R^2 is **CH_3;** or R^1 is **CH_3** and R^2 is hydrogen; R^3 is hydrogen, or a solubilising cation such as sodium, potassium, ammonium or substituted ammonium; and, n is a number from 2 to 20, preferably 3 to 12, more preferably 3 to 10, which denotes the number of repeat units.

Preferred alkyl ether carboxylic acids or carboxylate salts thereof have a **Cs-Cis** alkyl chain with between 2 to 20, more preferably between 3 to 12, even more preferably between 3 to 10 glycol repeat units, wherein the glycol repeat units are selected from ethylene glycol, propylene glycol or mixtures thereof. By this is meant that the molecule of formula 1 may contain mixtures of polyethylene glycol (also known as ethylene oxide) and polypropylene glycol (also known as propylene oxide) repeat units

Preferably the alkyl ether carboxylic acid or carboxylate salt thereof is comprised in a laundry composition at a level of from 1 to 12 wt.%, preferably from 1 to 10 wt.%, more preferably at a level of from 2 to 7.5 wt.%.

Preferably the laundry composition is a liquid laundry composition, more preferably a liquid detergent composition. When the composition is a liquid detergent composition, then it comprises a detersive surfactant, preferably anionic surfactant, nonionic surfactant, or a mixture thereof.

In a preferred embodiment, the alkyl ether carboxylic acid or carboxylate salt is used in combination with a cationic polymer in a laundry composition to provide softness to fabrics.

Preferably the alkyl ether carboxylic acid or carboxylate salt, or alternatively the combination of alkyl ether carboxylic acid or carboxylate salt and a cationic polysaccharide polymer is used in liquid detergent compositions having a pH of from 6.2 to 9, more preferably from pH 6.5 to 8.5, for example from pH 6.5 to 8.

If present, then a preferred level of the cationic polymer is from 0.1 to 1 wt.%.

Preferably the cationic polymer is selected from the group consisting of: cationic polysaccharide polymers, and cationic non-saccharide polymers having cationic protonated amine or quaternary ammonium functionalities that are homo or copolymers derived from monomers containing an amino or quaternary nitrogen functional group polymerised from at least one of the following monomer classes: acrylate, methacrylate, acrylamide, methacrylamide; allyls (including diallyl and methallyl); ethylene imine; and/or vinyl monomer classes, and mixtures thereof.

More preferably the cationic polymer is selected from the group consisting of cationic cellulose polymers, cationic guar polymers, cationic diallyl quaternary ammonium-containing polymers and homo or copolymers of dimethylaminoethyl (meth)acrylate, diethylaminoethyl (meth)acrylate or tert-butylaminoethyl (meth)acrylate in their quaternary or protonated amine form, and mixtures thereof.

Preferred cationic polysaccharide polymers are cationic guar and cationic cellulose polymers. Particularly preferred is hydroxy ether cellulose that is modified by incorporation of cationic groups (i.e. quaternised hydroxy ethyl cellulose).

Optionally, but preferably, the laundry composition further comprises an ingredient selected from, shading dye, enzyme, an antiredeposition polymer, a dye transfer inhibiting polymer, builder, sequestrant, sunscreen and/or soil release polymer.

In a second aspect, the invention relates to a method of softening fabrics, comprising the steps:

(a) providing a laundry composition comprising an alkyl ether carboxylic acid or carboxylate salt thereof, in combination with a cationic polymer;

(b) contacting one or more textile articles with the composition at one or more points during the main wash of a laundering process; and,

(c) allowing the textile articles to dry or mechanically tumble-drying them.

DETAILED DESCRIPTION OF THE INVENTION

As used herein, the term "comprising" means including, made up of, composed of, consisting and/or consisting essentially of.

All percentages quoted are wt.% based on total amount in the laundry composition unless otherwise stated.

The invention is directed to the use of alkyl ether carboxylic acid or carboxylate salt thereof to provide softness to fabrics.

Softening Benefits

We have found that the use of an alkyl ether carboxylic acid or carboxylate salt thereof (AEC) can provide fabric softening. Softening includes, but is not limited to, an improvement in the handling of a garment treated with the compositions of this invention relative to that of an article laundered under identical conditions but without the use of this invention. Consumers will often describe an article that is softened as "silky" or "fluffy", and generally prefer the feel of treated garments to those that are unsoftened.

Form of the Invention

The present invention can take any of a number of forms that are laundry compositions. Examples include powders, granules, bars, gels and liquids. Preferably the AEC is incorporated in liquid laundry products. Preferably they are main wash products. It can take the form of a laundry treatment agent for the main wash, which may be dilutable or non-dilutable. The laundry treatment agent may for example be an isotropic liquid, or a surfactant-structured liquid. Particularly preferred forms of this invention include combination detergent/softener products to provide "softening in the wash".

Softening in the Wash

By the term "softening in the wash" is meant a composition which provides a fabric softening benefit as well as providing cleaning to the laundered fabric. Such a composition can be added as part of a main wash product, or as a separate product for use in combination with another. However, for the purposes of this disclosure, the composition is intended for use in the main wash cycle. Preferably the softening in the wash composition of the invention is incorporated as part of a single product for use in the main wash.

When the AEC is used in a laundry composition, then preferably the composition has a pH of from 6.2 to 9, more preferably from pH 6.5 to 8.5, for example from pH 6.5 to 8.

Method of Use

The invention is directed to the use of an alkyl ether carboxylic acid or carboxylate salt in combination with a cationic polymer in a laundry composition to provide softness to fabrics.

The alkyl ether carboxylic acid or carboxylate salt thereof is used in a laundry composition, preferably a liquid composition, preferably a detergent composition.

The laundry composition provides a softness benefit to the laundered fabrics by a method of softening fabrics, comprising the steps:

(a) providing a laundry composition comprising an alkyl ether carboxylic acid or carboxylate salt thereof and a cationic polymer;

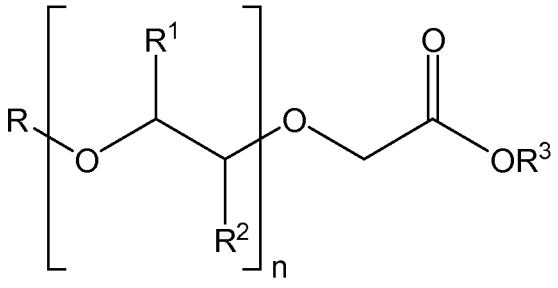
(b) contacting one or more textile articles with the composition at one or more points during the main wash of a laundering process; and,

(c) allowing the textile articles to dry or mechanically tumble-drying them.

Alkyl Ether Carboxylic Acid

The alkyl ether carboxylic acid/carboxylate (AEC) is usually derived from a fatty alcohol which is alkoxylated, usually with ethylene glycol and/or propylene glycol, a carboxylic acid is then introduced to the material to form the alkyl ether carboxylic acid.

Preferred alkyl ether carboxylic acid or carboxylate salt thereof are depicted by formula 1:



Formula 1

wherein R denotes a saturated or unsaturated $_{C6-C22}$ alkyl chain; R^1 and R^2 are either both hydrogen (in which case the repeat unit is ethylene glycol known as (EO) for short); or R^1 is hydrogen and R^2 is CH_3; or R^1 is CH_3 and R^2 is hydrogen (in which case the repeat unit is propylene glycol, known as (PO) for short); R^3 is hydrogen (in which case it is an alkyl ether carboxylic acid), or a solubilising cation such as sodium, potassium, ammonium or substituted ammonium (in which case

it is an alkyl ether carboxylate salt); and, n is a number from 2 to 20, preferably 3 to 12, more preferably 3 to 10, which denotes the number of repeat units.

Preferred alkyl ether carboxylic acids or carboxylate salts thereof have a **Cs-Cis** alkyl chain with between 2 to 20, more preferably between 3 to 12, even more preferably between 3 to 10 glycol repeat units, wherein the glycol repeat units are selected from ethylene glycol, propylene glycol or mixtures thereof. By this is meant that the molecule of formula 1 may contain mixtures of polyethylene glycol (also known as ethylene oxide) and polypropylene glycol (also known as propylene oxide) repeat units

The alkyl ether carboxylic acid or carboxylate salt thereof is advantageously provided in a laundry composition, preferably a liquid laundry composition. In this case, the composition comprises 1 to 12 wt.% alkyl ether carboxylic acid or carboxylate salt thereof. Preferably the alkyl ether carboxylic acid or carboxylate salt thereof is present at a level of from 1 to 10 wt.%, more preferably at a level of from 2 to 7.5 wt.%.

Cationic Polymer

This term refers to polymers having an overall positive charge.

Preferably the cationic polymer is selected from the group consisting of: cationic polysaccharide polymers, and cationic non-saccharide polymers having cationic protonated amine or quaternary ammonium functionalities that are homo or copolymers derived from monomers containing an amino or quaternary nitrogen functional group polymerised from at least one of the following monomer classes: acrylate, methacrylate, acrylamide, methacrylamide; allyls (including diallyl and methallyl); ethylene imine; and/or vinyl monomer classes, and mixtures thereof.

More preferably the cationic polymer is selected from the group consisting of cationic cellulose polymers, cationic guar polymers, cationic diallyl quaternary ammonium-containing polymers and homo or copolymers of dimethylaminoethyl (meth)acrylate, diethylaminoethyl (meth)acrylate or tert-butylaminoethyl (meth)acrylate in their quaternary or protonated amine form, and mixtures thereof.

Most preferably the cationic polymer is a cationic polysaccharide polymer.

More preferably the cationic polysaccharide polymer is a cationic guar or cationic cellulose polymer. Most preferably the cationic polymer is a cationic cellulose polymer, for example, quaternised hydroxy ethyl cellulose.

The composition may include a single cationic polymer or a mixture of cationic polymers from the same or different classes, i.e. the composition may contain a cationic polysaccharide polymer and a cationic non-polysaccharide polymer.

Cationic Polysaccharide Polymer

The term "cationic polysaccharide polymer" refers to polymers having a polysaccharide backbone and an overall positive charge. Polysaccharides are polymers made up from monosaccharide monomers joined together by glycosidic bonds.

The cationic polysaccharide-based polymers present in the compositions of the invention have a modified polysaccharide backbone, modified in that additional chemical groups have been reacted with some of the free hydroxyl groups of the polysaccharide backbone to give an overall positive charge to the modified cellulosic monomer unit.

A preferred class of cationic polysaccharide polymers suitable for this invention are those that have a polysaccharide backbone modified to incorporate a

quaternary ammonium salt. Preferably the quaternary ammonium salt is linked to the polysaccharide backbone by a hydroxyethyl or hydroxypropyl group. Preferably the charged nitrogen of the quaternary ammonium salt has one or more alkyl group substituents.

Preferred cationic polysaccharide-based polymers have a guar based, or cellulosic based backbone. Cellulose based cationic polymers are most preferred. Guar is a galactomannan having a β-1,4 linked mannose backbone with branchpoints to a-1,6 linked galactose units.

Suitable cationic guar gum derivatives, such as guar hydroxypropyltrimonium chloride, specific examples of which include the Jaguar series commercially available from Rhone-Poulenc Incorporated and the N-Hance series commercially available from Aqualon Division of Hercules, Inc.

An example of a preferred guar based cationic polymer is guar 2-hydroxy-3-(trimethylammonium) propyl ether salt.

Cellulose is a polysaccharide with glucose as its monomer, specifically it is a straight chain polymer of D-glucopyranose units linked via β-1,4 glycosidic bonds and is a linear, non-branched polymer.

Example cationic cellulose polymers are salts of hydroxyethyl cellulose reacted with trimethyl ammonium substituted epoxide, referred to in the field under the International Nomenclature for Cosmetic Ingredients as Polyquatemium 10 and is commercially available from the Amerchol Corporation, a subsidiary of The Dow Chemical Company, marketed as the Polymer LR, JR, and KG series of polymers. Other suitable types of cationic celluloses include the polymeric quaternary ammonium salts of hydroxyethyl cellulose reacted with lauryl dimethyl ammonium-substituted epoxide referred to in the field under the International Nomenclature

for Cosmetic Ingredients as Polyquatemium 24. These materials are available from Amerchol Corporation marketed as Polymer LM-200.

Typical examples of preferred cationic cellulosic polymers include cocodimethylammonium hydroxypropyl oxyethyl cellulose, lauryldimethylammonium hydroxypropyl oxyethyl cellulose, stearyldimethylammonium hydroxypropyl oxyethyl cellulose, and stearyldimethylammonium hydroxyethyl cellulose; cellulose 2-hydroxyethyl 2-hydroxy 3-(trimethyl ammonio) propyl ether salt, polyquaternium-4, polyquaternium-1 0, polyquaternium-24 and polyquaternium-67 or mixtures thereof.

More preferably the cationic cellulosic polymer is a quaternised hydroxy ether cellulose cationic polymer. These are commonly known as polyquaternium-1 0. Suitable commercial cationic cellulosic polymer products for use according to the present invention are marketed by the Amerchol Corporation under the trade name UCARE.

Other Cationic Polymer Classes

Non-polysaccharide based cationic polymers may also be used. Suitable cationic non-saccharide polymers include those having cationic protonated amine or quaternary ammonium functionalities that are homo or copolymers derived from monomers containing an amino or quaternary nitrogen functional group polymerised from at least one of the following monomer classes: acrylate, methacrylate, acrylamide, methacrylamide; allyls (including diallyl and methallyl); ethylene imine; and/or vinyl monomer classes, and mixtures thereof.
and cationic non-saccharide polymers having

Preferred cationic non-saccharide polymers include cationic diallyl quaternary ammonium-containing polymers and homo or copolymers of dimethylaminoethyl

(meth)acrylate, diethylaminoethyl (meth)acrylate or tert-butylaminoethyl (meth)acrylate in their quaternary or protonated amine form, and mixtures thereof.

Other suitable cationic polymers for use in the compositions include copolymers of 1-vinyl-2-pyrrolidone and 1-vinyl-3-methylimidazolium salt (known as Polyquatemium-16); copolymers of 1-vinyl-2-pyrrolidone and dimethylaminoethyl methacrylate (known as Polyquaternium-11); cationic diallyl quaternary ammonium-containing polymers, including, for example, dimethyldiallylammonium chloride homopolymer, copolymers of acrylamide and dimethyldiallylammonium chloride (known as Polyquatemium 6 and Polyquatemium 7 respectively); amphoteric copolymers of acrylic acid including copolymers of acrylic acid and dimethyldiallylammonium chloride (known as Polyquatemium 22), terpolymers of acrylic acid with dimethyldiallylammonium chloride and acrylamide (known as Polyquatemium 39), and terpolymers of acrylic acid with methacrylamidopropyl trimethylammonium chloride and methylacrylate (known as Polyquatemium 47). Preferred cationic substituted monomers are the cationic substituted dialkylaminoallcyl acrylamides, dialkylaminoallcyl methacrylamides, and combinations thereof.

The counterion of the cationic polymer is freely chosen from the halides: chloride, bromide, and iodide; or from hydroxide, phosphate, sulphate, hydrosulphate, ethyl sulphate, methyl sulphate, formate, and acetate.

Without wishing to be bound by theory, it is believed that the species responsible for providing a softening benefit in these formulations is a polymer/surfactant complex, especially a cationic polymer/AEC complex.

The cationic polymer is present at a level of from 0.1 to 1.5 wt.%, preferably from 0.1 to 1 wt.%, more preferably from 0.2 to 1 wt.%.

Many of the aforementioned cationic polymers can be synthesised in, and are commercially available in, a number of different molecular weights. Preferably the molecular weight of the cationic polymer is from 10,000 to 2,000,000 Daltons, more preferably from 10,000 to 500,000 Daltons.

The alkyl ether carboxylic acid or carboxylate salt thereof is used to soften fabrics and is preferably delivered from a laundry composition, preferably a laundry liquid composition, preferably a liquid detergent composition. Laundry compositions typically comprise one or more of the following ingredients.

Surfactants

The laundry composition is preferably a liquid detergent composition. Liquid detergent compositions comprise a detersive surfactant, preferably anionic, nonionic or a mixture thereof.

The surfactants may be chosen from the surfactants described in "Surface Active Agents" Vol. 1, by Schwartz & Perry, Interscience 1949, Vol. 2 by Schwartz, Perry & Berch, Interscience 1958, in the current edition of "McCutcheon's Emulsifiers and Detergents" published by Manufacturing Confectioners Company or in "Tenside-Taschenbuch", H. Stache, 2nd Edn., Carl Hauser Verlag, 1981. Preferably the surfactants used are saturated.

Suitable nonionic detergent compounds which may be used include, in particular, the reaction products of compounds having a hydrophobic group and a reactive hydrogen atom, for example, aliphatic alcohols, acids, amides or alkyl phenols with alkylene oxides, especially ethylene oxide either alone or with propylene oxide. Specific nonionic detergent compounds are C_6 to C_{22} alkyl phenol-ethylene oxide condensates, generally 5 to 25 EO, i.e. 5 to 25 units of ethylene oxide per molecule, and the condensation products of aliphatic Cs to C_{18} primary

or secondary linear or branched alcohols with ethylene oxide, generally 5 to 40 EO.

Suitable anionic detergent compounds which may be used can be soaps of fatty acids, or can be water-soluble alkali metal salts of organic sulphates and sulphonates having alkyl radicals containing from about 8 to about 22 carbon atoms, the term alkyl being used to include the alkyl portion of higher acyl radicals. Examples of suitable synthetic anionic detergent compounds are sodium and potassium alkyl sulphates, especially those obtained by sulphating higher C_8 to C_{18} alcohols, produced for example from tallow or coconut oil, sodium and potassium alkyl C_9 to C_{20} benzene sulphonates, particularly sodium linear secondary alkyl C_{10} to C_{15} benzene sulphonates; and sodium alkyl glyceryl ether sulphates, especially those ethers of the higher alcohols derived from tallow or coconut oil and synthetic alcohols derived from petroleum. The preferred anionic detergent compounds are sodium C_{11} to C_{15} alkyl benzene sulphonates and sodium C_{12} to C_{18} alkyl sulphates. Salts of sulphonates included as hydrotrobes can additionally be considered as anionic surfactants as defined herein. Also applicable are surfactants such as those described in EP-A-328 177 (Unilever), which show resistance to salting-out, the alkyl polyglycoside surfactants described in EP-A-070 074, and alkyl monoglycosides.

The nonionic detergent is present in amounts of from 0 to 40 wt.%, preferably from 1 to 40 wt.%, more preferably from 2 to 40 wt.%, even more preferably from 5 to 35 wt.%, for example from 6 to 20 wt.%.

If present, the anionic surfactant is present in amounts of from 4 to 40 wt.%, preferably from 5 to 35 wt.%, more preferably from 6 to 20 wt.%. Although the alkyl ether carboxylate (or salt thereof) is itself considered an anionic surfactant, for the purposes of this invention, the amount of anionic surfactant present in the

formulation does not include the amount of alkyl ether carboxylate (or salt thereof).

The total amount of surfactant present in the liquid composition is preferably at least 5 wt.%, more preferably 10 wt.%, most preferably 25 wt.%. More preferably the total amount of surfactant is from 15 to 65 wt.%, preferably from 10 to 50 wt.%.

Other surfactants such as amphoteric, zwitterionic and cationic surfactants may also be present in addition to the aforementioned nonionic and anionic surfactants.

Optional Ingredients

The laundry composition may additionally comprise one or more of the following optional ingredients.

Builders and sequestrants

The detergent compositions may also optionally contain relatively low levels of organic detergent builder or sequestrant material. Examples include the alkali metal, citrates, succinates, malonates, carboxymethyl succinates, carboxylates, polycarboxylates and polyacetyl carboxylates. Specific examples include sodium, potassium and lithium salts of oxydisuccinic acid, mellitic acid, benzene polycarboxylic acids, ethylene diamine tetra-acetic acid, diethylenetriamine-pentaacetic acid, alkyl- or alkenylsuccinic acid, nitrilotriacetic acid, and citric acid. Other examples are DEQUEST™, organic phosphonate type sequestering agents sold by Monsanto and alkanehydroxy phosphonates.

Other suitable organic builders include the higher molecular weight polymers and copolymers known to have builder properties. For example, such materials include appropriate polyacrylic acid, polymaleic acid, and polyacrylic/polymaleic

acid copolymers and their salts, such as those sold by BASF under the name SOKALAN™. Another suitable builder is sodium carbonate.

If utilized, the builder materials may comprise from about 0.5% to 20 wt%, preferably from 1 wt% to 10 wt%, of the composition. The preferred builder level is less than 10 wt% and preferably less than 5 wt% of the composition.

Preferably the laundry detergent formulation is a non-phosphate built laundry detergent formulation, i.e., contains less than 1 wt.% of phosphate.

Shading Dye

Shading dyes deposit to fabric during the wash or rinse step of the washing process providing a visible hue to the fabric. Shading of white garments may be done with any colour depending on consumer preference. Blue and Violet are particularly preferred shades and consequently preferred dyes or mixtures of dyes are ones that give a blue or violet shade on white fabrics. The shading dyes used are preferably blue or violet.

The shading dye chromophore is preferably selected from the group comprising: mono-azo, bis-azo, triphenylmethane, triphenodioxazine, phthalocyanin, naptholactam, azine and anthraquinone. Most preferably mono-azo, bis-azo, azine and anthraquinone.

Most preferably the dye bears at least one sulfonate group.

Preferred shading dyes are selected from direct dyes, acid dyes, hydrophobic dyes, cationic dyes and reactive dyes.

If included, the shading dye is present is present in the liquid composition in range from 0.0001 to 0.01 wt %.

Fluorescent Agent

The composition preferably comprises a fluorescent agent (optical brightener). Fluorescent agents are well known and many such fluorescent agents are available commercially. Usually, these fluorescent agents are supplied and used in the form of their alkali metal salts, for example, the sodium salts. The total amount of the fluorescent agent or agents used in the composition is generally from 0.005 to 2 wt.%, more preferably 0.01 to 0.1 wt.%. Preferred classes of fluorescer are: Di-styryl biphenyl compounds, e.g. Tinopal (Trade Mark) CBS-X, Di-amine stilbene di-sulphonic acid compounds, e.g. Tinopal DMS pure Xtra and Blankophor (Trade Mark) HRH, and Pyrazoline compounds, e.g. Blankophor SN. Preferred fluorescers are: sodium 2-(4-styryl-3-sulfophenyl)-2H-napthol[1 ,2-d]trazole, disodium 4,4'-bis{[(4-anilino-6-(N methyl-N-2 hydroxyethyl) amino 1,3,5-triazin-2-yl)]amino}stilbene-2-2' disulfonate, disodium 4,4'-bis{[(4-anilino-6-morpholino-1 ,3,5-triazin-2-yl)]amino} stilbene-2-2' disulfonate, and disodium 4,4'-bis(2-sulfoslyryl)biphenyl.

Perfume

Preferably the composition comprises a perfume. The perfume is preferably in the range from 0.001 to 3 wt.%, most preferably 0.1 to 1 wt.%. Many suitable examples of perfumes are provided in the CTFA (Cosmetic, Toiletry and Fragrance Association) 1992 International Buyers Guide, published by CFTA Publications and OPD 1993 Chemicals Buyers Directory 80th Annual Edition, published by Schnell Publishing Co.

It is commonplace for a plurality of perfume components to be present in a formulation. In the compositions of the present invention it is envisaged that there will be four or more, preferably five or more, more preferably six or more or even seven or more different perfume components.

In perfume mixtures preferably 15 to 25 wt.% are top notes. Top notes are defined by Poucher (Journal of the Society of Cosmetic Chemists 6(2):80 [1955]). Preferred top-notes are selected from citrus oils, linalool, linalyl acetate, lavender, dihydromyrcenol, rose oxide and cis-3-hexanol.

It is preferred that the laundry treatment composition does not contain a peroxygen bleach, e.g., sodium percarbonate, sodium perborate, and peracid.

Polymers

The composition may comprise one or more polymers. Polymers can assist in the cleaning process by helping to retail soil in solution or suspension and/or preventing the transfer of dyes. Polymers can also assist in the soil removal process. Dye transfer, anti-redeposition and soil-release polymers are described in further detail below.

The composition may comprise one or more polymers. Examples are carboxymethylcellulose, hydroxyethyl cellulose, hydroxpropyl cellulose, poly(ethylene glycol), polyvinyl alcohol), ethoxylated polyamines, polycarboxylates such as polyacrylates, maleic/acrylic acid copolymers and lauryl methacrylate/acrylic acid copolymers.

Dye transfer inhibitors

Modern detergent compositions typically employ polymers as so-called 'dye-transfer inhibitors'. These prevent migration of dyes, especially during long soak times. Generally, such dye-transfer inhibiting agents include polyvinyl pyrrolidone polymers, polyamine N-oxide polymers, copolymers of N-vinylpyrrolidone and N-vinylimidazole, manganese pthalocyanine, peroxidases, and mixtures thereof, and are usually present at a level of from 0.01 to 10 wt.% based on total amount in the laundry composition.

Anti-redeposition polymers

Anti-redeposition polymers are designed to suspend or disperse soil. Typically antiredeposition polymers are ethoxylated and or propoxylated polyethylene imine or polycarboxylate materials, for example, Acrylic acid based homo or copolymers available under the trade mark ACUSOL from Dow Chemical, Alcosperse from Akzonobel or Sokolan from BASF.

Soil Release Polymers

Examples of suitable soil release polymers include graft copolymers of polyvinyl ester), e.g., Ci -C6 vinyl esters, preferably polyvinyl acetate) grafted onto polyalkylene oxide backbones. Commercially available soil release agents of this kind include the SOKALAN type of material, e.g., SOKALAN HP-22, available from BASF (West Germany). Further suitable soil release polymers of a different type include the commercially available material ZELCON 5126 (from DuPont) and MILEASE T (from ICI). If present, the soil release polymer may be included at a level of from from 0.01 to 10 wt.% based on total amount in the laundry composition. Further examples of soil release polymers are terephthalic acid / glycol copolymers sold under the tradenames Texcare, Repel-o-tex, Gerol, Marloquest, Cirrasol.

Hydrotrope

The liquid detergent composition may optionally include a hydrotrope, which can prevent liquid crystal formation. The addition of the hydrotrope thus aids the clarity/transparency of the composition. Suitable hydrotropes include but are not limited to propylene glycol, ethanol, urea, salts of benzene sulphonate, toluene sulphonate, xylene sulphonate or cumene sulphonate. Suitable salts include but are not limited to sodium, potassium, ammonium, monoethanolamine, triethanolamine. Salts of sulphonates can also be considered as anionic surfactants as defined herein. Preferably, the hydrotrope is selected from the group consisting of propylene glycol, xylene sulfonate, ethanol, and urea to

provide optimum performance. The amount of the hydrotrope is generally in the range of from 0 to 30%, preferably from 0.5 to 30%, more preferably from 0.5 to 30%, most preferably from 1 to 15%.

Enzymes

Enzymes can also be present in the formulation. Preferred enzymes include protease, lipase, pectate lyase, amylase, cutinase, cellulase, mannanase. If present the enzymes may be stabilized with a known enzyme stabilizer for example boric acid.

Examples

Method of Production

Water, fluorescer and hydrotropes are mixed together at ambient temperature (approximately 22°C) for 2-3 minutes at a shear rate of 130 rpm using a Janke & Kunkel IKA RW20 overhead mixer. Salts and alkalis are added and mixed for 5 minutes prior to addition of surfactants and alkyl ether carboxylic acid and/or fatty acid. The temperature of the mix rises to around 50-60°C at this point. After allowing to cool to <30°C, the LR400 solution, PVP or PVP/PVI and any remaining components such as perfume, preservatives, opacifier and dyes are added.

Example Formulations

Formulations in accordance with the invention are listed in table 1.

Table 1

Ingredient	I %.wt	II %.wt	III %.wt	IV %.wt	V %.wt	VI %.wt	VII %.wt
LAS ACID	5	10	10	10	6	15	14
SLES	5	3	6		4	5	
NEODOL 25-7E	10	10	16	12	8	5	14
MARLOWET 1072 (Alkyl Ether Carboxylate)	3	6	6	3	4	6	3
PRIFAC 5908					2		3
PROPYLENE GLYCOL	9	9	11	14	14	15	5
GLYCEROL	5	5	5		5		5
TRIETHANOLAMINE	2	2.25	3	2	2.5	4	6
TINOPAL CBS-X	0.1	0.1	0.1			0.1	
Polyvinylpyrrolidone (PVP K15)	0.35	0.35	0.35	0.35		0.3	
PVP/PVI (Poly Vinyl Pyrrolidone-co-Poly Vinyl Imidazole)					0.65		
LR400 (Cationic polymer)				0.75	0.5	0.4	
Jaguar C500 (Cationic polymer)							0.4
PROXEL GXL	0.04	0.04	0.04	0.01	0.01	0.01	0.01
SODIUM CHLORIDE	0.5	0.5	0.5	0.5	0.5		
ACUSOL OP31	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Dye	0.001	0.0005	0.001	0.001	0.001	0.001	0.001
PERFUME	1.3	1.1	1.1	1.39	1.39	1.2	1.2
SODIUM HYDROXIDE	to pH 7	to pH 7.5	to pH 8.5	to pH 7	to pH 8	to pH 8	to pH 8.5
WATER	to 100	to 100	to 100	to 100	to 100	to 100	to 100

Softening Experiment Formulations

Alkyl ether carboxylic acid/carboxylate salt for fabric softening

Various liquid detergents were made using the aforementioned method to test fabric softening. The ingredients of the liquid detergents are shown in table 2:

Table 2

Ingredient	A %.wt	Internal Control %.wt	1 %.wt
LAS ACID	10.3	10.3	10.3
NEODOL 25-7E	20	20	20
Glycerol	5	5	5
Propylene Glycol	9	9	9
Triethanolamine	6	4	4
Prifac 5908[1]	6		
MARLOWET 4560[2]		6	6
Sodium Hydroxide	to pH 9	to pH 8	to pH 8
Water	to 100	to 100	to 100

[1] Prifac 5908 is hydrogenated topped palm kernel fatty acid available from Croda

[2] Marlowet 4560 is C_{16}-Ci_8 alcohol polyethylene glycol ether carboxylic acid available from Sasol

Formulation A is comparative and contains fatty acid. Formulation 1 is according to the invention and includes an Alkyl Ether Carboxylic Acid. An internal control was used and this control had an identical formulation to formulation 1. This was used to check the accuracy of the panellists, and the softening score for the internal control should be very similar or identical to the softening score for formulation 1.

Details of the AEC vs. Fatty Acid panel test (method, no. of panellist = 12)
The internal control, and formulations A and 1 were used as main wash products for identical bundles of fabrics. The main wash was carried out using local water (14°FH). The protocol used involved washing 10 pieces (20cm x 20cm) of terry towelling along with polycotton ballast measured to a 2.5kg total load. This was added to a Miele front loading washing machine. 35ml of formulated detergent

from table 2 was added into a dosing ball then placed on top of the load in the drum of the washing machine.

The machine was programmed to a standard 40°C cotton cycle. The towelling swatches were line dried in between cycles. This process was repeated 5 times. The towels were then given to the panel for assessment.

The laundered fabric was then assessed by a trained panel of 12 people. The panellists were asked to score the garments for softness, in comparison to an internal control. The internal control was given a score of 100.

The average softness scores are shown in table 3. A higher score indicates better softening. The values for the formulation 1 (according to the invention) were practically the same. The data indicates that the alkyl ether carboxylate provides much superior softening in comparison to the fatty acid formulation without alkyl ether carboxylate.

Table 3

Formulation	Softness Score
A (Comparative)	**55**
1 (Invention)	**98**
Internal Control (same as formulation 1)	**100**

Combination of alkyl ether carboxylic acid/carboxylate salt with a cationic polymer for improved fabric softening

Softening experiments were also done to ascertain if the softening effect of the alkyl ether carboxylic acid or carboxylate salt thereof could be improved further by addition of a cationic polymer. Formulations were made up as shown in Table 4.

Table 4

Ingredient	B %.wt	C %.wt	2 %.wt	3 %.wt	4 %.wt
LAS ACID	5	5	5	5	5
SLES	3.5	3.5	3.5	3.5	3.5
NEODOL 25-7E	7.5	7.5	7.5	7.5	7.5
Propylene Glycol	15	15	15	15	15
Triethanolamine	2	2	2	2	2
Softening Clay (Bentonite)		3			
MARLOWET 4560[1]			6	6	
MARLOWET 1072[2]					6
LR400[3]				0.5	0.5
Sodium Hydroxide	to pH 8	to pH 8	to pH 8	to pH 8	to pH 8
WATER	to 100	to 100	to 100	to 100	to 100

[1] Marlowet 4560 is C_{16}-C_{18} alcohol polyethylene glycol ether carboxylic acid available from Sasol

[2] Marlowet 1072 is **C12-C14** alcohol polyethylene glycol ether (5EO) carboxylic acid available from Sasol

[3] LR400 is cationic cellulose polymer available from Amerchol

This base liquid without any fabric softening additives was used a control (formulation B). Formulation (C) is a comparative example, and includes a fabric softening clay (Bentonite) added as part of the remaining components. Formulation (2) is according to the invention and includes an alkyl ether carboxylic acid without cationic polymer. Formulations (3) and (4) are also according to the invention in a different preferred embodiment and include a combination of alkyl ether carboxylic acid and a cationic polysaccharide polymer. Different alkyl ether carboxylic acids are used in (3) and (4).

Softening Experiment

Formulations B & C and 2 to 4 were used as main wash products for identical bundles of fabrics. The main wash was carried out using local water (14°FH). The

protocol used involved washing 10 pieces (20cm x 20cm) of terry towelling along with polycotton ballast measured to a 2.5kg total load. This was added to a Miele front loading washing machine. 35ml of formulated detergent from table 4 was added into a dosing ball then placed on top of the load in the drum of the washing machine.

The machine was programmed to a standard 40°C cotton cycle. The towelling swatches were line dried in between cycles. This process was repeated 5 times. The towels were then given to the panel for assessment.

The laundered fabric was then assessed by a trained panel of 10 people. They ranked the fabric treated with each of the 5 products from 1-5 (5 indicating the softest fabric) using each number (i.e. each panellist ranked the products 1, 2, 3, 4, 5 from least to most soft). The results are shown in table 5:

Table 5

Formulation	Individual Ranks & Sum Total	Average Rank
B (Comparative)	1, 1, 4, 1, 1, 1, 3, 5, 3, 1 = 21	2.1 (21/10)
C (Comparative)	2, 3, 1, 3, 3, 3, 1, 2, 1, 2 = 21	2.1 (21/10)
2 (Invention)	4, 2, 2, 4, 2, 2, 2, 1, 4, 3 = 26	2.6 (26/10)
3 (Invention)	3, 4, 3, 5, 5, 5, 4, 4, 5, 4 = 42	4.2 (42/10)
4 (Invention)	5, 5, 5, 2, 4, 4, 5, 3, 2, 5 = 40	4.0 (40/10)

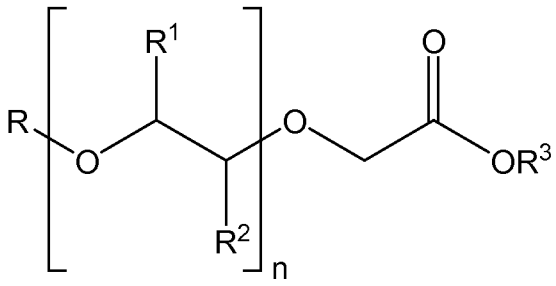
The results for formulation 2 again showed that use of an alkyl ether carboxylic acid or carboxylate salt provided a fabric softening benefit, even above that provided by a fabric softening clay.

The results for formulations 3 & 4 provide clear evidence that the softening effect of the alkyl ether carboxylic acid or carboxylate salt can be further improved by combining it with a cationic polymer.

CLAIMS

1. Use of an alkyl ether carboxylic acid or carboxylate salt thereof in combination with a cationic polymer in a laundry composition to provide softness to fabrics.

2. Use according to claim 1, wherein the alkyl ether carboxylic acid or carboxylate salt thereof is depicted by:



wherein R denotes a saturated or unsaturated **C6-C22** alkyl chain; R^1 and R^2 are either both hydrogen; or R^1 is hydrogen and R^2 is CH_3; or R^1 is CH_3 and R^2 is hydrogen; R^3 is hydrogen, or a solubilising cation such as sodium, potassium, ammonium or substituted ammonium; and, n is a number from 2 to 20, preferably 3 to 12, denoting the number of repeat units.

3. Use according to claim 1 or claim 2, wherein the alkyl ether carboxylic acid or carboxylate salt has a **Cs-Cis** alkyl chain with between 2-1 2 glycol repeat units, wherein the glycol repeat units are selected from ethylene glycol, propylene glycol or mixtures thereof..

4. Use according to any preceding claim, wherein the alkyl ether carboxylic acid or carboxylate salt thereof is provided in a laundry composition at a level of from 1 to 12 wt.%, preferably at a level of from 2 to 7.5 wt.%.

5. Use according to claim 4, wherein the laundry composition is a liquid laundry composition having a pH of from 6.2 to 9, preferably from pH 6.5 to 8.5, most preferably from pH 6.5 to 8.

6. Use according to any preceding claim, wherein the cationic polymer is present at a level of from 0.1 to 1 wt.%.

7. Use according to any one of claims 4 to 6, wherein the cationic polymer is selected from the group consisting of: cationic polysaccharide polymers, and cationic non-saccharide polymers having cationic protonated amine or quaternary ammonium functionalities that are homo or copolymers derived from monomers containing an amino or quaternary nitrogen functional group polymerised from at least one of the following monomer classes: acrylate or (meth)acrylate; acrylamide or (meth)acrylamide; allyls; ethylene imine; and/or vinyls, and mixtures thereof.

8. Use according to claim 7, wherein the cationic polymer is selected from the group consisting of cationic cellulose polymers, cationic guar polymers, cationic diallyl quaternary ammonium-containing polymers and homo or copolymers of dimethylaminoethyl (meth)acrylate, diethylaminoethyl (meth)acrylate or tert-butylaminoethyl (meth)acrylate, and mixtures thereof.

9. Use according to claim 8, wherein the cationic polymer is a cationic polysaccharide polymer, selected from cationic cellulose polymers and cationic guar polymers.

10. Use according to claim 9, wherein the cationic polysaccharide polymer is a cationic cellulose polymer.

11. Use according to claim 10, wherein the cationic polysaccharide polymer is a quaternised hydroxy ethyl cellulose.

12. Use according to any one of claims 3 to 11, wherein the laundry composition is a detergent composition comprising a detersive surfactant, preferably anionic, nonionic or a mixture thereof.

13. Use according to any one of claims 3 to 12, wherein the composition further comprises an ingredient selected from, shading dye, enzyme, an antiredeposition polymer, a dye transfer inhibiting polymer, builder, sequestrant, sunscreen and/or soil release polymer.

14. A method of softening fabrics, comprising the steps:

(a) providing a laundry composition comprising an alkyl ether carboxylic acid or carboxylate salt thereof and a cationic polymer;

(b) contacting one or more textile articles with the composition at one or more points during the main wash of a laundering process; and,

(c) allowing the textile articles to dry or mechanically tumble-drying them.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/071587

A. CLASSIFICATION OF SUBJECT MATTER
INV. C11D1/06 C11D3/00 C11D11/00 C11D3/22
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 practicable, search terms used)
EPO-Internal , WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2 288 600 A (SANDOZ LTD) 25 October 1995 (1995-10-25) page 5, last paragraph - page 6, line 5; claims; examples	1-14
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-/- .

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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